2023 Maine State Hazard Mitigation Plan

**Plan Prepared by
Maine Emergency Management Agency**

Janet T. Mills
GOVERNOR

STATE OF MAINE
OFFICE OF THE GOVERNOR
1 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0001

September 27, 2023

Ms. Lori Ehrlich
Regional Administrator
FEMA Region 1
220 Binney Street
Cambridge, Massachusetts 02142

Dear Ms. Ehrlich:

I am pleased to present and formally adopt the 2023 Maine State Hazard Mitigation Plan. This plan complies with current federal requirements under the Stafford Act for state hazard mitigation plans and maintains eligibility for millions of dollars in state-allocated disaster recovery and hazard mitigation funding for the State of Maine and over one billion dollars in national competitive funds.

Maine is exposed to numerous natural hazards, many of which are exacerbated by climate change. This plan provides an assessment of current and anticipated risk from these natural hazards, an analysis of existing capabilities and adaptive capacity, and a mitigation strategy to implement risk reduction and to fill capability gaps on a long-term and sustainable basis. The goals of the plan align with Maine's commitment to clean energy and climate resilience as presented in *Maine Won't Wait, a Four-Year Plan for Climate Action*.

This plan is a living document containing multiple risk and capability assessment products, all of which reside on the Maine Emergency Management Agency's Website. State executive offices and agencies will begin immediately to advance and track their assigned mitigation actions.

This plan includes assurances that the State will comply with all applicable Federal statutes and regulations in effect with respect to the periods for which it receives grant funding. The Maine Emergency Management Agency will amend the plan whenever necessary to reflect changes in State or Federal statutes and regulations. The planning team will make improvements with the advent of new information to ensure that every component continues to serve the State of Maine as needed. For example, the planning team will monitor, evaluate, and update state hazard mitigation actions in anticipation of new climate change trends and natural hazard risk findings.

The Maine State Hazard Mitigation Plan is a product of stakeholder engagement with over one hundred contributing mitigation partners representing local, county, state, tribal, and federal government, non-profit organizations, academic institutions, students, and other members of the public. Suggestions provided by mitigation partners were thoughtful, diverse, informative, and each one has made the plan a success. Thank you to those who were involved for your contributions, and I look forward to your continued involvement in future updates of this plan as we all work together towards a more resilient Maine.

Sincerely,

Janet Mills
Governor

Section 1 – Executive Summary

Hazard Mitigation is any sustained action to reduce or eliminate long-term risk to people and property from the effects of natural hazards.

Mitigation is acting now – before the next disaster occurs.

Though the occurrence of natural hazards cannot be avoided, Maine can certainly take positive action to reduce their impacts and invest in our future. As reported by the National Institute of Building Sciences, every dollar invested in mitigation saves up to thirteen dollars that would be spent on costly repairs to vulnerable infrastructure. Mitigation also saves lives by reducing the impacts of natural disasters, which cause an average of 363 deaths per year in the United States as reported by National Oceanic and Atmospheric Administration.

Planning is the first step towards effective mitigation. The 2023 State Hazard Mitigation Plan (SHMP) presents Maine's many natural hazard risks and strategic guidance to reduce or eliminate our greatest vulnerabilities. The SHMP is updated every five years to posture the state for new climate change impacts, policy improvements, new development trends, and many other factors affecting Maine's risk landscape. The goals of the plan have therefore expanded to address our improved understanding of climate change risks and the expansive efforts of state and federal agencies in advancing climate resilience policies. These goals are as follows:

Protect lives, property, and the environment from all natural hazard risks and associated impacts of climate change now and in the future.

Enhance state natural hazard mitigation capabilities through greater coordination among federal, state, county, and local partners.

Improve hazard mitigation literacy and awareness among the public, business owners, academic institutions, and state, county, and local officials.

Implement mitigation actions that preserve or restore the functions of natural systems and emphasize sustainable development.

Build equity into all facets of the State Hazard Mitigation Program.

The SHMP provides eligibility for the FEMA Hazard Mitigation Assistance (HMA) grant program. These programs seek to fund effective and innovative activities that address future risks to natural disasters. Addressing these risks help Maine and our communities become more resilient. While some HMA opportunities can be used for capacity-building activities, others are directed toward physical infrastructure projects. Maine state agencies, tribal nations, local governments, and municipalities have all applied for HMA grants to assist with updating local hazard mitigation plans, project scoping, building code training, and management costs. Maine would be ineligible to apply for HMA grants without an approved hazard mitigation plan.

The State Hazard Mitigation Plan provides strategic guidance and hazard mitigation assistance in our ever-changing landscape of risk

The Mitigation Planning Process involved coordination with over one hundred local, state, tribal, federal, and non-governmental participants, to the collective benefit of this and many other state planning mechanisms that are now integrated with MEMA's mitigation goals. This plan is intended to support not only our communities but also State agencies practicing natural hazard mitigation, equitable resource provision, and climate change resilience.

Our communities have an opportunity to identify their own mitigation strategies through development of Local Hazard Mitigation Plans (LHMP). The SHMP guides local and regional planners to create successful mitigation plans with best-available resources. Conversely, local mitigation efforts are integrated in the SHMP to build a stronger statewide mitigation strategy representing all levels of government. The LHMP update process is typically managed by County Emergency Management Agencies, the SHMP process is managed by the Maine Emergency Management Agency (MEMA), and both plans are regulated by the Federal Emergency Management Agency (FEMA).

Natural hazard events are widespread within Maine, ranging from flooding, drought, extreme cold, extreme heat, damaging winds, wildfires, ice storms, heavy snowfall, landslides and mass wasting, severe erosion, and earthquakes. Many of the most impactful natural disasters involve a cascade of events, where one event can give way to many others. For example, droughts may lead to wildfires, and wildfires that destroy soil-stabilizing vegetation will lead to widespread erosion, landslides, and poor water quality when rains eventually return. Hurricanes are a combination of many hazards: coastal storm surge, inland flooding, damaging wind, thunderstorms, tornadoes, and rip currents all coincide with these massive storms. Recent impacts due to climate change have increased risks from other natural hazards, including poor air quality driven by wildfires and extreme heat, an ever-expanding damage from forest pests responding to drought and heat, and public health risks from freshwater and marine harmful algal blooms in warming, nutrient-rich freshwater and marine ecosystems.

Though the resilient and self-sufficient nature of Mainers has traditionally been enough to handle the impacts of our natural hazards, conditions are changing drastically. Currently there are six Presidentially Declared Disasters, with another two disaster declarations pending in 2023. Now more than ever, the SHMP will serve Maine with strategic guidance and hazard mitigation assistance in our ever-changing landscape of risk. Through strong partnership, we can move toward a more resilient Maine.

Acronym Definitions

Acronym/abbrev.	Definition
AADT	Annual Average Daily Traffic
ALA	American Lung Association
AOP	Aquatic Organism Passage
APA	Approval Pending Adoption
AQI	Air Quality Index
AQS	Air Quality System
ARP	Acid Rain Program
ASDSO	Association of Dam Safety Officials
BCA	Benefit Cost Analysis
BFE	Base Flood Elevation
BGS	Bureau of General Services
BI	Bureau of Insurance
BIL	Bipartisan Infrastructure Law
BLD	Beech Leaf Disease
BRIC	Building Resilient Infrastructure and Communities
BTM	Browntail Moth
BTU	British Thermal Unit
C&CB	Capacity & Capacity-Building
CDC	Maine Center for Disease Control
CDC	U.S. Center for Disease Control
CDS	Congressionally Directed Spending
CDWG	Community Wildlife Defense Grant
CEJEST	Climate and Economic Justice Screening Tool
CEO	Code Enforcement Officer
CFR	Code of Federal Regulations
CIKR	Critical Infrastructure and Key Resources
CME	Coronal Mass Ejections
CMP	Central Maine Power
COPD	Chronic Obstructive Pulmonary Disease
CPC	Climate Prediction Center
CPF	Community Project Funding
CRS	Community Rating System
CSAPR	Cross-State Air Pollution Rule
CWPP	Community Wildfire Protection Plan
DACF	Department of Agriculture. Conservation and Forestry
DAFS	Department of Administrative and Financials Services
DEP	Department of Environmental Protection
DFIRM	Digital Flood Insurance Rate Map
DHS	Department of Homeland Security
DMR	Department of Marine Resources
DOE	Department of Energy
DOT	Maine Department of Transportation
DSP	Dam Safety Program
DTF	Drought Task Force
DWP	CDC Drinking Water Program
EAB	Emerald Ash Borer
EAL	Expected Annual Loss
EMA	Emergency Management Agency
EMP	Electromagnetic Pulse
EOP	Emergency Operations Plan

Acronym/abbrev.	Definition
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
ERC	Energy Release Component
ESP	Energy Security Plan
EWL	Extreme Water Levels
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FMA	Flood Mitigation Assistance
FMAG	Fire Management Assistance Grant
FMP	Floodplain Management Program
FPA	Forest Practices Act
GDP	Gross Domestic Product
GEO	Governor's Energy Office
GeoLib	Maine GeoLibrary
GHGs	Greenhouse Gases
GIS	Geographic Information System
GMRI	Gulf of Maine Research Institute
GOPIF	Governor's Office of Policy Innovation and the Future
HABs	Harmful Algal Blooms
HAZMAT	Hazardous and Toxic Materials
HMA	Hazard Mitigation Assistance
HMGP	Hazard Mitigation Grant Program
HWA	Hemlock Wooly Adelgid
IA	Individual Assistance
ICCOH	Interagency Coordinating Committee on Hurricanes
IFW	Department of Inland Fisheries and Wildlife
IIJA	Infrastructure Investment and Jobs Act
IJC	International Joint Commission
KBDI	Keetch-Byram Drought Index
LHMP	Local Hazard Mitigation Plan
LID	Low Impact Development
LIHEAP	Maine Low Income Home Energy Assistance Program
LPDM	Legislative Pre-Disaster Mitigation
MBMAP	Maine Beach Mapping Program
MC	Senator George J. Mitchell Center for Sustainability Solutions
MEGIS	Maine Office of GIS
MEMA	Maine Emergency Management Agency
MEOW	Maximum Envelopes of Water
MFS	Maine Forest Service
MHPC	Maine Historic Preservation Commission
MMA	Maine Municipal Association
MOMs	Maximum of MEOWs
MRSA	Maine Revised Statutes Annotated
MS4	Municipal Separate Storm Sewer Systems
MWW	Maine Won't Wait
NAAQS	National Ambient Air Quality Standards
NBRC	Northern Border Regional Commission
NBRC	Northern Border Regional Commission
NEDEWS	Northeast Drought Warning System

Acronym/abbrev.	Definition
NESEC	Northeast State Emergency Consortium
NESIS	Northeast Snowfall Impact Scale
NFWF	National Fish and Wildlife Foundation
NHC	National Hurricane Center
NIPP	National Infrastructure Protection Plan
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOFO	Notice of Funding Opportunity
NOx	Nitrogen Oxides
NWS	National Weather Service
OAG	Office of the Attorney General
PAR	Population at Risk
PFAS	Per- and Polyfluorinated Substances
pH	Potential Hydrogen
PM	Particulate Matter
PROTECT	Promoting Resilient Operations for Tranformative, Efficient, and Cost-Saving Transportation
PSP	Paralytic Shellfish Poisoning
RAPT	Resilience Analysis and Planning Tool
RFAC	River Flow Advisory Commission
RLF	Revolving Loan Fund
RPO	Regional Planning Organization
SAX	Saxitoxin
SBA	U.S. Small Business Administration
SBW	Spruce Budworm
SDP	Substantial Damage Plan
SFHA	Special Flood Hazard Area
SFM	Office of the State Fire Marshal
SHMP	State Hazard Mitigation Plan
SJ	Silver Jackets
SLR	Sea Level Rise
SMBPP	State of Maine Beach Profiling Program
SMPDC	Southern Maine Plannning and Development Commission
SOx	Sulfur Dioxide
SPI	Standard Precipitation Index
STORM	Safeguarding Tomorrow through Ongoing Risk Mitigation
SVI	Social Vulnerability Index
TCI	The Climate Initiative
THIRA/SPR	Threat and Hazard Identification and Risk Assessment/Stakeholder Preparedness Review
TN	Tribal Nations
TNC	The Nature Conservancy
TORRO	Tornado and Storm Research Organizarion
TPI	Third Party Inspector
TRAPPD	Transportation Risk Assessment for Planning and Project Delivery
UEI	Unique Entity Indentifier
UMS	University of Maine System
USD	U.S. Dollar
USDA	U.S. Department of Agriculture
USDM	U.S. Drought Monitor
USEPA	U.S. Environmental Protection Agency
USG	Unhealthy Sensitive Group
NPG	National Preparedness Goal
NPS	National Preparedness System
PA	Public Assistance
SLOSH	Sea Lake and Overland Surges from Hurricanes

Acronym/abbrev.	Definition
USGS	U.S. Geological Survey
UV	Ultraviolet Radiation
VM	Volunteer Maine
VOC	Volatile Organic Compounds
WMO	World Meterological Organization
WUI	Wildland Urban Interface
AAR	After action report
HES	Hurricane Evacuation Study
HHPD	High Hazard Potential Dams
ME-CFRM	Maine Coastal Flood Risk Model
MICA	Maine Interagency Climate Adaptation
MWW	Maine Won't Wait plan
NBRC	Northern Border Regional Commission
PT	Planning Team
SFA	Northeast-Midwest State Foresters Alliance
SHMP	State Hazard Mitigation Plan
AOP	Culvert Aquatic Organism Passage Progran
ARPA	American Rescue Plan Act
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
BBCS	Bureau of Building Codes and Standards
CAG	Community Action Grants
CCGP	Coastal Community Grant Program
CDBG	Community Development Block Grant
CDC	U.S. Center for Disease Control
CIG	Conservation Innovation Grants
CRP	Community Resilience Partnership
CWDG	Community Wildfire Defense Grant
DSS-WISE	Decision Support System for Water Infrastructure Security
EAP	Emergency Action Plan
EMPG	Emergency Management Performance Gra
FIRM	Flood Insurance Rate Map
FPMS	USACE Flood Plain Management Services
HHPD	High Hazard Potential Dams
HMA	Hazard Mitigation Assistance
HSGP	FEMA Homeland Security Grant Program
HUD	Housing and Urban Development
IBC	International Building Code
IEBC	International Existing Building Code
IECC	International Energy Conservation Code
IMC	International Mechanical Code
IRC	International Residential Code
LIDAR	Light Detection and Ranging
LUPC	Land Use Planning Comission
MCC	Maine Climate Council
MCMI	Maine Coastal Mapping Initiative
ME-CFRM	Maine Coastal Flood Risk Model
MGS	Maine Geological Survey
MPAP	Municipal Planning Assistance Program
MSCU	Municipal Stream Crossing Upgrade Grant
MUBEC	Maine Uniform Building and Energey Code
NBRC	Northern Border Regional Commission
NDSP	National Dam Safety Program
NFIP	National Flood Insurance Program
NFPP	National Fish Passage Program

Planning Process

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Section 2 – Planning Process

Stafford Act 44 CFR §201.4(b), §201.4(c)(1)[1]

2.1 How the Plan was Prepared [S1]

The Maine State Hazard Mitigation Plan – 2023 Update constitutes Volume II of the State Comprehensive Emergency Management Plan. As such, the plan fulfills requirements of the Stafford Act, 44 CFR 201.4, while also contributing to a larger framework for state-level emergency management activities and a process for how State Government interfaces with other emergency management stakeholders, including local, county, and tribal governments, non-governmental organizations, other states, the Federal Government, and the private sector.

2.1.1 Planning Team and Mitigation Partners

The Maine Emergency Management Agency (MEMA) is responsible for updating the 2023 Maine State Hazard Mitigation Plan (SHMP). These plans are regulated by the Federal Emergency Management Agency (FEMA). Approval of SHMPs by FEMA allow states to apply for Hazard Mitigation Assistance (HMA). In March of 2022 MEMA coordinated a Planning Team, consisting of staff from MEMA and the Department of Agriculture, Conservation and Forestry (DACF), with objectives to administer the plan update and seek opportunities for plan integration with other state agencies. Responsibilities for plan update leadership include establishing the plan update/maintenance process, writing the updated plan, engaging stakeholders, hosting informational meetings, requesting targeted input and feedback, performing risk assessments using best available GIS/database resources, and tracking implementation of mitigation goals.

Through the update process the Planning Team engaged key stakeholders, referred to as Mitigation Partners, to incorporate resources for the Risk Assessment, State Capabilities Assessment, Local Capabilities Assessment, and Mitigation Strategy sections of the Plan. Mitigation Partners represent various interests such as emergency management, economic development, land use and building code development, housing, health and social services, infrastructure, natural and cultural resources, and related community lifelines. Communications with Mitigation Partners led to multiple opportunities for plan integration between the SHMP and other state plans as noted in the Mitigation Strategy.

Many Planning Team members represent local jurisdictions. In this plan, jurisdictions are defined at the county geopolitical level, and primary stakeholders are County EMA Directors. County EMAs work directly with their municipalities to collect important risk, capabilities, and mitigation strategies to ensure that the most relevant, grass-roots data are reported in local plans and in the SHMP.

2.1.2 Mitigation Goals

Five mitigation goals have been established for the 2023 SHMP update, based on past plans, MEMA's direction for advancing the mitigation program, and recommendations from all Mitigation Partners. Please refer to Section 6 – Mitigation Strategy, for details on how these goals were established.

Mitigation Goal 1: Protect lives, property, and the environment from all natural hazard risks and associated impacts of climate change now and in the future.

Mitigation Goal 2: Enhance state natural hazard mitigation capabilities through greater coordination among federal, state, county, and local partners.

[1] Stafford Act 44 CFR §201.4: https://www.law.cornell.edu/cfr/text/44/201.4

Mitigation Goal 3: Improve hazard mitigation literacy and awareness among the public, business owners, academic institutions, and state, county, and local officials.

Mitigation Goal 4: Implement mitigation actions that preserve or restore the functions of natural systems and emphasize sustainable development.

Mitigation Goal 5: Build equity into all facets of the State Hazard Mitigation Program

2.1.3 Plan Organization

This SHMP update consists of the following sections:

Section 1 – Executive Summary
Section 2 – Planning Process
Section 3 – Risk Assessment
Section 4 – State Capabilities
Section 5 – Local Capabilities
Section 6 – Mitigation Strategy
Section 7 – Plan Maintenance

2.1.4 Summary of Review and Updates

The Plan underwent many substantial updates. All planning participants provided updates that were incorporated to improve the plan. These updates targeted two major needs. First, the State of Maine has recently taken major strides in establishing climate change resilience policy, regulations, programs, technical assistance, data, and funding to match the need of growing climate change risks, nearly all of which align with FEMA Hazard Mitigation Assistance (HMA) program goals managed by MEMA. For example, the SHMP goals have been updated based on this newfound support for climate resilience and greater potential for state agency partnerships to help address climate change issues. Second, In April 2023, FEMA enacted changes to the State Mitigation Planning Policy Review Guide[2], requiring greater consideration of climate risks and resource equity challenges for disadvantaged communities.

Additional motivations for this plan update include changes in risk, development, the occurrence of multiple Disaster Declarations and undeclared local severe weather events, availability of new geospatial data to better calculate risk, and the emergence of new natural hazards that have not been profiled in previous plan versions. Mitigation Partners provided evidence to the importance of these new hazards due to climate change and their sensitivity to other hazards.

The Planning Team took a focused and targeted approach to efficiently manage resources for the update. This included internal collaboration to review and revise fundamental components of the plan that specifically address FEMA's new policy guide. This also includes coordinating with partners to expand the usefulness and benefits of hazard mitigation planning across many state, local, and nongovernmental entities. The Planning Team organized the plan update in three groups to identify changes in 1) natural hazard risks, 2) state and local capabilities that support hazard mitigation, and 3) capability gaps and problem statements that may be addressed by new mitigation goals and proposed actions. The Planning Team took advantage of pre-existing partnerships and meeting schedules to grow interest in the mitigation program and maximize opportunities for plan integration. Participation consisted of multiple subject matter experts, including climate scientists, resilience program administrators, and community action partners. Many opportunities were given to provide and incorporate feedback, as noted below.

[2] FEMA Mitigation Policy: https://www.fema.gov/sites/default/files/documents/fema_state-mitigation-planning-policy-guide_042022.pdf

Review and Update of the Planning Process

The Planning Team determined that the planning process for the 2019 SHMP required updates to 1) engage more state agencies and incorporate their subject matter expertise into the planning process and 2) restructure the planning activities to offer more opportunities for receiving and incorporating feedback and include more examples of plan integration. Further, the planning process was amended to account for changes in FEMA's State Mitigation Planning Policy Guide relevant for all sections of the plan. A new timeframe and milestones were also included to clarify the planning process.

Review and Update of the Risk Assessment

Though the level of risk has not changed substantially since the 2019 SHMP, there are many more useful resources now to help understand and quantify risk. Many changes were implemented by the Planning Team and Mitigation Partners to improve the Risk Assessment, including a more comprehensive description of why certain hazards were included or excluded from profiles, and the addition of new hazards and changes to previously included hazards, based on climate change impacts. New GIS resources are now available to quantify and monetize risk to state and jurisdictional assets for a multitude of mappable hazard types. Community lifelines concepts are integrated into vulnerability assessments, and there is greater consideration of disadvantaged communities and their vulnerability to profiled hazards. New local risk assessment data is also incorporated into this section of the plan.

Review and Update of the State and Local Capabilities

Though many of the state and local mitigation capabilities documented in the 2019 plan remain available, still more are newly available or properly documented in the 2023 SHMP update. Many of these opportunities are the result of state and federal administrative changes leading to more support for hazard mitigation. This section now incorporates all mitigation/resilience-based programs, policies, practices, plans, guidelines, and funding sources that the Planning Team was made aware of during the update process. As the list of capabilities began to form, a list of capability gaps and potential solutions was created to provide a basis for major updates of the Mitigation Strategy.

Review and Update of the Mitigation Strategy

The Planning Team reviewed the 2019 SHMP mitigation strategy and determined that the scope of mitigation goals and actions that fulfill the goals needed updates in order to encompass the problem statements brought forward by Mitigation Partners. This resulted in the creation of five new mitigation goals presented above and new mitigation actions that document the work being completed, not just by MEMA, but also by Mitigation Partners.

Review and Update of Plan Maintenance

Plan maintenance did not require many revisions other than those required by FEMA's new planning policy guide. The most substantial change is the inclusion of a 5-year plan cycle graphic depicting timeframes of specific processes, and milestones to support a well-supported and successful plan update.

2.2 Involvement and Coordination with Mitigation Partners [S1; S2]

Over one hundred participants contributed to the SHMP 2023 update, representing state and federal agencies, county government, regional planning organizations, universities, private nonprofit organizations, quasi-governmental organizations, and consultants who assisted with plans and vulnerability assessments that were integrated with the SHMP update. The 2023 plan represents a very high level of coordination and plan integration compared to the 2019 plan. No consultants were hired to update the SHMP, and all necessary work was undertaken by MEMA.

Coordination with Mitigation Partners varied based on types of mitigation-related authorities, subject matter expertise, and level of interest and work capacity of the partners. For example, coordination between MEMA and state/federal/private organizations involved review/suggested edits of plan sections; interviews to determine risk, capabilities, and mitigation actions of interest to the organization; and in some cases, plan integration to improve implementation of the mitigation program and the programs administered by partner organizations. All coordination occurred by virtual or in person meetings, with follow-up meetings/calls or email correspondence. The specific improvements made through coordination are documented below in the roster of participants and throughout the SHMP.

Information flows back and forth on a frequent basis between towns, their respective counties, and the state, particularly during the development of Multi-Jurisdictional Hazard Mitigation Plans. Concurrently, agencies were involved through their participation as Mitigation Partners, and through individual meetings and contacts with MEMA. Perhaps more important from a coordination standpoint is that there has been a great deal of coordination on mitigation issues between federal, state, and county officials. The results of this coordination work include:

- Awareness of issues: A greater awareness of some of the issues Maine faces, such as increased flood flows resulting from upstream development in a given watershed (enhanced awareness has helped in the development of mitigation strategies);
- Opportunities for mitigation: A greater awareness of available Hazard Mitigation Assistance (HMA)
- Local Outreach: Ongoing workshops by the Maine Department of Transportation for local officials on the use of geosynthetics and general “best management practices” in road and ditch work
- Multi-jurisdictional Coordination: Continuous trainings and exercises with state, county, and local participation
- GIS Information: A greater use of GIS-based mapping and the continued close cooperation between state agencies in the sharing of GIS data.

Federal officials were also involved through their participation in various MEMA-sponsored conferences and exercises on hazard mitigation and disaster assistance.

2.2.1 Sectors Represented by Mitigation Partners [S2.a.]

The Planning Team invited stakeholders to become Mitigation Partners to collectively improve the SHMP by representing multiple sectors and providing many perspectives. Table 2.1 generalizes the various sectors that each Mitigation Partner represents. In addition to economic development, land use and development, building codes, and natural and cultural resources, sectors relate to all community lifelines: safety and security; Food, water, and shelter; health and medical; energy; communications; transportation; and hazardous materials.

Table 2.1: Sectors represented by Mitigation Partners

BC – Building Codes*	GIS – GIS expert*	LUD – Land Use and Development*
CS – Communications systems	GSME – Grant subject matter expert*	NCR – Natural and cultural resources
ED – Economic Development*	HFWS – Housing, food, water, shelter	RSME – Risk subject matter expert*
EM – Emergency management	HI – Hazard insurance*	SA – State assets*
ES – Energy systems	HSS – Health and Social Services	TS – Transportation systems

CC – Partner is also a climate change subject matter expert

UC – Partner is also an underserved community's subject matter expert

* Though not listed in FEMA community lifelines, these sectors directly support community lifelines through contributions to THIRA/SPR and other risk-based plans and analyses.

2.2.2 Coordination with Climate Change and Disadvantaged/Underserved Communities Experts [S2.a.]

The state climatologist participated in the Risk Assessment update, and many members of the Maine Climate Council contributed to sections of the plan as noted in the roster of participants below. As noted above and in Section 7 – Mitigation Strategy, the SHMP goals were designed to complement goals from The State of Maine's Climate goals set forth by the Governor entitled, "Maine Won't Wait" by representing interests in hazard mitigation from the perspective of emergency management. Subject matter experts from NOAA, US Geological Survey, Maine Geological Survey, US Army Corps of Engineers, and the University of Maine provided crucial new climate change risk information that was not available in previous plan updates.

Subject matter experts who work with underserved communities were also invited to participate in the plan update process as noted below. GIS subject matter experts assisted with developing regional-scale analyses of disadvantaged community vulnerability for different hazards profiled in Section 3 – Risk Assessment, using tools such as the Social Vulnerability Index[3], Climate and Economic Justice Screening Tool[4], and FEMA's RAPT tool[5]. The Planning Team engaged with organizations who work directly with disadvantaged communities. However, more work is needed to further integrate equity in hazard mitigation, as many of these organizations have limited resources to consider how best to implement hazard mitigation, as they address current housing, poverty, and healthcare crises in Maine. Other organizations that administer resources supporting equity offered suggestions to better implement these resources for purposes of hazard mitigation. These needs inform mitigation actions shared in Section 7 – Mitigation Strategy.

2.2.3 Coordination with Dam Safety Program [HHPD1]

The Maine Dam Safety Program (DSP) is a division within MEMA, therefore it was a simple process to coordinate with the filled positions of Dam Safety Administrator and the Assistant Dam Safety Inspector. The Dam Safety Inspector position has remained vacant for nearly two years and MEMA relies on an engineering consultant to fulfill the duties of the DSP. Please refer to Section 3– Risk Assessment, Dam Safety Limitations for more information.

[3] SVI Tool: https://www.atsdr.cdc.gov/placeandhealth/svi/index.html
[4] CEJST Tool: https://screeningtool.geoplatform.gov/
[5] RAPT: https://www.fema.gov/emergency-managers/practitioners/resilience-analysis-and-planning-tool

Dam Safety Program Involvement [HHPD1.a.]

The DSP Administrator is responsible for managing the state dam safety database, all emergency action plans (EAPs) for high hazard dams, maintaining contact information for dam owners, and administrating the High Hazard Potential Dams grant program (HHPD), among many other responsibilities. Most planning coordination occurred between the Planning Team and the program administrator due to limited staff.

MEMA engages other entities such as hydropower project operators, through the annual River Flow Advisory Commission. In these meetings, discussions about long-term trends in flow conditions related to flooding and drought are covered, and information on FEMA's Hazard Mitigation Assistance (HMA) program is shared with participants. Unfortunately, there is currently limited interest in the HHPD program because it is so new, there are only a small number of eligible dams in Maine, and the DSP is currently too understaffed to manage the program. The intent is to target this problem by encouraging more training and staffing to increase HHPD interests in Maine.

Dam Safety Data Contributions Limitations, and Potential Solutions [HHPD1.b.]

The DSP provided their entire dams geodatabase for the SHMP. This does not include EAPs, which are not generally in digital form in Maine, with no standard georeferenced data for inundation zones, structures at risk, etc. As a mitigation action, there is an effort to add staff who will be able to digitize this information for easier use in other plans such as future SHMP updates. As a result, the hydraulic studies and inundation maps prepared for dams in Maine are currently inaccessible for use in the SHMP.

Dam safety inspections designate High, Significant, and Low hazard levels. Refer to Section 3 – Risk Assessment for more details on these designations. The DSP does not report the size of the population at risk (PAR), but rather keeps track of high hazard dams that would cause loss of life from a major dam failure. High hazard dams are closely regulated. The locations of these dams can be used to infer the locations of PARs based on downstream populated centers, but this would be an inaccurate approach without inundation maps. DSP has provided a mitigation action to digitize more data in the future, including PARs (see Section 6 – Mitigation Strategy).

2.2.4 Coordination with County and Local Entities

County EMAs were kept notified of SHMP updates through their own plan update process, and through monthly director meetings noted below. The Natural Hazards Planner provides review and technical assistance to County EMAs for plan updates, in addition to leading the SHMP update, and it became a common process to share helpful data. Interested local groups were involved in the preparation of county and local plans, and through participation in MEMA workshops, exercises, and training sessions. Additionally, since the plan has been posted on the MEMA website, public comments were taken into consideration in this update. To date, several residents have been interested in coastal effects (storm surge) and evacuation routes, one about climate, and several students (from out of state) wanted to know about the planning process in general as part of their studies.

Outreach to businesses, non-profit organizations, and professional associations such as the Maine Municipal Association and Associated General Contractors will continue. Again, more detailed maps showing vulnerable areas would be very useful documentation in this outreach. Additionally, based on annual conference feedback, the case study approach is the best way to showcase mitigation projects. More of these should help local businesses to thrive and continue to save tax dollars after hazard effects have been reduced.

2.2.5 Roster of Participants and their Contributions

Though many participants represent multiple sectors, only their primary sector is shown in the “Sector” column. Also in the Sector column, participants with climate change and climate adaptation expertise, or who are responsible for climate resilience-based programs, policies, and assistance are noted with a “CC”. Participants who administer programs, policies, and other support to underserved communities are noted with “UC” under the Sector column. Table 2.2 provides a list of participating entities, a summary of their contributions to the plan update, and the specific sections where their contributions led to improvements in the plan.

All participants aided the plan update in ways that matched their time availability and subject matter expertise. Their assistance is documented in the “Assistance” column and the specific sections improved by their contributions are noted in Table 2.2.

Table 2.2: Participants in the SHMP update

Category	Entity	Name	Title	Assistance	Sector	Sections
Planning Team						
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Samuel Roy	Natural Hazards Planner	SHMP 2023 Update Lead Planner	RSME	All
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Heather Dumais	State Hazard Mitigation Officer	SHMP 2023 Update Planning Team Member	GSME	All
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Jonathan Ross	Senior Planner	SHMP 2023 Update Planning Team Member	EM	All
State	Department of Agriculture, Conservation and Forestry – Floodplain Management Program	Sue Baker	CFM, Floodplain Management Program Coordinator	SHMP 2023 Update Planning Team Member	HI	All
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Christine Whelan	Hazard Mitigation Program Assistant	SHMP 2023 Update editor	GSME	All
Mitigation Partners (Stakeholders)						
State	Department of Administrative and Financial Services – Bureau of General Services	Bill Longfellow	Director, BGS	Vulnerable state assets	SA	3
State	Department of Administrative and Financial Services – Maine Office of GIS	Bob Bistrais	GIS Manager	GIS resources	GIS	3
State	Department of Administrative and Financial Services – Office of the State Controller	Sheena Greenlaw	Risk Assessor	Vulnerable state assets	SA	3
State	Department of Administrative and Financial Services – Office of the State Economist	Amanda Rector	Economist	Population and development trends	ED	3, 4
State	Department of Agriculture, Conservation and Forestry – Commissioner's Office	Tom Gordon	Public Service Coordinator	Agricultural vulnerabilities	HFWS	3, 4, 5, 6
State	Department of Agriculture, Conservation and Forestry – Floodplain Management Program	Janet Parker	Planner II	NFIP data, insurance capabilities and mitigation actions	HI	3, 4, 5, 6

Category	Entity	Name	Title	Assistance	Sector	Sections
State	Department of Agriculture, Conservation and Forestry – Land Use Planning Commission	Ben Godsoe	Acting Planning Manager, LUPC	LUPC mitigation authorities	LUD	3, 4
State	Department of Agriculture, Conservation and Forestry – Land Use Planning Commission	Tim Carr	Senior Planner, LUPC Floodplain Coordinator	floodplain mapping updates/progress for UTs and rural areas	LUD	3, 4
State	Department of Agriculture, Conservation and Forestry – Maine Forest Service, Forest Health	Robby Gross	Chief Forest Ranger	Natural hazards (wildfire)	RSME	3, 4, FMAG
State	Department of Agriculture, Conservation and Forestry – Maine Forest Service, Forest Protection	Allison Kanoti	Director of Forest Health and Monitoring	Natural hazards (blight/infestation)	RSME	3, 6
State	Department of Agriculture, Conservation and Forestry – Maine Forest Service, Forest Protection	Kent Nelson	Fire Prevention Specialist	Wildfire mitigation grants/programs	GSME	FMAG
State	Department of Agriculture, Conservation and Forestry – Maine Forest Service, Forest Protection	Jeff Currier	Regional Forest Ranger	Wildfire	RSME	3
State	Department of Agriculture, Conservation and Forestry – Maine Forest Service, Forest Protection	Joe Mints	Special Operations Supervisor	Wildfire	GSME	3, FMAG
State	Department of Agriculture, Conservation and Forestry – Maine Geological Survey	Ryan Gordon	Hydrogeologist	Natural hazards (flood, drought)	RSME	3, 4, 6
State	Department of Agriculture, Conservation and Forestry – Maine Geological Survey	Pete Slovinsky	Marine Geologist	Natural hazards (coastal processes)	RSME	3, 4, 6
State	Department of Agriculture, Conservation and Forestry – Maine Geological Survey	Henry Berry	Physical Geologist	Natural hazards (earthquakes)	RSME	3
State	Department of Agriculture, Conservation and Forestry – Maine Geological Survey	Lindsay Spigel	Senior Geologist	Natural hazards (landslide/mass wasting)	RSME	3, 6
State	Department of Agriculture, Conservation and Forestry – Maine Geological Survey	Steve Dickson	State Geologist	Natural hazards (flood, erosion)	RSME	3
State	Department of Agriculture, Conservation and Forestry – Municipal Planning Assistance Program	Tom Miragliuolo	Senior Planner	Municipal Comprehensive plans	LUD	3, 4, 5
State	Department of Agriculture, Conservation and Forestry – Resource Information and Land Use Planning	Judith East	Director	Land use/development policy	LUD	3

Category	Entity	Name	Title	Assistance	Sector	Sections
State	Department of Agriculture, Conservation and Forestry – Resource Information and Land Use Planning	David Ludwig	Senior Climate Planner	Land use/development policy	LUD	4
State	Department of Defense, Veterans and Emergency Management – Dam Safety Program	Tara Ayotte	Dam Safety Administrator	Dams database, HHPD program	GSME	3, 6, HHPD
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Daisy Mueller	Critical Infrastructure Protection Officer	critical infrastructure data consult	EM	3
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Lynn Walkiewicz	Individual Assistance Officer	Equity and vulnerable communities' guidance	HFWS, UC	5, 6
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Bill Guindon	Mass Care Coordinator	Equity and vulnerable communities' guidance	HFWS, UC	5, 6
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Anne Fuchs	MPR Division Director	Mitigation strategy update and guidance on timeline	EM	4, 5
State	Department of Defense, Veterans and Emergency Management – Maine Emergency Management Agency	Faith Staples	Tech Hazards Program Manager	Commodity flow/SHMP integration mitigation action	EM	6
State	Department of Economic and Community Development – Maine Office of Tourism	Steve Lyons	Director, Maine Office of Tourism	Development and tourism trends	ED	3
State	Department of Environmental Protection – Bureau of Air Quality	Kevin Ostrowski	Air Quality Forecaster	Air Quality risks	RSME	3, 4, 6
State	Department of Environmental Protection – Bureau of Air Quality	Martha E. Webster	Air Quality Forecaster	Air Quality risks	RSME	3, 4, 6
State	Department of Environmental Protection – Bureau of Land Resources	Jeffrey C. Kalinich	Assistant Shoreland Zoning Coordinator	Shoreland Zone	LUD	4, 6
State	Department of Environmental Protection – Bureau of Land Resources, Nonpoint Source Training Center	Kathy Hoppe	Nonpoint Source awareness campaign, DEP	Culvert improvement resources	NCR	4, 5
State	Department of Environmental Protection – Bureau of Land Resources, Nonpoint Source Training Center	John Maclaine	Nonpoint source training center, DEP	Culvert improvement resources	NCR	4, 5
State	Department of Environmental Protection – Bureau of Water Quality	Linda Bacon	Limnologist, Lake Assessment Section Leader	Freshwater HABs/microcystin	NCR	3, 6

Category	Entity	Name	Title	Assistance	Sector	Sections
State	Department of Environmental Protection – Commissioner's Office	Nathan Robbins	Climate change and adaptation, DEP	Climate resilience efforts via DEP	GSME	3, 4, 5, 6
State	Department of Environmental Protection – Commissioner's Office	Marybeth Richardson	Office of the Commissioner	Sand Dune erosion	LUD	3, 4
State	Department of Environmental Protection – GIS Unit	John Lynam	GIS Manager	Vulnerable sites regulated by DEP	GIS	3, 6
State	Department of Marine Resources – Bureau of Public Health	Kohl Kanwit	Public Health Bureau Director, DMR	Marine HABs and red tide	HSS	3, 4, 6
State	Department of Marine Resources – Eastern Maine shellfish growing area	David Miller	Shellfish Growing Program, DMR	Marine HABs and red tide	HSS	3
State	Department of Marine Resources – Western Maine shellfish growing area	Bryant Lewis	Shellfish Growing Program, DMR	Marine HABs and red tide	HSS	3, 4, 6
State	Department of Public Safety – Office of the State Fire Marshal	Paul Demers	State Building Official	Building Codes and MUBEC Update	BC	4, 5, 6
State	Department of Public Safety – Office of the State Fire Marshal	Richard McCarthy	State Fire Marshal	Building Codes and resolve to study process of new building code adoption	BC	4, 5, 6
State	Governor's Energy Office	Ross Anthony	Buildings & Energy Efficiency Analyst	Mitigation Strategy - plan integration with Maine Won't Wait	ES	6
State	Governor's Energy Office	Allie Rand	Energy Analyst	Energy/grid resilience, Grid Resilience Prog.	GSME	4, 6
State	Governor's Energy Office	Ethan Tremblay	Energy Policy Analyst	Energy/grid resilience, Energy security	ES	3
State	Governor's Energy Office	Lisa J. Smith	Senior Planner	Energy sector, State Energy Security Plan	ES	3, 6
State	Governor's Office of Policy Innovation and the Future	Sarah Curran	Deputy Director, Climate Planning & Community Partnerships	Social vulnerability; climate change	GSME, CC, UC	3, 4, 5, 6
State	Governor's Office of Policy Innovation and the Future	Hannah Pingree	Director	Mitigation Strategy - plan integration with Maine Won't Wait	GSME, CC, UC	6
State	Governor's Office of Policy Innovation and the Future	Jessica Scott	Senior Planner	Social vulnerability; climate change	GSME, CC, UC	3, 4, 5, 6
State	Governor's Office of Policy Innovation and the Future	Brian Ambrette	Sr. Climate Resilience Coordinator	Social vulnerability; climate change	GSME, CC, UC	3, 4, 5, 6
State	Maine Center for Disease Control – Drinking Water Program	Susan Breau	Water Resources Team Leader	Public water risk assessment	HFWS	3, 4, 5, 6
State	Maine Center for Disease Control – Drinking Water Program	Ashley Hodge	Source Water Protection Coordinator	Public water risk assessment	HFWS	3, 4, 5, 6

Category	Entity	Name	Title	Assistance	Sector	Sections
State	Maine Center for Disease Control – Environmental and Community Health	Rebecca DeKeuster	Program Coordinator	Heat-related illness	HSS	3
State	Maine Center for Disease Control – Environmental and Community Health	Rebecca Lincoln	Toxicologist	Heat-related illness, County heat plans	HSS	3, 6
State	Maine Department of Transportation – Environmental Office	Mark Lickus	Hydrologist	Coastal flood modeling	RSME, CC	3, 6
State	Maine Department of Transportation – Environmental Office	Charlie Hebson	Manager, Surface Water Resources Division	State assets; climate change impacts on hazards	TS, CC	3, 4, 6
State	Maine Department of Transportation – Environmental Office	Taylor LaBrecque	Resource Management Coordinator	MDOT State Capabilities and Mitigation Strategy	GSME	4, 6
State	Maine Department of Transportation – Environmental Office	Eric Ham	Sr Environmental manager	MDOT asset vulnerability	TS	3, 4
State	Maine Department of Transportation – Maintenance & Operations Office	Brian Burne	Highway Maintenance Engineer	Severe summer storms; severe fall/winter storms; tropical cyclones	TS	3
State	Maine Department of Transportation – Office of Policy & Research	Dawn Bickford	Product Evaluation Program Coordinator	MDOT State Capabilities and Mitigation Strategy	RSME	6
State	Maine GeoLibrary Board	Claire Kiedrowski	Executive Director	GIS resources	GIS	3, 4, 6
State	Maine Historic Preservation Commission	Christi Chapman-Mitchell	Assistant Director	Historic asset vulnerability and plans for preserving history in Maine	NCR	3, 4, 6
State	Maine Public Utilities Commission	Maria Jacques	Emergency Communications Director	E911 address geocoding; Mitigation Strategy for GIS actions	CS	3, 6
State	MaineHousing	Jane Whitley	Human Resources Director	Disadvantaged communities	HFWS, UC	6
County	Androscoggin County Emergency Management Agency	Angela Molino	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Aroostook County Emergency Management Agency	Darren Woods	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Cumberland County Emergency Management Agency	Michael Durkin	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Franklin County Emergency Management Agency	Amanda Simoneau	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Hancock County Emergency Management Agency	Andrew Sankey	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Kennebec County Emergency Management Agency	Jason Decker	Director	Local Capabilities, Local Mitigation Actions	EM	5

Category	Entity	Name	Title	Assistance	Sector	Sections
County	Knox County Emergency Management Agency	Candice Richards	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Lincoln County Emergency Management Agency	Maury Prentiss	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Knox County Emergency Management Agency; Maine GeoLibrary	Leticia VanVuuren	GIS Administrator, Maine GeoLibrary Board Chair	GIS Risk Assessment Resources, GIS mitigation actions	GIS, UC	5, 6
County	Oxford County Emergency Management Agency	Allyson Hill	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Penobscot County Emergency Management Agency	Bradley Nuding	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Piscataquis County Emergency Management Agency	Jaeme Duggan	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Sagadahoc County Emergency Management Agency	Sarah Bennett	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Somerset County Emergency Management Agency	Mike Smith	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Waldo County Emergency Management Agency	Dale D. Rowley	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	Washington County Emergency Management Agency	Lisa Hanscom	Director	Local Capabilities, Local Mitigation Actions	EM	5
County	York County Emergency Management Agency	Arthur W. Cleaves	Director	Local Capabilities, Local Mitigation Actions	EM	5
Federal	Federal Emergency Management Agency Region I – Mitigation Division, Risk Analysis Branch	Nan Johnson	Senior Community Planner	SHMP Review and FEMA SHMP Guide interpretation	RSME	FEMA Review
Federal	Federal Emergency Management Agency Region I – Response Division FIT	Kara Walker	Emergency Management Specialist	Maine hazard and demographic profiles	EM	3
Federal	National Cohesive Wildland Fire Strategy – Northeastern Region	Larry Mastic	Coordinator, Northeast Region	Wildfire risk assessment	NCR	6
Federal	National Oceanic and Atmospheric Administration – Office for Coastal Management	Jamie Carter	Senior Remote Sensing Analyst	Climate Change Risk Assessment contributor	RSME, CC	3, 4, 6
Federal	National Weather Service – Caribou Weather Forecast Office	Louise Fode	Warning Coordination Meteorologist	Natural hazards (flood, drought, storms)	RSME, CC	3
Federal	National Weather Service – Gray Weather Forecast Office	Justin Arnott	Science and Operations Officer	Hurricane historic record	RSME, CC	3

Category	Entity	Name	Title	Assistance	Sector	Sections
Federal	National Weather Service – Gray Weather Forecast Office	Donald Dumont	Warning Coordination Meteorologist	Natural hazards (flood, drought, storms)	RSME, CC	3, 6
Federal	National Weather Service – Gray Weather Forecast Office	Sarah Jamison	Warning Coordination Meteorologist	Natural hazards (flood, drought, storms)	RSME, CC	3
Federal	United States Army Corps of Engineers – Hydrologic Engineering	Brandon Raymond	Hydrodynamic engineer	Coastal flood modeling	RSME, CC	3
Federal	United States Army Corps of Engineers – Silver Jackets	Sheila Warren	Silver Jackets Coordinator	Coordinating Silver Jackets Partners	CS	3, 6
Federal	United States Geological Survey – New England Water Science Center	Nick Stasulis	Chief, Maine SW/GW Networks	Natural hazards (flood)	RSME, CC	3, 6
Federal	United States Geological Survey – New England Water Science Center	Glenn Hodgkins	Research Hydrologist	Climate change impacts on flood probability	RSME, CC	3
Federal	United States Geological Survey – New England Water Science Center	Pam Lombard	Supervisory Hydrologist	Climate change impacts on flood probability	RSME, CC	3
Tribal Nation	Mi'kmaq Nation	Shawn Newell	Risk Manager	Building trust with Tribal Nations	EM	2, 6
Regional Planning Organization	Greater Portland Council of Governments	Sara Mills-Knapp	Director of Sustainability	Mitigation programs, policy, plans, funding	ED, CC	4, 5
Regional Planning Organization	Lincoln County Regional Planning Commission	Emily Rabbe	County Planner	Mitigation programs, policy, plans, funding	ED, CC	4, 5
Regional Planning Organization	Midcoast Council of Governments	Adi Philson	Planner	Mitigation programs, policy, plans, funding	ED	4, 5
Regional Planning Organization	Southern Maine Planning and Development Commission	Abbie Sherwin	Senior Planner, Coastal Resilience Coordinator	Mitigation programs, policy, plans, funding	ED, CC	4, 5
University	Bowdoin College – Environmental Studies	Eileen Johnson	Professor	Development trends data	GIS	3, 6
University	State Climatologist, University of Maine System – School of Earth and Climate Sciences	Sean Birkel	Maine State Climatologist	Climate change impacts on hazards	RSME, CC	3, 4, 6
University	University of Maine System – Cooperative Extension	Glenn Koehler	Associate Scientist – Integrated Pest Management	Forest pest impacts	HFWS	3
University	University of Maine System – Facilities Management	Gretchen Catlin	Chief Facilities & General Services Officer	Local Capabilities, Local Mitigation Actions	EM	3
University	University of Maine System – School of Civil and Environmental Engineering	Lauren Ross	Associate Professor	Storm surge, harmful algal blooms	RSME, CC	3

Category	Entity	Name	Title	Assistance	Sector	Sections
University	University of Maine System – School of Civil and Environmental Engineering	Shaleen Jain	Professor, P.E.	Climate change impacts on hazards	TS, CC	3, 6
University	University of Maine System – School of Forest Resources	Adam Daigneault	Associate Professor	Freshwater HAB economic vulnerability	NCR, CC	3, 4
University	University of Maine System – University of Southern Maine GIS	Vinton Valentine	Director of GIS	Development trends data	GIS	3, 4, 6
Quasi-governmental	Maine Connectivity Authority	Andrew Butcher	President	Broadband as critical infrastructure	CS	6
Quasi-governmental	Maine Rural Water Association	Matt Demers	Director of Contract Utility Services	Public water systems mitigation actions	HFWS	4, 5, 6
Quasi-governmental	Maine Water Utilities Association	Cindy Wade	Executive Assistant	Public water systems mitigation actions	HFWS	4, 5
Private company	Brookfield Renewable US	Thomas Mapletoft	Senior Water Resource Manager	River basin management systems	RSME	4, 6
Private company	Versant Power	Janet Scully	Emergency Management Agency Lead	Power outage data and grid resilience planning	ES	3, 6
Private - Nonprofit	Gulf of Maine Research institute – Climate Center	Hannah Baranes	Research Assistant Professor	Sea Level Rise projections and mitigation actions	RSME	3, 6
Private - Nonprofit	Maine Community Action Partnership	Multiple organizations	Statewide Organization	Service to disadvantaged communities	HFWS, UC	5, 6
Private - Nonprofit	The Nature Conservancy – Maine Office	Jeremy Bell	Climate Adaptation Program Director	Private sector mitigation projects	NCR, CC	3, 4, 5, 6
Private - Consultant	Beech Hill Research	Amanda Dwelley	Research Analyst	Equity, disadvantaged communities	GSME	6
Private - Consultant	Climate Advisory	Lisa Churchill	Principal Consultant	MDOT asset vulnerability	RSME	3
Private - Consultant	Rothe Associates	Richard Rothe	Principal Consultant	County Hazard Mitigation Plan updates	RSME	5
Private - Consultant	Timmons Group	Chris Gerecke	Director of Enterprise Solutions	Wildfire risk assessment	RSME	FMAG

2.3 Plan Integration [S1]

The planning process for the SHMP was integrated to the maximum extent possible, based on current planning activities related to hazard mitigation at the local, county, and state level. Below is a summary of plan integration opportunities that were utilized during the SHMP update process. Not all Mitigation Partners contributed to plan integration, but all provided improvements to the SHMP in various forms.

2.3.1 Examples of Plan Integration

Integration with Maine Climate Council Goals

Many of the updated components of the plan integrate elements from “Maine Won’t Wait”, the State’s 4-year climate action plan, and results of the SHMP update will be integrated in other state and county/local climate-based planning mechanisms. Please refer to Section 6 – Mitigation Strategy for more information on how plan integration guided the development of new goals for the Plan.

Integration with Governor’s Office of Policy Innovation and the Future

The Governor’s Office of Policy Innovation and the Future (GOPIF) is proposing to conduct a natural hazards and climate change vulnerability assessment of state and critical private assets. The objectives of this vulnerability assessment intend to utilize and expand upon the SHMP Risk Assessment and is an excellent example of plan integration that will proceed during the active years of this plan. The vulnerability assessment will provide an understanding of: 1) the natural and climate hazards to which assets are exposed, the likelihood of those hazards occurring, and how the intensity and likelihood of those hazards may change over time; 2) the asset’s susceptibility to damage or failure given its location, design, age, condition, and state of repair; and 3) the consequences that impairment or failure of the asset will have on public safety and health, the delivery of state services, impacts to state and local economies, and the environment and natural resources. The assessment will identify “critical infrastructure” assets that are important for public safety and health. The assessment will also give particular attention to areas of the state where socially vulnerable communities and vulnerable state-owned assets overlap. These are communities whose struggle to recover may be improved by reliable services and resilient infrastructure. The vulnerability assessment will make recommendations of risk mitigation and adaptation strategies at the agency policy level and individual asset level for the highest-risk assets. The recommendations will inform state adaptation strategies and serve as a model for local planning and mitigation.

Integration with Local Hazard Mitigation Plans [S10.d.]

The SHMP is closely integrated with Local Hazard Mitigation Plans (LHMPs), as they serve similar roles for establishing mitigation programs, but for a local level of government. MEMA leads the update process for the SHMP and provides technical assistance and review services during LHMP plan cycles. County Emergency Management Agencies (County EMAs) and Regional Planning Organizations (RPOs) typically lead the development and update of LHMPs, all of which are multi-jurisdictional. The University of Maine System also holds an approved Multi-jurisdictional Hazard Mitigation Plan. These entities rely on information from the SHMP to appropriately address needs for an approvable plan. Conversely, the SHMP is required to integrate information from LHMPs to provide a more comprehensive assessment of local risks and capabilities, as well as provide a picture of mitigation at multiple levels of government. Please refer to Sections 5 and 6, Local Capabilities and Mitigation Strategy, respectively, for more information on how these planning functions are integrated.

MEMA has made recent strides with modernizing the update process for LHMPs to strengthen local mitigation capabilities, and better serve local governments interested in HMA opportunities. In April 2023, FEMA updated LHMP review guidelines to reflect the importance of incorporating climate change and equity considerations into mitigation. As anticipated, this has made it easier to review and extract information for inclusion in the state plan.

Since all multi-jurisdiction plans utilize the suggested format contained in the guide, this greatly expedited the preparation of the updated SHMP.

To unify plans, all counties were encouraged to use tables to capture items such as risk and capabilities data. Counties are also encouraged to use the Consumer Price Index to capture corrected costs.

Integration with Maine Floodplain Management Program

The Mitigation Goals incorporate actions implemented by the Floodplain Management Program (FMP) to provide the SHMP with a more comprehensive strategy to reduce risk from flooding. Though these actions are largely the responsibility of the FMP, other state agencies assist the program whenever appropriate and seek out other opportunities for plan integration to provide consistent approach to flood mitigation.

Integration with Governor's Energy Office State Energy Security Plan

As noted in the State Energy Security Plan, the State of Maine and its citizens are highly dependent upon energy resources to power our daily lives. A serious energy supply or delivery disruption, a rapid and unsustainable increase in energy prices, or other energy emergency, could bring substantial injury to commercial and industrial activity and to the personal health, safety, and welfare of Maine's citizens. The Governor's Energy Office (GEO) develops the state's plan related to energy emergencies in coordination with the Maine Emergency Management Agency (MEMA) and other stakeholders under U.S. Public Law 94-163, Section 362 (1975), Energy Policy and Conservation Act of 1975, last updated November 15, 2021, and as described in 10 C.F.R. § 420.13(b)(9). The plan is aligned with the Maine Comprehensive Emergency Management Plan (CEMP), managed by MEMA.

The fifth section of the State Energy Plan, Energy Resiliency & Hazard Mitigation, details the state's mitigation strategy to strengthen sector reliability, enhance energy supply resilience for end-users, and securing critical energy infrastructure. The GEO is using the state emergency response plan and SHMP as a starting point, and will seek more granular information from county emergency managers. This includes specific examples of infrastructure at risk. Conversely, GEO has provided guidance to the Planning Team regarding how to assess energy risks, and what current energy resilience resources and projects can be described as capabilities and mitigation actions, respectively.

Integration with Maine Forest Service

Maine Forest Service and MEMA maintain a unified approach to wildfire mitigation through actions documented in Mitigation Goals 1, 2, and 4. Further, this plan update expands on the previous plan by offering objectives for a more comprehensive analysis of land use practices, including guidance from the Forest Policy and Management Division. Finally, the Forest Health Monitoring Division has provided guidance on forest pests as a Tier 2 hazard, leading to new proposed actions under Mitigation Goal 4. their own forest health monitoring, protection, and policy goals to this plan update where they align with the hazard mitigation goals. Many of these concepts were integrated into the SHMP from the 2020 Maine Forest Action Plan[6].

Integration with Maine GeoLibrary Strategic Plan Update

The capabilities offered by Maine GeoLibrary are crucial for the development of SHMP and LHMP risk assessments. To ensure these geospatial capabilities remain relevant, it is necessary to integrate the Mitigation Strategy with the Maine GeoLibrary Strategic Plan[7]. All mitigation actions based on leveraging or improving GIS resources are informed by feedback from GeoLibrary partners.

[6] Maine Forest Action Plan: https://www.maine.gov/dacf/mfs/about/action_plans/Maine%20Forest%20Action%20Plan%202020.pdf

[7] Maine Geolibrary Strategic Plan: https://www.maine.gov/geolib/StrategicPlan/index.html

The updated strategic plan will provide a blueprint for financing Board operations, data acquisition and hosting, and dissemination of geospatial data to the greater GIS community and the public. This plan will form the basis for completing and maintaining the Board's OneMAP for ME program. Integration is based on GeoLibrary strategic initiatives, which encompass many of the capabilities MEMA depends on to complete the SHMP update. These strategic initiatives include GIS database development, portal development, land records modernization, data sharing and distribution, and education/outreach.

Integration with DEP Priorities and Commitments

In 2021, the Department of Environmental Protection (DEP); Department of Agriculture, Conservation, and Forestry (DACF); Department of Marine Resources (DMR); Department of Inland Fisheries and Wildlife (DIFW); Department of Transportation (DOT); the Maine Office of the Attorney General (OAG); and MEMA, assembled a preliminary list of laws and rules administered by each agency where regulated activities could be impacted by sea level rise, storm surges, or flooding. DEP identified changes to statutes and rules for solid waste facilities, sites that have a substantial effect on the environment, protected natural resources, stormwater management, certain critical infrastructure, and contractor training. DEP has begun to convene partners to begin developing revisions, and to adopt changes to several rules concurrently and ongoing. In this way, DEP has already started integrating risk data for sea level rise scenarios into planning and regulation changes.

Integration with Maine DOT Vulnerability Assessment

Maine DOT is experiencing the effects of climate change first-hand[8]. In 2022, a number of large storm events resulted in infrastructure failure, causing the roads to be impassible, extended detours, and millions of dollars in damage. As noted in the Maine Climate Council's Vulnerability Mapping Report, many culverts across the state have greater than 66% chance of overtopping within the next 30 years (75-year or greater recurrence interval peak flows). Additionally, along the coast, the Maine Climate Council recommends a commitment to manage 1.5 feet of relative sea level rise by 2050, and 3.9 feet of sea level rise by 2100. The data and science to support this recommendation are included in the Scientific Assessment of Climate Change and Its Effects in Maine, which is also available on the Maine Climate Council Website.

To lower the risk of future damage to infrastructure, Maine DOT has taken a number of steps to reduce vulnerability to climate change for transportation assets and other infrastructure including creation of a vulnerability assessment. Maine DOT's vulnerability assessment integrates with the SHMP Risk Assessment by sharing a number of geospatial resources focused primarily on inland and coastal flooding. Based on the vulnerability assessment, a number of mitigation actions relating to common interests between Maine DOT and MEMA are provided in the SHMP.

Integration with FEMA Programs

Since a pre-requisite of FEMA funding is the existence of approved local and state plans, the three programs that are most integrated to the plans are: the Building Resilient Infrastructure and Communities (BRIC) grant program; the Hazard Mitigation Grant Program (HMGP); and the Flood Mitigation Assistance (FMA) grant program. Others are provided in greater detail in Section 4 – State Capabilities. Going forward, the projects identified in the local plans will continue to be linked to the overarching goals of the state plan for all natural hazards. MEMA and other state agencies will also continue to work with and support FEMA's Risk Map program which, in turn, will lead to better flood plain management through better maps, education, and state support of local code enforcement officers.

[8] MaineDOT Adapting to Climate Change: https://www.maine.gov/mdot/climate/adaptation/

Further Interests in Plan Integration

In the future, MEMA will look to partner with other state agencies to incorporate economic and housing development into the State Hazard Mitigation Plan. With factors such as disabled and/or aging populations, and economic development particularly within coastal communities it is essential that collaboration amongst groups occurs as a proactive means to address changing or increasing vulnerability. The extent of current exposure to economic development and/or housing factors resides within applicant interest in FEMA funded grant programs. Such issues are not usually brought to MEMA's attention until a person or party inquires about federal funding.

2.4 Plan Update Schedule, Time Frame, Milestones [S1]

Figure 2.1 shows the schedule of the 2023 SHMP update, and specific meetings and milestones met during the process. The plan update was segmented into plan sections. The Risk Assessment and Planning Process sections underwent the earliest edits in order to build an updated understanding of risk and document participation by Mitigation Partners, respectively. These updates needed to begin prior to updates to State/Local Capabilities and the Mitigation Strategy, as these sections are designed to address risk. Planning Process updates continued throughout the update process to continue documentation of new Mitigation Partners and their contributions.

The Planning Team began updating the Capabilities Assessment upon completion of an initial Risk Assessment in November 2022. The Risk Assessment was submitted to FEMA's Region I Mitigation Division for an informal review while the review process commenced for other sections. The capabilities section includes state and local capabilities, and identified capability gaps based on analysis of the Risk Assessment. The Mitigation Strategy update began as the capability gaps became more apparent.

Though edits to the Plan Maintenance section were less substantive than in other sections, some major changes were included to better address FEMA's new SHMP guidelines. Also, a more comprehensive 5-year plan cycle time frame is provided, including timing to apply for a BRIC plan update grant.

This SHMP update accounted for a single 45 business day period for FEMA plan review. In the future, FEMA recommends accounting for two full federal review periods in case major revisions are required. However, the remaining plan update time frame accounts for final coordination among Mitigation Partners, final revisions, FEMA's designation of Approvable Pending Adoption status, and final adoption by the Governor.

Multiple activities were coordinated with Planning Team members, Mitigation Partners, and the public audience. These opportunities are described in further detail below.

2.4.1 Planning Team Activities

Planning Team Kickoff

The Planning Team kicked off the SHMP update process on March 15, 2022. This meeting established roles and responsibilities of the plan update based on interpretation of the Plan Maintenance section of the 2019 SHMP. It was agreed that MEMA's Natural Hazards Planner would lead the plan update process, based on similar responsibilities for reviewing and providing technical assistance for LHMPs. At this time, it was decided that, based on the 2019 Plan Maintenance, the full Planning Team would consist of MEMA staff and the State NFIP Coordinator, but future Planning Teams may include representatives from other partner agencies. The Planning Team agreed that given many changes in risk associated with climate change, and new focus on disadvantaged communities by Maine government, members decided to engage a large number of stakeholders representing a diversity of relevant interests.

It was agreed that the Risk Assessment would require updates first, followed by capabilities and mitigation strategy. Many geospatial resources were already being used to support Maine's Hazard Mitigation Assistance program, and a plan was laid out to incorporate these resources into a public online map tool. The importance of documenting stakeholder participation was also expressed, and a list of participants was created for inclusion in the Planning Process section. Finally, a need was expressed for funding support for future SHMP updates, and a plan was established to apply for a BRIC plan update grant prior to the 2028 SHMP update.

Timeline Review

The Planning Team met with MEMA's Mitigation, Planning and Recovery Division Director to confirm the meeting timeline and solidify plan update roles and responsibilities.

State-FEMA Consults

State-FEMA consult meetings are hosted by FEMA Region I Mitigation Division partners on an annual basis to introduce new staff, review progress towards mitigation goals, and to address needs for assistance. The Plan update process was outlined by the Planning Team, in addition to the process for integrating data from Maine LHMPs into the SHMP, and vice-versa.

Equity Recommendations

On September 9, 2022, Maine Climate Council's Equity Subcommittee, led by GOPIF Mitigation Partners, met with MEMA and other state agencies to provide a review of recommendations for defining equity in Maine, demonstration of tools for monitoring equity based on demographic data, and prioritizing resilience/mitigation projects that support equity across the state. Other related meetings hosted by the Equity Subcommittee featured trust-building conversations with tribal nations. These recommendations guided vulnerability analyses, introduced new state and local capabilities, and established new mitigation actions to support equitable implementation of mitigation program.

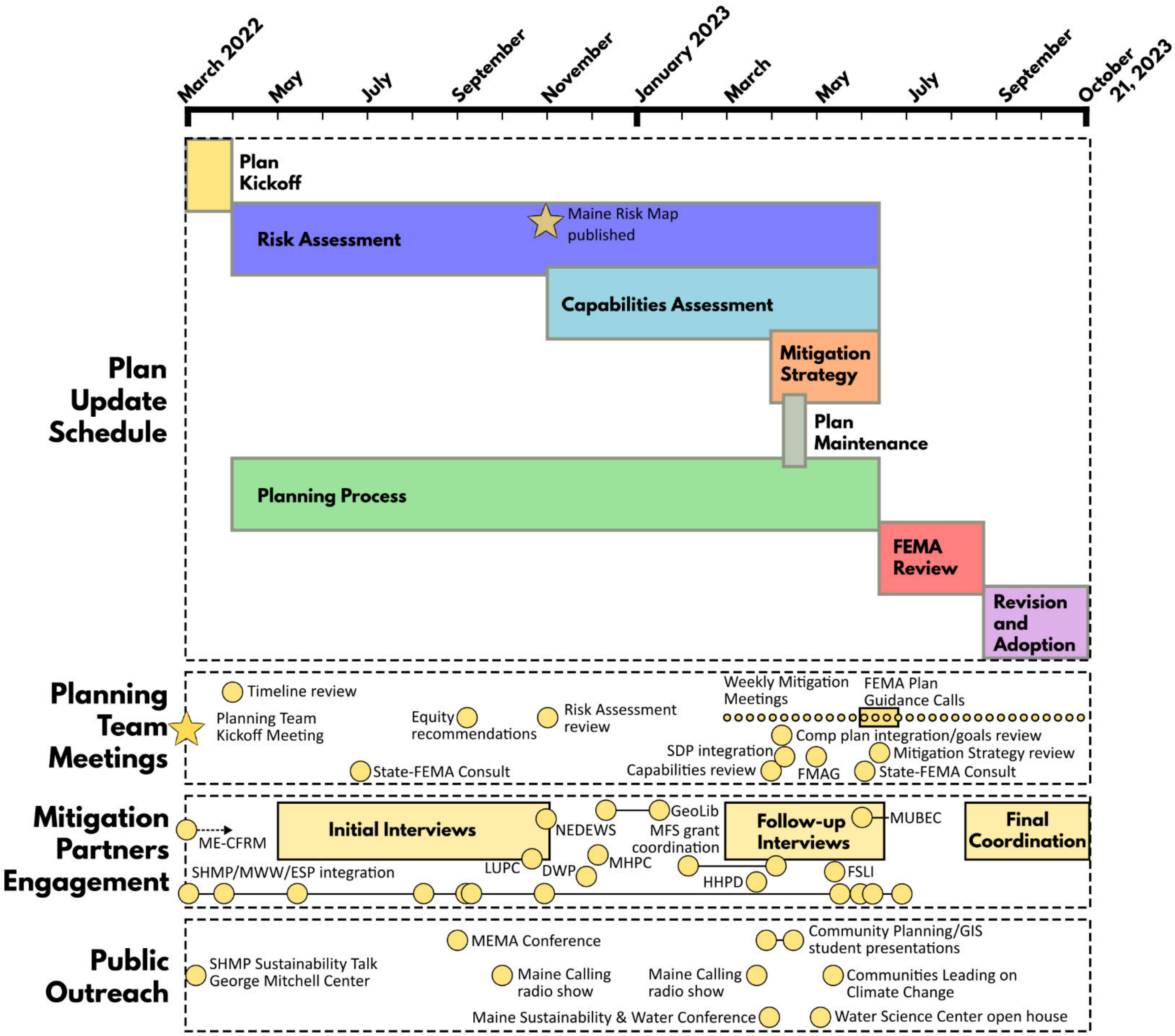

Figure 2.1: SHMP update schedule and milestones, Planning Team meetings, Mitigation Partners engagement activities, and public outreach opportunities.

Risk Assessment Review

On November 8, 2022, the Planning Team met to review progress on the Risk Assessment. Many substantial changes were made since the 2019 SHMP, based on input and resources provided by Mitigation Partners. The Planning Team decided that the Risk Assessment update was in suitable enough condition to be submitted to FEMA for an informal review and initial feedback. This was an important step because in April 2022, new SHMP review guidelines were presented by FEMA, and the Planning Team wanted to be sure that revisions met these new guidelines.

Some gaps in information were noted and additional minor edits continued after submission of the Risk Assessment to FEMA on November 22, 2022.

Weekly Mitigation Meetings
Weekly meetings were established in March 2023 to track progress and better communicate needs for the SHMP update. These meetings are also used to strengthen ties between planning and grant sections of the Mitigation, Planning, and Recovery Division of MEMA. As a result, new information has been incorporated into the capabilities assessment regarding a larger number of funding resources that support hazard mitigation, in addition to FEMA Hazard Mitigation Assistance (HMA).

Capabilities Review
On April 4, 2023, the Planning Team presented a review of all documented state and local mitigation capabilities, including policies, programs, practices, regulations, and funding. Particular attention was paid to land use and development regulations, building codes, and FEMA HMA funding, though more than one hundred different capabilities were identified. After this meeting, additional capabilities were added based on frequent suggestions by Mitigation Partners.

Comprehensive Plan Integration and Mitigation Goals Review
The Planning Team met on April 5, 2023, to establish a strategy to incorporate the SHMP into MEMA's Comprehensive Plan. This time was also used to check in with team members and institute the new mitigation goals, and the process of integrating the SHMP into other state plans. The mitigation goals are a high-level representation of plan integration, as noted here and in the Mitigation Strategy section.

A more detailed conversation during this meeting led to a review of old mitigation actions, evaluating whether these were completed, ongoing, or required carryover or modification under the new mitigation goals. Additionally, new mitigation actions were also presented, reviewed, and eventually approved by the Planning Team. This meeting also kicked off requests for feedback from Mitigation Partners.

Substantial Damage Plan Integration
On April 12, 2023, The Planning Team met to discuss integration with Maine Floodplain Management Program's Substantial Damage Plan (SDP). It was noted that plan integration will need to occur at a later time, given the timeline requirements for SHMP approval, and this was included as a mitigation action. The current SDP is included in the SHMP as an appendix entry.

FMAG Requirements Review
On May 1, 2023, the Planning Team met with FEMA partners to discuss the Fire Management Assistance Grants (FMAG) program. After this meeting, the Planning Team confirmed and addressed remaining requirements for the state to remain FMAG compliant through the next SHMP cycle.

FEMA Plan Guidance Calls
Starting on May 31, 2023 and proceeding with five meetings through early June, members of the Planning Team met with FEMA Region I Senior Planner and reviewer for the Maine SHMP, to review plan guidelines and better ensure that all plan elements were met.

Mitigation Strategy Review
On June 12, 2023, members of the Planning Team finalized the list of mitigation actions. An overview conversation of progress was necessary to organize input from 118 participants, which led to the new creation or carryover of 146 mitigation actions, representing stronger integration of the SHMP with many other state planning mechanisms.

2.4.2 Mitigation Partner Activities

Mitigation partner activities consisted of meetings and interviews. The largest meetings were coordinated by the Maine Climate Council Community Resilience and Climate Equity subcommittees, which offered many opportunities to present on the SHMP update process and progress/improvements, request feedback from specific sectors, and to pursue opportunities to integrate the SHMP with other state planning mechanisms. Many of the meetings coordinated by the Planning Team with Mitigation Partners were smaller scale and intended to accomplish specific plan update goals. Further interactions with Mitigation Partners took the form of interviews, where the Planning Team requested more information about risks identified by each partner, capabilities that exist within their organization that aid mitigation, ideas on how to improve mitigation for their organization in the next five years, and current or future planning mechanisms that can be integrated with the SHMP. Finally, many loose ends from meetings and interviews were resolved through emails and phone calls.

SHMP/MWW/ESP Integration

Mitigation Partners met with the Planning Team members on 11 different occasions to identify opportunities for plan integration between the SHMP and Maine Won't Wait (MWW), however, through this process there became a broader interest for incorporating many other planning mechanisms as well, which are identified above. One of these is the State Energy Security Plan (ESP). The focus on plan integration was an important motivator for Mitigation Partners to participate in the SHMP update process and contribute information relevant to hazard mitigation into all parts of the plan. These meetings were often led or facilitated by GOPIF but involved many additional agencies including the Governor's Energy Office (GEO), Maine DOT, DEP, Department of Administrative and Financial Services (DAFS), DACF, and MEMA.

Specific topics for plan integration focused on establishment of updated SHMP mitigation goals that not only continue to support the mission of hazard mitigation in Maine, but also work to strengthen state capabilities by joining forces with a larger number of agencies interested in climate resilience and climate equity.

Through these meetings, MEMA has also contributed to GEO's process for selecting projects for the Grid Resilience Program, establishment of geospatial grid resilience web tools, and updates to the ESP as noted above.

Initial Interviews and Follow-up Interviews

The Planning Team hosted numerous interviews in person and virtually using Microsoft Teams and Zoom. Interviewees were selected based on their participation in previous SHMPs, their demonstration of subject matter expertise through other projects, and their involvement in the Maine Climate Council. The focus of these interviews was initially to fulfill requirements for the Risk Assessment, but conversations also focused on capabilities and mitigation actions. These interviews led to the reorganization of the Risk Assessment and inclusion of hazard profiles for new "Tier 2" hazards, which are of growing concern in Maine due to climate change.

Follow-up interviews were conducted later on in the process, after the informal review of the Risk Assessment was completed. Follow-up interviews focused primarily on solidifying State Capabilities, Local Capabilities, and the Mitigation Strategy. Follow-up interviews informed the creation of new goals, problem statements that connect with capability gaps, and mitigation actions that address these gaps.

For example, the Planning Team met with officials from the National Weather Service and US Geological Survey to discuss updating the hazard profile data contained in this plan. Meeting highlights included the discussion of historic storm events, traditional weather patterns, and the degree to which current weather trends are sensitive to climate change impacts.

The Planning Team also met with faculty from the University of Maine Senator George J. Mitchell Center for Sustainability Solutions, to examine opportunities to integrate the University's work, as it relates to climate change and disadvantaged and underserved communities with the SHMP. The Planning Team met with the State Climatologist and many other supportive faculty to update climate change aspects of the Risk Assessment and encourage stronger government-university collaborations in the future. The group also discussed opportunities to collaborate with students on projects pertaining to climate change mitigation, adaptation, and how to incorporate land use planning with post-disaster recovery.

ME-CFRM

Multiple meetings were facilitated by Maine DOT to plan a Maine Coastal Flood Risk Model (ME-CFRM). MEMA provided information from the Risk Assessment on the recurrence interval of major coastal flooding events, and a timetable has been provided for the ME-CFRM model. This model will be a dramatic improvement in current coastal flood models, as it will combine storm surge scenarios with sea level rise and riverine flooding, all based on improved LiDAR data and storm intensity data. The completion of ME-CFRM is a mitigation action in this SHMP update

LUPC Hazard Mitigation Planning Meeting

The Planning Team joined Land Use Planning Commission (LUPC) staff to present on the formal process for LHMP and SHMP update and review. LUPC, a commission within DACF, is a crucial partner for hazard mitigation planning, as they are responsible for enforcing Maine's Shoreland Zoning Law and ensuring participation in the National Flood Insurance Program (NFIP) in the Unorganized Territory, which takes up the majority of Maine's land area. In this LUPC meeting, the Planning Team received information about various risks noted in the unorganized territory, current capabilities to administer land use laws and ordinances, and how these capabilities could be improved in the future for purposes of reducing risk.

NEDEWS Partners Meeting

The Northeast Drought Early Warning System (NEDEWS) Partners Meeting was held on November 1, 2022. In this meeting, members of the Planning Team presented on drought data from Maine's 2020-2022 drought and gained a more comprehensive insight into regional drought trends, locations and intensities, and the recurrence interval of impactful drought. Additional tools for measuring drought risk were also utilized in the SHMP, based on input from this important meeting, which had not been held since prior to the COVID pandemic.

DWP Coordination Meeting

The Maine Department of Human Health, and Services Center for Disease Control Drinking Water Program (DWP), met with the Planning Team to discuss plans to identify vulnerable sources of public water supplies. MEMA coordinated with DWP, who provided GIS locations of water abstraction sites, to conduct an overlay analysis with hazard layers including flood, storm surge, and wildfire hazard overlays. This data was then provided to DWP for their own planning mechanisms. Results were aggregated by MEMA to remove locations of sensitive water infrastructure and presented within the SHMP Risk Assessment, thereby demonstrating basic practice for plan integration.

MHPC Coordination Meeting

The Planning Team met with a representative of the Maine Historic Preservation Commission (MHPC) to discuss known vulnerabilities to state and federally recognized historic sites, and whether hazard mitigation is a consideration in preserving these sites. This meeting was initiated by the Planning Team after review of the 2021 MHPC survey report "Weathering Maine: Historic properties and climate change planning in Maine[9]." This report studied whether historic properties and cultural resources are included in local climate change planning efforts. It was found through this report that only 22% of communities have started planning to prepare for the physical effects associated with extreme weather events or changing climate, while only 11 communities in Maine have specifically considered cultural and historic resources, most of which are located on the coast.

To help communities and the public to identify risk of historic features from flooding and sea level rise, MHPC has developed the Historic Properties Toolkit[10].

GeoLibrary Coordination Meetings

The Maine GeoLibrary (reference to GeoLib) provides public access to crucial geospatial information, including asset locations and hazard layers used for this Risk Assessment. MEMA's Natural Hazards Planner coordinated with the GeoLibrary Board to incorporate public GIS data to its greatest potential. The GeoLibrary Board Chairperson also offered guidance on a number of GIS-focused mitigation actions that would further enhance the quality of future risk assessments. These conversations focused on the challenges of tracking development trends in Maine, a home rule state with little to no state oversight on construction and septic permitting. One approach may be to track new additions to addressable structures, though the frequency of updates for new addresses differs by municipality. As a result of this process, MEMA has been invited to coordinate with the GeoLibrary Board to contribute to their next strategic plan update.

MFS Grant Coordination

The Planning Team met on several occasions with the Maine Forest Service (MFS). These conversations were initiated with a need for updating the Risk Assessment, but quickly transitioned to strategies for mitigation grant coordination. At the time of this SHMP update, MEMA is not yet fully coordinated with MFS, but there is a stronger understanding of how HMA and wildfire mitigation grants overlap, and best practices to direct potential applicants to the most eligible and least competitive program. Please refer to Section 4 – State Capabilities and Section 6 – Mitigation Strategy for more details.

Discussion points from the meeting also included impacts of the 2020-2022 drought on wildfire potential, Maine's increasing vulnerability to wildfires due to Maine's aging housing stock, and how the shrinking population base in rural areas makes it more difficult to support volunteer fire departments.

Coordination with MFS also introduced the Planning Team to the 2020 Maine Forest Action Plan and opportunities to incorporate important forest-based mitigation ideas into the SHMP. These conversations led to plan integration with the Director of Forest Health and Monitoring on the topic of invasive and native forest pests, and associated forest health issues that appear to be expanding under current climate change trends. An entire Hazard Profile was included in Section 3 – Risk Assessment in order to address this growing issue and properly integrate the interests of MFS and MEMA.

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[9] Weathering Maine: https://www.maine.gov/mhpc/sites/maine.gov.mhpc/files/inline-files/Weathering%20Maine%20Report_0.pdf

[10] MHPC Historic Properties toolkit: https://www.maine.gov/mhpc/programs/protection-and-community-resources/climate-change

HHPD and Dam Safety Coordination

Members of the Planning Team met on several occasions with the DSP as noted above. In this meeting on March 27, 2023, the Planning Team discussed HHPD requirements with the DSP Administrator. Rules for HHPD eligibility were discussed, and a list of eligible dams was formed. This list is provided as an appendix.

This meeting was also a time to discuss current challenges faced by the understaffed DSP, and is included as a problem statement and series of mitigation actions in Section 6 – Mitigation Strategy.

FSLI Coordination

MEMA's Natural Hazard Planner applied for and received funds to hire an intern for the summer of 2023 in order to assist with some late-stage aspects of the SHMP update. These funds were provided in part by the Future Sustainability Leaders Internship program, sponsored by the Senator George J. Mitchell Center for Sustainability Solutions at the University of Maine. This meeting was held to coordinate state partners, academic partners, and interns as they began work on various state programs. Many state agencies represented by Mitigation Partners in the SHMP were in attendance at the meeting, and it provided an excellent opportunity to strengthen state and university coordination through unified interests in training students. This meeting, among other interviews with university faculty, led to changes in mitigation goals to represent the importance of research faculty for finding new and innovative ways to reduce risk from natural hazards.

MUBEC and Building Codes Coordination

The Planning Team met with officials from the Office of the State Fire Marshall (SFM) to discuss the Maine Uniform Building and Energy Code, and its significance for hazard mitigation. Building codes are of great interest because when updated and implemented effectively, they can be used to mitigate against all hazards.

The SFM provided important insight on implementation of MUBEC, as reported in Section 4 – State Capabilities. Currently, MUBEC is undergoing an update process to adopt 2021 building and energy codes from the International Code Council.

There are many challenges with enforcing modern building codes in rural parts of Maine, as SFM is only responsible for updating and managing MUBEC and training code enforcement officers, they have no regulatory authority, nor do they have funding to oversee permitting and inspections that are managed on a municipal level. The challenges and potential solutions to this issue are further described in Section 6 – Mitigation Strategy.

The family of codes included in MUBEC are focused in large part on the environmental factors that can impact structural stability and safety, and as a result share the same objective as the SHMP Risk Assessment.

Final Coordination

The Planning Team has afforded time after the FEMA plan review process to coordinate with Mitigation Partners once more to confirm potential revisions requested by FEMA and review all aspects of the plan one final time. The Governor will then be presented with a final version of the plan to review and adoption. Refer to Figure 2.1 and Section 7 – Plan Maintenance for more information on the structure of final coordination.

2.4.3 Public Outreach Opportunities

The Planning Team took advantage of several public outreach opportunities to present the SHMP update to a broader audience and communicate the importance of hazard mitigation. These opportunities included a talk given by the Natural Hazards Planner in March 2022, two Maine Calling radio shows hosted by Maine Public Radio, presentations to university students in community planning and GIS degree programs, a poster presentation at the Maine Sustainability and Water Conference, and an open house event at the New England Water Science Center. The State Hazard mitigation Officer also attended the Communities Leading on Climate Conference (CLCC).

MEMA Conference – Maine Partners in Preparedness

Meeting Dates: August 31 – September 31, 2022

The Maine Partners in Preparedness Conference was attended by over 400 participants from both the private and public sectors. Each year this statewide conference features keynote speakers who address current situations. Since the first conference, topics have ranged widely from local to global hazards. Breakout sessions ranged widely from preparedness to mitigation with topics including school safety, floodplain management and mapping, pet sheltering, and community resilience efforts in coastal Maine.

2.4.4 Additional Meetings of Importance

County and Local Directors

Monthly Meeting Dates: March 2022 – July 2023

MEMA meets with County Emergency Management Directors and local officials on a monthly basis, with multiple opportunities to coordinate efforts for LHMP and SHMP updates. County EMAs are the primary contributor of information from LHMPs used within the SHMP.

Drought Task Force

Meeting Dates: Summer 2020 to Fall 2022

The Drought Task Force, led by members of the state's River Flow Advisory Commission, convened in Summer 2020 for the first time since 2016 and continued to meet monthly during times of significant drought impacts through Fall 2022. The Drought Task Force is co-chaired by MEMA and USGS and brought representatives from the National Weather Service, Maine Geological Survey, Maine Center for Disease Control, the Department of Environmental Protection, and the Maine Public Utilities Commission. All community lifeline sectors are represented in Drought Task Force and River Flow Advisory Commission meetings.

River Flow Advisory Commission

Meeting Dates: March (annually)

The River Flow Advisory Commission, which is co-chaired by the Maine Emergency Management Agency and the United States Geological Survey, meets annually in March to facilitate communication of river flow data between dam operators, river basin managers, and state and federal agencies. The Maine River Flow Advisory Commission is composed of representatives from eight major river basin management operations, seven state agencies, two federal agencies, and the University of Maine. This meeting is a crucial opportunity for communicating with high hazard potential dam operators, who contribute information to river flow conditions. As the HHPD program grows in Maine, these contacts will be the first to receive training and technical assistance.

Technical Assistance to Jurisdictions

(2021 – 2025)

All sixteen of the county (multi-jurisdictional) LHMPs, the University of Maine System LHMP, and a number of Tribal Plans are in the process of being updated by 2025. During this time, the state has provided technical assistance through workshops, individual planning meetings, and individual plan reviews. After initial meetings with planners, most of the draft section reviews were conducted through email and phone calls.

2.5 Resources used to Update the Plan

In addition to direct contributions by Mitigation Partners, the 2023 SHMP Update was developed utilizing input from many resources that are referenced throughout the plan as footnote citations. Hundreds of resources were used to improve the plan and cannot be practically listed here. However, there are a smaller number of resources that were instrumental in the plan update process, and these are referenced here:

Maine State Hazard mitigation Plan – 2019 Update[11]
Information obtained during preparation of 2018-2023 county LHMPs
Maine Won't Wait: a Four-Year Plan for Climate Action[12]
Maine's Climate Future: 2020 Update[13]
Maine Risk Map[14]
Review of Maine Dam Safety records
Review of materials, reports and data provided by other agencies
Federal Disaster Declarations and Emergency Declarations for Maine
Review of New England and other approved state plans

[11] https://www.maine.gov/mema/sites/maine.gov.mema/files/inline-files/State%20Hazard%20Mitigation%20Plan%202019%20Update_10.8.2019.pdf
[12] https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf
[13] https://digitalcommons.library.umaine.edu/climate_facpub/6/
[14] https://experience.arcgis.com/experience/202cb7e1444c4881b44b7586136ef9e7/

Risk Assessment

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Section 3 – Risk Assessment

Stafford Act 44 CFR §201.4(c)(2)(i)-(iii) [1]

3.1 Summary

The following section identifies, profiles, and assesses the vulnerability of the State of Maine to identified natural hazards in compliance with *44 CFR §201.4(c)(2)*. The risk assessment is designed with an intent to capture all best-available data and knowledge of probable natural hazards in the State of Maine; identify assets, community lifelines, and socially vulnerable and disadvantaged communities that are potentially vulnerable to these hazards; and report how current/projected changes in climate, development, and demographics may change vulnerability. Maine's climate, geography, demography, and infrastructure all influence the State's risk to impacts from natural hazards. The risk assessment provides a summary of identified hazards and vulnerabilities for the State of Maine, followed by comprehensive hazard profiles and vulnerability assessments for each identified hazard. Justifications are provided for all hazards not profiled in this Plan.

This Risk Assessment employs a spectrum of subject matter experts, data resources, historical events, potential loss estimates, model projections, probability of occurrence, and GIS and statistical analyses to analyze natural hazards that are most likely to impact Maine. The Risk Assessment is the foundation for determining an appropriate mitigation strategy for the State of Maine. Stakeholders who contributed Risk Assessment information and editing assistance are represented in Section 2 – Planning Process. Footnote citations link to sources for all technical information.

Twelve natural hazard groups are profiled in this Risk Assessment. Of these, 9 are considered Tier 1 hazards and 3 are considered Tier 2 hazards. Tier 1 hazards hold a higher priority for assessment because they are historically proven to pose risks to Maine communities. Tier 1 hazards include flooding, severe summer weather, tropical cyclone, severe fall/winter weather, wildfire, drought, erosion, mass wasting, and earthquake. Based on assessments by subject matter experts, all hazards except earthquakes are considered to be responsive to climate change, making it more challenging to determine their future nature.

Tier 2 hazards currently pose a moderate risk to communities, but these may become more prominent with the effects of climate change. Tier 2 hazards include forest pests, harmful algal blooms, and air quality (criteria air pollutants and acid rain). These hazards were included based on assessments by subject matter experts and on climate projections for Maine.

Table 3.1 shows general information for each hazard profiled in this Risk Assessment.

[1] Stafford Act 44 CFR §201.4: https://www.law.cornell.edu/cfr/text/44/201.4

Natural Hazard Summary Table

Table 3.1: Hazard profile and vulnerability summary.

Hazard	Locations (approximate area of state)	Planning Extent/ intensity	Number of occurrences	Future probability	Potential exposure, millions (2022 USD)		Analysis type
					State assets (# assets*)	Local assets (# assets*)	
Flood							
Inland and coastal flooding	Low lying areas across the state (2,184 sq mi, 6.2%)	100-500 year floods, 20% damage to exposed structures	55 since 1846	Increasing due to projected increase in precipitation	$17.93 (117)	$10,511 (22,192)	GIS asset-hazard overlay
Sea level rise	Low lying coastal areas (76 sq mi, 0.21%)	1.6 feet of sea level rise projected for 2050, 100% relocation for exposed structures	Incremental	sea level rise is increasing coastal flooding occurrence	$9.95 (24)	$1,944 (3,454)	GIS asset-hazard overlay
Severe Summer Weather							
Wind	Statewide	Damaging 70 mph gusts, 2% damage to exposed structures	~Annual	Potential increase	$16.4 (2,238)	$6,600 (758,999)	GIS asset-hazard overlay
Hail	Statewide	Damaging hail >1 inch, 0.2% damage to exposed structures	670 since 1950	Potential increase	$1.64 (2,238)	$658.8 (758,999)	GIS asset-hazard overlay
Tornado	Statewide	EF2, 0.2% damage to exposed structures	17 since 1950	Potential increase	$1.64 (2,238)	$658.8 (758,999)	GIS asset-hazard overlay
Tropical Cyclone							
Storm surge	Coastal areas (115.7 sq mi, 0.33%)	Category 2 Storm Surge, 75% damage to exposed structures	1-3 since 1842	Increase	$82.79 (71)	$8,678 (16,768)	GIS asset-hazard overlay
Hurricane winds	Statewide	Category 2 winds: 100 mph, 130 mph wind gusts, 5% damage to exposed structures	1-3 since 1842	Increase	$41 (2,238)	$16,470 (758,999)	GIS asset-hazard overlay
Severe Fall/Winter Weather							
Extratropical cyclone	Statewide, storm surge limited to coast (115.7 sq mi, 0.33%)	Similar to Category 1 Hurricane event, 75% damage to exposed structures		Potential increase	$59.6 (28)	$3,712 (6,725)	Historic event
Winter storm	Statewide	NWS Hazardous weather criteria	>200 since 1996	May increase or decrease depending on location	$0.83	$0.43	Historic, average of top three events
Heavy snow	Statewide	6-8 inches in 24 hours	>400 since 1996	May increase or decrease depending on location	$0.83	$6.83	Historic event
Ice storm	Statewide	> 1/4 inch ice accumulation	12 since 1996	Potential increase with warmer winters	$14.95	$196.90	Historic, average of top three events

Wildfire							
Wildfire	Multi-county wildfire (1/4 of state)	Similar to Wildfire of 1947, 100% damage to exposed structures	2 in the last 250 years	May increase with drought and reduced suppression capabilities	$301 (433)	$62,143 (151,121)	Historic, GIS asset-hazard overlay
Drought							
Drought	Statewide	Similar to 2002 drought, 25% crop losses	6 statewide droughts in last 85 years	May become more extreme	$0	$166.74 (25% crop loss), 300 dry wells	Agricultural Census loss model
Erosion							
Beach erosion	Entire beach coastline (2% of total)	Coastwide storm impacting all exposed assets, 100% damage to exposed structures	Unprecedented	Expected to increase with sea level rise	$4.36 (3 state parks)	$753.1 (2,040)	GIS asset-hazard overlay
Bluff erosion	Entire bluff coastline (53% of total)	Coastwide storm impacting all exposed assets, 100% damage to exposed structures	Unprecedented	Expected to increase with sea level rise	$27.7 (Structures and state highway)	$311.4 (803)	GIS asset-hazard overlay
Mass Wasting							
Landslide	Statewide - state and local roads	All reported landslide sites, 100% damage to exposed structures	Unprecedented	May increase or decrease depending on location	$42.4 (21.2 mi state highway)	$69.2 (34.62 mi local roads)	GIS asset-hazard overlay
Earthquake							
Earthquake	Multi-county event (1/4 of state)	Large earthquake, 100% damage to exposed structures	Unprecedented	No change in probability	$720 (686)	$59,923 (132,533)	GIS asset-hazard overlay
Tier 2 Hazards							
Forest pests	*There is insufficient data to calculate the recurrence interval and impacts/losses to state and jurisdictional assets caused by forest pests. Negative impacts are expected for forest industries, inland/coastal tourism, and health impacts related to browntail moth.*						
Harmful algal blooms (HABs)	*There is insufficient data to calculate the recurrence interval and impacts/losses to state and jurisdictional assets caused by HABs. Negative impacts are expected for freshwater and marine tourism, human and animal health risks, shellfishing industry, and public water suppliers.*						
Air quality	*There is insufficient data to calculate the recurrence interval and impacts/losses to state and jurisdictional assets caused by air quality. Negative impacts are expected for most of Maine, particularly urban centers, if a poor air quality event were to occur.*						

* Number of assets provided for GIS analyses only.

3.2 Identification and Description of Natural Hazard Types

The SHMP Planning Team prepared Table 3.2 as an overview of all natural hazards that may impact Maine. Please visit MEMA's Maine Risk Map site [2] to access the geospatial hazard and asset data used to conduct this analysis. To simplify the Risk Assessment, multiple hazards were grouped based on their similar characteristics and seasonal co-occurrence. For example, the flood hazard profile group consists of multiple hazard types (including inland, coastal, and flash flood) with each involving inundation but occur under different conditions and/or unique flood drivers and mechanisms. Different hazard types tend to occur in the summer season are included under the Severe Summer Weather group, while colder season hazards are included in the Severe Fall/Winter Weather group. It is important to note, although these hazards could potentially occur at any time, they have been grouped under the season in which they are most likely to occur. Despite their summer occurrence, tropical cyclones are a unique hazard to warrant a separate hazard group from Severe Summer Weather.

Hazard profile groups are further organized under Tier 1 and Tier 2 classifications. Tier 1 hazards hold a higher priority for assessment because of the historical proof to pose risks to Maine communities. Except for earthquakes, all Tier 1 hazards are responsive to climate change. Tier 2 hazards currently pose a moderate risk to communities, but these may become more prominent with the effects of climate change. The Risk Assessment includes 9 Tier 1 hazards and 3 Tier 2 hazards. A further 5 hazards are identified but not profiled for this Risk Assessment for reasons explained below.

[2] MEMA Maine Risk Map: https://maine.maps.arcgis.com/apps/mapviewer/index.html?webmap=eb8ec0935ce544dbaa80aec18c8db785

Table 3.2: Maine Natural Hazard Identification Summary

Hazard Profile Group	Type of hazard and base mechanisms	Subject matter expert agencies and supporting resources
TIER 1 NATURAL HAZARDS		
Flood	Inland flood	NOAA, FMP, FEMA, County EMA, MGS, USGS, UMS
	Coastal flood	NOAA, FMP, FEMA, County EMA, MGS, USGS, UMS
	Flash flood	NOAA, USGS, UMS, FEMA
	Urban/surface water floods	NOAA, USGS, FEMA
	Tsunami	NOAA, USGS
	Dam failure	MEMA Dam Safety
Severe summer weather	Severe storms	NOAA
	High winds	NOAA
	Extreme heat	NOAA, UMS
Tropical cyclone	Tropical storm	NOAA: NHC
	Hurricane	NOAA: NHC
Severe fall/winter weather	Heavy snow	NOAA
	High winds	NOAA
	Blizzard	NOAA
	Sleet	NOAA
	Hail	
	Ice storm/freezing rain	NOAA
	Extreme cold	NOAA, UMS
Drought	Meteorological drought	NOAA, Northeast DEWS, USDA, USGS, UMS, MGS, DACF
	Hydrologic drought	
	Agricultural drought	
	Socioeconomic drought	
Mass wasting	Creep	MGS, USGS, UMS
	Rockfall	
	Landslides	
Erosion	Beach erosion	MGS
	Bluff erosion	MGS
Fire	Wildfire	MFS
	Urban fire	
	Air quality	MEMA, DEP
Earthquake	Tectonic earthquake	MGS, USGS
	Explosive earthquake	
	Collapse earthquake	
	Volcanic earthquake	
	Cryoseism/frost quake	MGS, USGS
TIER 2 NATRUAL HAZARDS		
Blight/infestation	Invasive species/Forest pests	MFS
Harmful Algal Blooms	Freshwater and Marine	DMR, DEP
Air quality	Winter and summer	MEMA, DEP
HAZARDS NOT PROFILED IN THIS PLAN		
Subsidence		USGS
Volcanic activity		USGS
Avalanche		USGS
Geomagnetic Storm		NWS
Pandemic		CDC

List compiled by Maine Emergency Management Agency – 2022

3.3 Hazard Classification

Each Hazard Profile Group consists of one or more basic hazard mechanisms, which can occur as a part of several other groups. Table 3.3 demonstrates hazard interrelationships and how each Hazard Profile Group shares these different hazard mechanisms as primary, contributing, or consequential to the hazards. For example, heavy rain and strong winds are primary mechanisms for severe summer weather, severe fall/winter weather, and tropical cyclones. Also, there are several mechanisms that may contribute to a Hazard Profile Group but are not a primary cause for the hazard. For example, mass wasting and erosion may be a consequence of heavy rain and multiple flooding and earthquake mechanisms. Finally, there are other mechanisms that may “cascade” from or become a consequence of a hazard profile group, though they are not a primary characteristic of the hazard. For example, tropical cyclones are likely to cause multiple types of flooding classified under the Flood Hazard Profile Group, while large mass wasting and earthquake events can trigger tsunamis classified under the Flood Hazard Profile Group.

Table 3.3: Profiled Meteorological and Geological Hazards Sharing Mutual Potential Hazards

Hazard Group / Hazard Mechanism	Flood	Severe Summer Weather	Tropical Cyclone	Severe fall/Winter Weather	Drought	Mass Wasting	Erosion	Fire	Earthquake	Blight/ Infestation	Not a natural hazard	Not profiled
Heavy rain												
Inland flood												
Riverine and lacustrine flood												
Ice jam												
Snowmelt												
Coastal flood												
High astronomical tide												
Storm surge												
Sea level rise												
Waves												
Flash flood												
Urban/surface water floods												
Tsunami												
Dam failure												
Thunderstorms												
Lightning												
Tornado												
Hail												
Strong straight-line winds												
Extreme heat												
Tropical storm												
Hurricane												
Heavy snow												
Ice storm/freezing rain												
Sleet												
Extreme cold												
Cryoseism/frost quake												
Meteorological drought												
Dry or warm snow drought												
Hydrologic drought												
Agricultural drought												
Socioeconomic drought												
Creep												
Rockfall												
Landslides												
Beach erosion												
Bluff erosion												
Wildfire												
Urban Fire												
Tectonic earthquake												
Explosive earthquake												
Collapse earthquake												
Volcanic earthquake												
Forest pests												
Air quality												
Subsidence												
Harmful Algal blooms												
Avalanche												
Volcanic activity												

	Flood	Severe Summer Weather	Tropical Cyclone	Severe fall/Winter Weather	Drought	Mass Wasting	Erosion	Fire	Earthquake	Blight/ Infestation
Primary mechanisms of hazard	13	7	5	11	5	3	2	2	4	1
Mechanisms that may contribute to hazard	4	0	0	0	1	15	19	5	0	0
Mechanisms that may be consequence of hazard	3	16	7	13	2	5	0	2	5	0

Maine Emergency Management Agency – 2022

3.4 Process for Identifying Vulnerabilities in State Assets and Jurisdictions [S6.a.1.]

Each hazard profile and vulnerability assessment considers the most vulnerable assets in the State of Maine. However, identification of vulnerable sites is no guarantee that future natural hazard events will damage these assets. As the Mitigation Act of 2000 requires every jurisdiction to have a hazard mitigation plan in order to be eligible for grant funding, and due to the large number of small Maine municipalities, it was decided to define a “jurisdiction” in Maine as a county except in cases where it is possible to provide municipal or individual asset scale details. Although county government in Maine is very small with few authorities, the preparation of county plans was determined to be the best way to create a regional approach to creating these plans. All sixteen Maine counties are eligible to apply for FEMA Plan Update Grants to develop multi-jurisdictional Hazard mitigation Plans with participation from their communities. FEMA mitigation grants are offered through the BRIC and FMA non-disaster programs, or when available, the HMGP post-disaster program [3]. As of this writing, most County Hazard Mitigation Plans are in their fourth version.

In 2022-2023, the State of Maine conducted a risk assessment, updating both the methodology and data from the previous risk assessment conducted in 2018. The intent of this process was to provide emergency management planners with a broad perspective on the hazards and threats that pose a risk to the State of Maine. The selection of hazards and threats presented in the tool was derived from existing literature within the emergency management community, to include the 2018 State Hazard Mitigation Plan. The methodology used in the risk assessment process is based on the Code of Federal Regulations, Emergency Management Accreditation Program Standards, and best practices in the field of risk assessment to include the assessment conducted in 2017 by the Rhode Island Emergency Management Agency. Execution of this methodology was primarily virtual, leveraging the emergency managers in each of the state’s (16) counties.

3.4.1 Geospatial Analysis of Assets and Known Hazard Locations

MEMA’s Natural Hazards Planner developed a geospatial workflow to identify the occurrence of geolocated assets within areas known or projected to be exposed to the natural hazards identified within this Plan. Assets include State owned or leased properties and insured contents, state road infrastructure, state and municipal conserved lands, municipal road infrastructure, and a general assessment of building footprint locations (including state, local, and privately owned assets of residential, commercial, and industrial class) across the state. The overlay analysis does not take into account any pre-existing mitigation efforts at each site.

The hazard layers used in this assessment consist of public data that can be accessed through MEMA’s Hazard Mitigation Plan Risk Assessment Map [4]. MEMA encourages Maine communities to use this tool to assess their own patterns of risk and inform their own Local Hazard Mitigation Plans in the future. Please refer to our list of stakeholders in Section 2 – Planning Process, where we acknowledge the agencies and organizations that provided the data for this assessment.

Locations for categorized assets were determined through use of the Maine E911 database. State assets were geolocated based on address data and verified using satellite imagery. Building footprints were provided by Microsoft’s Bing Maps database [5]. For Maine DOT assets, the primary focus was on stream crossings for inland and coastal flood risks and road mileage for severe fall/winter storms.

[3] MEMA Mitigation Grants webpage: https://www.maine.gov/mema/grants/mitigation-grants
[4] MEMA Hazard Mitigation Plan Risk Assessment Map: https://maine.maps.arcgis.com/home/item.html?id=eb8ec0935ce544dbaa80aec18c8db785
[5] Microsoft building footprints database: https://www.microsoft.com/en-us/maps/building-footprints

Aggregate damage estimates for State assets are based on building replacement cost values provided for insurance purposes by Maine Bureau of General Services. Aggregate damage estimates for the generic buildings identified from footprint data are based on the average value per square foot for commercial, residential, and industrial structures. Unfortunately, the building footprint data provided by Microsoft does not include zoning/classification fields. To account for this, the relative proportion of zoning class was used to produce a weighted average price per square foot for all building footprints in Maine (Table 3.4). The average square footage value is used to estimate cumulative damages in dollar value for all building footprints that intersect the hazard layers used in this Plan.

The "select layer by location (Data Management)" tool was used in ArcMap to identify assets that are overlain by hazard layers. These assets were tagged based on this condition and counted toward the vulnerability assessment for each hazard profile described below. This data was aggregated by municipality and by county in order to provide a general sense of vulnerability at a more interpretable scale for the entire state.

Table 3.4: Building class types and relative proportion used to estimate average value (2022 USD)

Building Class	% of US buildings	Average value per square foot
Residential	94.5%	$210
Commercial	5.2%	$301
Industrial	0.3%	$145
Average	**100%**	**$215**

Vulnerable asset value data is also rendered in kernel density maps providing the general location of potentially vulnerable assets. Kernel density maps, or heat maps, provide an estimate of the total number of assets located within a unit of area, and are useful for interpreting relative spatial differences in development and associated vulnerabilities.

3.4.2 Disadvantaged communities Assessment

Disadvantaged community assessments were performed based on availability of information for disadvantaged and/or socially vulnerable communities and their potential exposure in locations known for prominent natural hazard occurrence (for example, flood plain maps published by the National Flood Insurance Program). The objective of the assessment is to identify potentially disadvantaged communities who are disproportionately impacted by natural hazards both historically and under future projections. The equity assessment then ties to pre-existing mitigation capabilities directly assisting disadvantaged communities, to inform mitigation strategies to ensure fair and just mitigation assistance determined by level of need.

The Social Vulnerability Index (SVI [6]) is used for our assessment, a standard used by Federal Agencies to plan assistance for disadvantaged communities. SVI is available at Census track resolution to identify intersections between hazard occurrence layers and communities, with specific focus on those disadvantaged communities identified with a SVI score of 0.6 or greater [7]. Though Census Track SVI is broadly considered to be the best available resource for a statewide equity assessment, it must be acknowledged the census track resolution is, in many rural locations, not fine enough to provide a consistent assessment of disadvantaged and potentially vulnerable communities. SVI analyses, therefore provides less accuracy in rural locations that compose the majority of Maine by area.

[6] Social Vulnerability Index: https://www.atsdr.cdc.gov/placeandhealth/svi/index.html
[7] FEMA equity definitions: https://www.fema.gov/sites/default/files/documents/fema_equity-webinar-final_8-17-21.pdf

3.4.3 Process Used to Analyze Information from County Risk Assessments

In the preparation of this Plan, all county Local Hazard Mitigation Plans were evaluated to determine the nature of hazards and how they differed throughout the state, as well as the extent to which specific hazards contribute to the overall statewide hazard risk. Flooding, Severe Fall/Winter Weather, Severe Summer Weather, and Wildfires are considered the highest priority hazards for nearly all areas of Maine. The estimate of potential dollar losses contained in this Plan was also obtained from each of the county plans. In general, the jurisdictions with the highest potential damages are the ones with the most risk. Vulnerability assessments for jurisdictions incorporate Local Hazard Mitigation plan data as well as many other resources cited throughout the plan.

The following paragraphs represent a composite summary of the findings from the various county plans as well as the knowledge gained in the preparation of this Plan.

3.4.4 Tracking Development Trends in Hazard Prone Areas

Several resources are available for tracking general development trends in Maine. However, capabilities are limited for tracking development trends specifically in known hazardous areas in Maine. Local governments are responsible for documenting construction and septic installation permits and they may provide this information to the State. For purposes of this plan update, MEMA utilizes satellite imagery data to identify specific overlaps of development within hazard prone areas, such as Special Flood Hazard Areas. Other beneficial resources include septic permit records, development trend assessments from Local Hazard Mitigation Plans, and data from the US Census and American Community Survey.

Flooding – Hazard Profile

TIER 1 HAZARD

3.5 Flooding – General Definition and Types of Events [S3.a., S3.b.]

Flooding is an overflow and inundation of water onto normally dry land as a result of: 1) the overflow of inland or tidal waters, or 2) the unusual and rapid accumulation or runoff of surface waters from any source [8] The following are types of flooding events experienced in Maine:

3.5.1 Inland Flood

Inland flooding occurs when moderate precipitation accumulates over several days, intense precipitation falls over a short period, there is abundant runoff from spring snowmelt, a river overflows because of an ice or debris jam or dam or levee failure, or a combination of these factors. The following flood mechanisms occur during inland flooding:

Riverine Flood: A river flood occurs when water levels rise over the top of the riverbanks due to excessive rainfall from low pressure systems, landfilling tropical systems, persistent nearly stationary thunderstorms over extended periods of time, or a combination of snowmelt and rainfall along with ice jams [9]. Periodic overbank flow of rivers and streams is a typical result of spring runoff in Maine. See "Location of River Basin" section for flooding details.

Lacustrine Flood: Lacustrine or lake flooding occurs when the outlet for the lake cannot discharge the flood waters fast enough to maintain the normal pool elevation of the lake. During a base flood event, normal increases in water surface elevations on most Maine lakes and ponds range from 1 to 5 feet. However, in Maine there are some examples where the base flood event will reverse the flow of the outlet stream. In such instances, river and base flood elevations can rise more than 15 feet above normal pool. Maine's mandatory shore land zoning and floodplain management elevation requirements do much to mitigate lake and pond development by imposing significant setbacks from the water's edge. This type of flooding can impact private camps built near the water's edge. Though less common than riverine floods, there is documented damage from lacustrine flooding in Aroostook County in 2018 [10].

Ice Jam: Ice jams occur when warm temperatures and heavy rain cause snow to melt rapidly. Snow melt combined with heavy rains can cause frozen rivers to swell, which breaks the ice layer on top of the river. The ice layer often breaks into large chunks, which float downstream and often pile up in sharp river bends, shallow river channels, mouths of tributaries, points where river slope decreases, and near narrow passages around other obstructions such as bridges and dams. The channel blockage acts like a temporary dam causing the water to rise rapidly behind the jam causing a rapid onset of upstream flooding. If the ice jam suddenly breaks, a torrent of water is rapidly released downriver causing flash flooding below the jam location [11]. Damages from ice jam flooding usually exceed those of clear water flooding because of higher than predicted flood elevations, rapid increase in water levels upstream and downstream, and physical damage caused by ice chunks. Moving ice masses can shear off trees and destroy buildings and bridges above the level of the flood waters.

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[8] NWS Flood definitions: https://www.weather.gov/mrx/flood_and_flash
[9] NOAA definition of flood types: https://www.nssl.noaa.gov/education/svrwx101/floods/types/
[10] Rains threaten major flooding along Fish River chain of lakes: https://thecounty.me/2018/05/02/news/rain-threatens-major-flooding-in-fort-kent-along-fish-river-chain-of-lakes/
[11] NESEC Ice Jam Definition: http://nesec.org/ice-jams/

3.5.2 Coastal Flood

A coastal flood, or the temporary inundation of low-lying land areas along the coast, is caused by higher-than-average astronomical tide and is worsened by heavy rainfall, storm surge driven by onshore winds (i.e., wind blowing landward from the ocean), damaging waves, and sea level rise. Coastal flooding comes with two significant components: an increase in still-water levels and storm surge. The typical high winds associated with coastal storms exacerbate flooding by “pushing” more water toward land and increasing base water levels, or still-water levels. Strong storms such as tropical cyclones or nor’easters can cause large damaging waves and storm surges along areas of the coast of Maine. Fetch, or the distance the wind can blow over open water, is a significant factor in the size of storm waves. The shape of the ocean floor just offshore is another variable. The following flood mechanisms contribute to coastal flooding:

High Tide: High astronomical tides are produced in the ocean waters by the "heaping" action resulting from the horizontal flow of water toward two regions of the earth representing positions of maximum attraction of combined lunar and solar gravitational forces [12]. Low tides are created by a compensating maximum withdrawal of water from regions around the earth midway between these two humps. The alternation of high and low tides is caused by the daily (or diurnal) rotation of the earth with respect to these two tidal humps and two tidal depressions. High astronomical tides are the highest levels that can be predicted to occur under average meteorological conditions.

Storm Surge: Storm surge is an abnormal rise in water level in coastal areas, over and above the regular astronomical tide, caused by forces generated from a severe storm's wind and low atmospheric pressure. Storm surge is extremely dangerous because it is capable of flooding large coastal areas. Extreme flooding can occur in coastal areas particularly when storm surge coincides with normal high tide, resulting in storm tides (see below). Along the coast, storm surge is often the greatest threat to life and property.

Storm Tide: Storm tide is a combination of predicted astronomical tide and storm surge. It is the overall water level achieved during a storm event and is usually measured at a tide gauge. For example, if a predicted astronomical tide is 10 feet, and 4 feet of storm surge comes in on top of that high tide, the storm tide level would be 14 feet.

Waves: Wind-driven waves, or surface waves, are created by the friction between wind and surface water. Generally, the larger the fetch (or the distance across open water that wind can blow), the larger the wave height. As wind blows across the surface of the ocean or a lake, the continual disturbance creates waves. As the wind blows for extended periods of time and over large distances, the wave heights increase [13].

Sea Level Rise: Global sea level rise is an increase in the world’s ocean’s surface height due to two dominant factors: volumetric increase and thermal expansion. Melting glaciers and land-based ice sheets, such as the Greenland ice sheet, which are linked to changes in atmospheric temperature, can contribute significant amounts of freshwater input to the Earth's oceans, increasing the volume of the oceans. Additionally, a steady increase in global atmospheric temperature creates an expansion of sea water molecules, thereby increasing ocean volume through thermal expansion. The Intergovernmental Panel on Climate Change Report estimates that the global sea level rise was approximately 1.7-1.8 millimeters per year (mm/yr) over the past century, based on tide station measurements around the world. Since 1993, satellites have measured average global sea levels and shown that the rate has increased to about 3.3 mm/yr (ref: U. Colorado). Climate models show that sea levels will continue

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[12] NOAA tidal forces: https://tidesandcurrents.noaa.gov/restles2.html
[13] NOAA ocean waves definition: https://oceanservice.noaa.gov/facts/wavesinocean.html

to rise, with the 2017 US National Climate Assessment concluding that it is *very likely to rise between 1 and 4 feet by the end of the century.* Relative sea level rise, or local sea level rise, refers to how the height of the ocean changes relative to the land at a particular location. In Maine, there are four long-term tide gauges monitoring local sea levels [14], [15]. Long-term sea level trends in Maine indicate about half of the observed sea level rise has occurred since 1990, and rates are generally at or slightly above global long-term and short-term averages. The Maine Climate Council recommends managing for 1.5 feet of relative sea level rise by 2050 and 4 feet by 2100 [16]. The Maine Geological Survey maintains a monthly Sea Level Rise Ticker and Dashboard for keeping track of local sea level trends [17]). over the past century, based on tide station measurements around the world, with projected increased trends in sea level in the 20th Century based on global climate models.

3.5.3 Flash Flood

A flash flood is caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through riverbeds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam. Flash floods are very dangerous and destructive not only because of the force of the water, but also the hurtling debris that is often swept up in the flow [18].

3.5.4 Urban/surface water flood

Surface water floods occur when an urban drainage system is overwhelmed, and water flows out into streets and nearby structures. Flooding from surface runoff can happen within minutes or more gradually, while the level of water is often shallow (rarely more than 1 meter deep). It creates no immediate threat to lives but may cause significant economic damage [19]. The combined sanitary and storm water systems that some urban areas installed years ago cause flooding of sanitary sewerage when riparian or coastal floods occur. Runoff is increased due to many impervious surfaces such as roof tops, sidewalks, and paved streets.

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[14] Portland ME tide gauge: https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8418150
[15] Eastport ME tide gauge: https://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?id=8410140
[16] Maine Won't Wait: https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf
[17] Maine Geological Survey Sea Level Rise Dashboard: https://www.maine.gov/dacf/mgs/hazards/slr_ticker/slr_dashboard.html
[18] NWS flash flood: https://www.weather.gov/mrx/flood_and_flash
[19] Three Common Types of Flood: https://www.zurich.com/en/knowledge/topics/flood-and-water-damage/three-common-types-of-flood

3.5.5 Tsunami

A tsunami is a series of extremely long waves caused by a large and sudden displacement of the ocean, usually the result of an earthquake below or near the ocean floor. This force creates waves that radiate outward in all directions away from their source, sometimes crossing entire ocean basins. Unlike wind-driven waves, which only travel through the topmost layer of the ocean, tsunamis move through the entire water column, from the ocean floor to the ocean surface. Over 80% of tsunamis are caused by earthquakes on converging tectonic plate boundaries. Other causes include landslides, volcanic activity, certain types of weather, and—possibly—near-earth objects (e.g., asteroids, comets) colliding with or exploding above the ocean [20]. Once a tsunami forms, its speed depends on the depth of the ocean. In the deep ocean, a tsunami can move as fast as a jet plane, over 500 mph, and its wavelength, the distance from crest to crest, may be hundreds of miles [21]. All areas with elevation less than 100 feet and within two miles of the coast could be impacted by a tsunami [22]. However, based on information obtained from the Maine Geological Survey, the chances of a catastrophic event impacting the Maine coastline are minimal [23]. Tsunami modeling from the University of Rhode Island [24] indicates the possibility of 5 to 6 meter waves along the coast of Maine if submarine landslides occur along the U.S. Continental Shelf. Maine is relatively protected from distant tsunami sources in the Azores and Caribbean, but local submarine landslides could produce waves reaching the coast of Maine.

3.5.6 Dam Failure/Breach [HHPD2]

Any malfunction or abnormality outside the design assumptions and parameters that adversely affect a dam's primary function of impounding water is considered a dam failure. Lesser degrees of failure can progressively lead to or heighten the risk of a catastrophic failure, which may result in an uncontrolled release of the reservoir and can have a severe effect on persons and properties downstream. Dam breaches can cause rapid and expansive downstream flooding, loss of life, damage to property, and the forced evacuation of people. A dam breach has a low probability of occurring, but with a potentially high impact [25].

[20] NOAA tsunami definition: https://www.noaa.gov/education/resource-collections/ocean-coasts/tsunamis
[21] KOMAR, P.D., 1996. Tidal-Inlet Processes and Morphology Related to the Transport of Sediments. J. Coastal Research, Special Issue No. 23, 23-45.
[22] Cal OES Tsunami Fact Sheet: https://www.conservation.ca.gov/cgs/Documents/Tsunami/How-to-Survive-a-Tsunami.pdf
[23] Maine Geological Survey Tsunami Page : https://www.maine.gov/DACF/mgs/hazards/tsunamis/index.shtml
[24] Grilli, S., Grilli, A. R., Tehranirad, B., & Kirby, J. T. (2017). Modeling Tsunami Sources and Their Propagation in the Atlantic Ocean for Coastal Tsunami Hazard Assessments and Inundation Mapping along the US East Coast. In *Coastal Structures and Solutions to Coastal Disasters 2015: Tsunamis* (pp. 1-12). Reston, VA: American Society of Civil Engineers. https://personal.egr.uri.edu/grilli/COPRI15_sgrilli.pdf
[25] FEMA Dam Safety Awareness: https://www.fema.gov/sites/default/files/2020-08/fact-sheet_dam-awareness.pdf

3.6 Flooding – Location of Hazard [S3.a.1]

All of Maine has locations that are susceptible to flooding from flood types listed above. Notable locations of potential flooding by flood type are listed below (Figure 3.1).

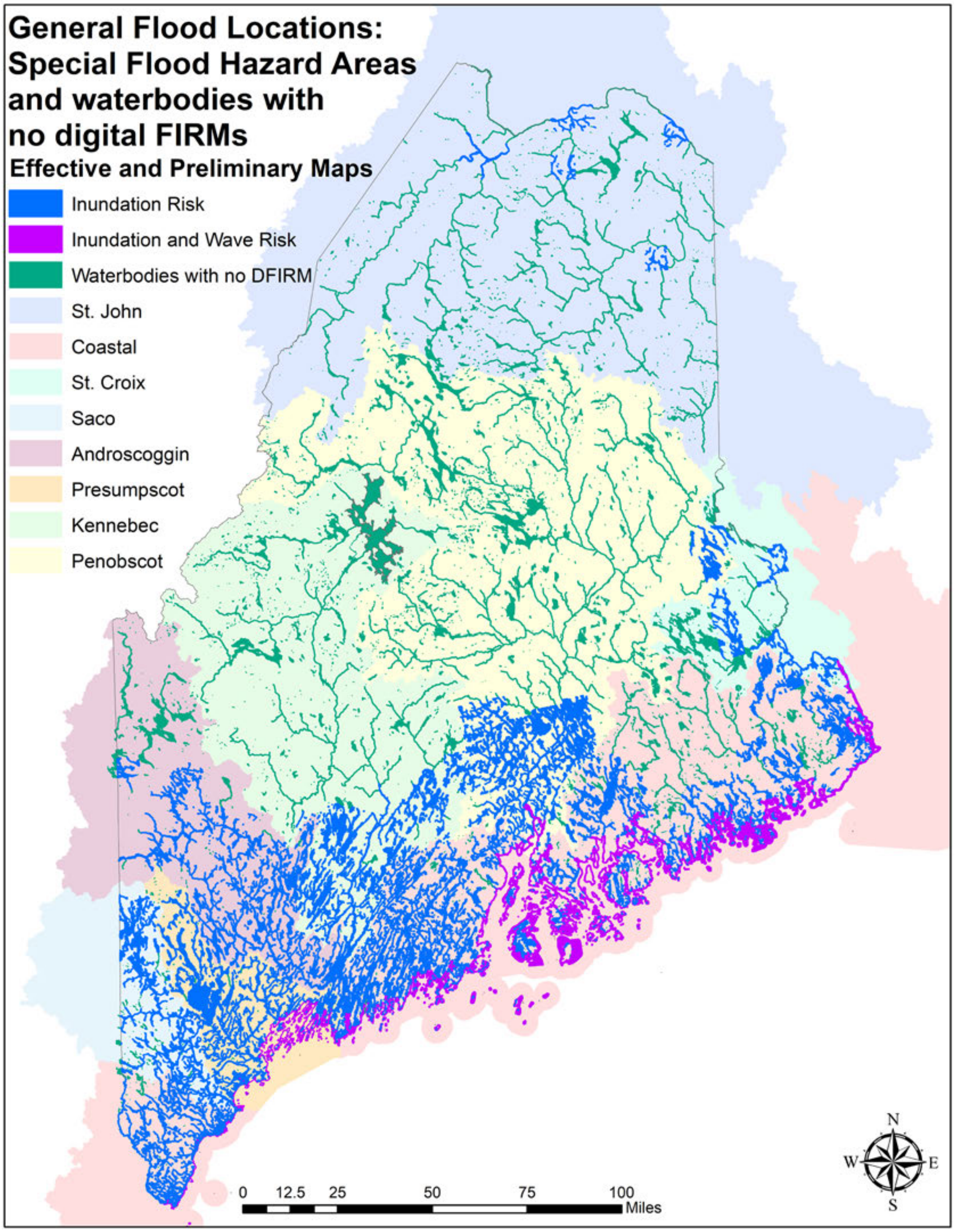


Figure 3.1. State-level overview of available resources for identifying flood locations in each major river basin. Visit FEMA's National Flood Hazard Layer Viewer to review flood occurrence in specific locations.

Due to the nature of Maine's geographic features, many of its rivers flow steeply from the mountains eastward toward the sea. Rivers in mountainous regions tend to rise very quickly after heavy rainfall because of the gradient of riverbeds and drainage areas. Generous precipitation (about 42.6 inches a year) contributes to the flood potential. The low-pressure system over the seaboard and the tendency of some storms to follow one another in rapid succession provide heavy, combined moisture. The nature of Maine's geography, geology and hydrology is such that flooding is usually fast rising but of short duration (Figure 3.2).

With five major rivers, more than 5,000 streams and brooks, 6,000 ponds and lakes, and 3,500 miles of coastline, water abundance is one of the state's most valuable natural resources as well as its primary hazard. Maine's geography and climate are critical factors which affect the flows of these water bodies.

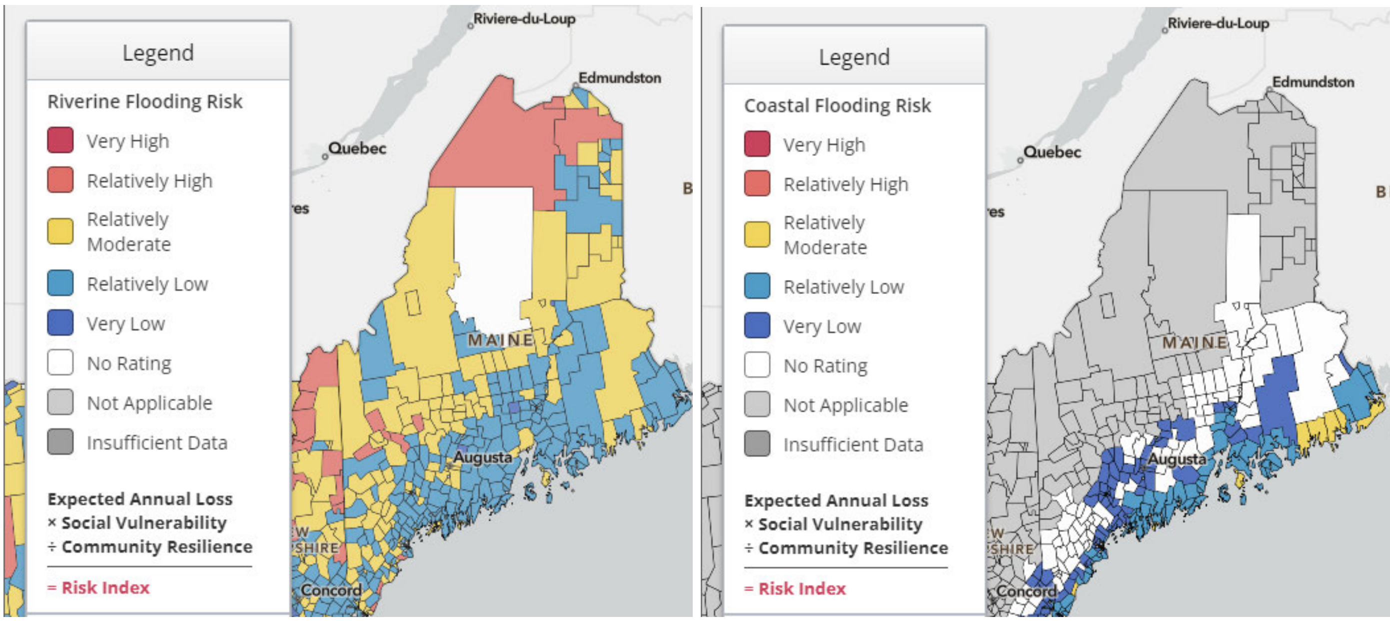


Figure 3.2: National Risk Index map of riverine (left) and coastal (right) flooding risk by census track in Maine. Though these maps indicate risk, rather than simply the occurrence of floods, the general location of historic flooding is captured by the "relatively moderate/high" census tracts. https://hazards.fema.gov/nri/map#

3.6.1 Location of Riverine/Riparian Flooding

Some of Maine's rivers have overflowed many times, but recent flooding has caused increased damage because of the extensive development and denser population of the floodplains. For example, the floods of 1896 and 1936 were more severe but much less destructive than the flood of 1987[26]. By the late 20th century, a much larger population was living and working in the floodplain areas and more people, businesses and infrastructure were affected. Maine's susceptibility to flooding is further exacerbated by the wide-ranging weather variables as discussed in the climate section. Due to seasonal (and regional) factors such as heavy rains, rapidly melting snow pack and/or ice jams, major flooding most frequently occurs between December and May. The most flood prone months are April, January, and March respectively. Floods can also be caused by hurricanes or any other hazardous event involving heavy and/or sustained rainfall. Flooding often occurs along the state's major river basins, outlined below. The most vulnerable of Maine's rivers are the Kennebec and Androscoggin. Refer to MEMA's Risk Assessment Map[27] to view specific locations susceptible to flood.

[26] Flood of April 1987 in Maine; US Geological Survey Water-Supply Paper 2424: https://pubs.usgs.gov/wsp/2424/report.pdf
[27] MEMA Risk Assessment Map: https://maine.maps.arcgis.com/apps/mapviewer/index.html?webmap=eb8ec0935ce544dbaa80aec18c8db785

Androscoggin River Basin

The Androscoggin River Basin runs 169 miles from its Umbagog Lake source in Errol, New Hampshire to its mouth at Merrymeeting Bay near the borders of Cumberland, Lincoln, and Sagadahoc Counties. The Androscoggin River Basin drains from the western boundaries of Maine and New Hampshire. While it drains less area than the Kennebec River Basin, the river has a more rapid fall (1,245 feet from its source) with an average slope of almost eight feet per mile. The river's steep slope has historically attracted mill-based industries and towns such as Livermore Falls, Lewiston, Auburn, Lisbon Falls and Topsham along its course. Before offshore outsourcing, the mills manufactured products as diverse as paper, textiles, and shoes. Floods have historically been severe in some of the downtown locations where development was extensive, particularly in Oxford County which has been the most vulnerable to floods in the last 36 years. After major ice jam flooding in December 2003, the Town of Canton located in Oxford County applied for, and won a $3 million FEMA Pre-Disaster Mitigation acquisition/demolition project. Due to the proximity of the river to Oxford County, York County, and the state of New Hampshire, mutual aid agreements have been established to emphasize cooperation across emergency plans.

Kennebec River Basin

The Kennebec River Basin occupies approximately 5,900 square miles of southwestern Maine. The river basin originates at Moosehead Lake and flows south approximately 145 miles to Merrymeeting Bay. The Kennebec River joins the Androscoggin River in Merrymeeting Bay before exiting to the ocean at Fort Popham. The upper two-thirds of the basin are hilly and mountainous and the lower third of the basin has gentle topography representative of a coastal drainage area. Major communities in this basin include Bingham, Anson, Madison, Norridgewock, Skowhegan, Waterville, Winslow, Augusta, Hallowell, and Gardiner. Storage dams, such as Wyman Dam in Somerset County, control the upper part of the Kennebec River Basin, and the basin below the dams is largely uncontrolled affecting communities built extensively in floodplains. Notably, the lower third of the river basin is also relatively susceptible to tidal influence as far north as Augusta.

Presumpscot River Basin

Sebago Lake is the source of the Presumpscot River which drains into Casco Bay in Portland, 26 miles downstream. The basin includes some area to the north of Sebago Lake, and the terrain across the basin is generally hilly. While the Presumpscot River Basin covers a small geographic area, it is home to some of the highest population density in the State of Maine.

Penobscot River Basin

The Penobscot River Basin runs 105 miles from its source at the confluence of its east and west Branches in Medway to its mouth in Penobscot Bay. With a land area of 8,570 square miles, the Penobscot River Basin drains almost as large an area as the Kennebec and Androscoggin Rivers combined. It drains a large portion of the north-central part of the state from the Canadian border to Penobscot Bay. It includes most of Maine's pristine bogs and ponds and includes Baxter State Park near its center. A system of upstream dams, the relatively gradual fall of the river averaging only three feet per mile, and the presence of extensive wetlands in the eastern part of the basin have in the past prevented massive floods. The Piscataquis River in the upper part of the basin, however, passes through a series of small communities with many downtown areas vulnerable to spring flooding. The Kenduskeag River flows through Bangor and joins the Penobscot in the downtown area. It has occasionally caused considerable flooding damage to Bangor's downtown.

Saco River Basin

With a land area of 1,700 square miles, the Saco River Basin has approximately a quarter of the drainage area of the Kennebec River but no upstream storage dams. The Saco Basin is generally described as embracing all of York County, as well as most of Cumberland County, and the southern portion of Oxford County. The Saco River runs 75 miles from Crawford Notch in New Hampshire to Biddeford. Several small rivers with small exclusive basins comprise this area. It includes small rivers like the Kennebunk, Mousam, Presumpscot, Royal, Ogunquit and the Maine portion of the Piscataqua and Salmon Rivers. Many of the smaller rivers such as the Mousam have experienced significant flooding in recent years.

St. Croix River Basin

At 1,650 square miles, the St. Croix River Basin has as much drainage area as the Saco River Basin, but it is controlled by upstream storage dams. The Saco, St. Croix, and St. John rivers do not have the extensive floodplain development of the Kennebec and Androscoggin Rivers. The St. Croix River runs 71 miles from the Chiputneticook Lakes to Passamaquoddy Bay and serves as the international border between Maine and Canada. The basin includes the area known as "Down East". Most of the basin is subject to tidal influence, but it is also comprised of many smaller rivers such as the Dennys, Pleasant, Machias, Narraguagus and Union Rivers. This area has historically been sparsely populated but has experienced increasing pressures for development. Most flood damages in this basin are due to infrastructure rather than residential and commercial structures.

St. John River Basin

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

3.6.2 Location and Hazard Characteristics of Dams [HHPD1.a; HHPD2.a]

The result of a dam failure is a flood. The location of each dam is, therefore, a location of potential flooding from a dam breach or failure. Figure 3.3 identifies the extent of dams spread throughout the state. The Maine Dam Safety Program [28] continues to maintain records indicating the level of hazard associated with each unique structure, summarized in Table 3.5, and updated paper copies of dam failure inundation maps for every high hazard dam in the state reported in Emergency Action Plans. Though these maps are not sharable in paper form there is interest in providing digital map resources with future onboarding of new technical staff.

The terms "high", "significant" and "low" refer to the downstream hazard potential of the dams as defined within *Title 37B MSRA*, Chapter 24. *Title 37B MSRA* assigns administration of the Maine Dam Safety Program (DSP) to the Maine Department of Defense, Veterans and Emergency Management.

High Hazard Potential Dam: A dam assigned the high hazard potential classification where failure or mis-operation will probably cause loss of human life; [2001, c. 460, §3]

Significant Hazard Potential Dam: A dam assigned the significant hazard potential classification where failure or mis-operation results in no probable loss of human life but can cause major economic loss, environmental damage or disruption of lifeline facilities or affect other concerns. Significant hazard potential dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure. [2001, c. 460, §3]

Low Hazard Potential Dam: A dam assigned the low hazard potential classification where failure or mis-operation results in no probable loss of human life and low economic and environmental losses. Losses are principally limited to the owner's property; and [2001, c. 460, §3]

[28] Maine Dam Safety Program: https://www.maine.gov/mema/hazards/dam-safety

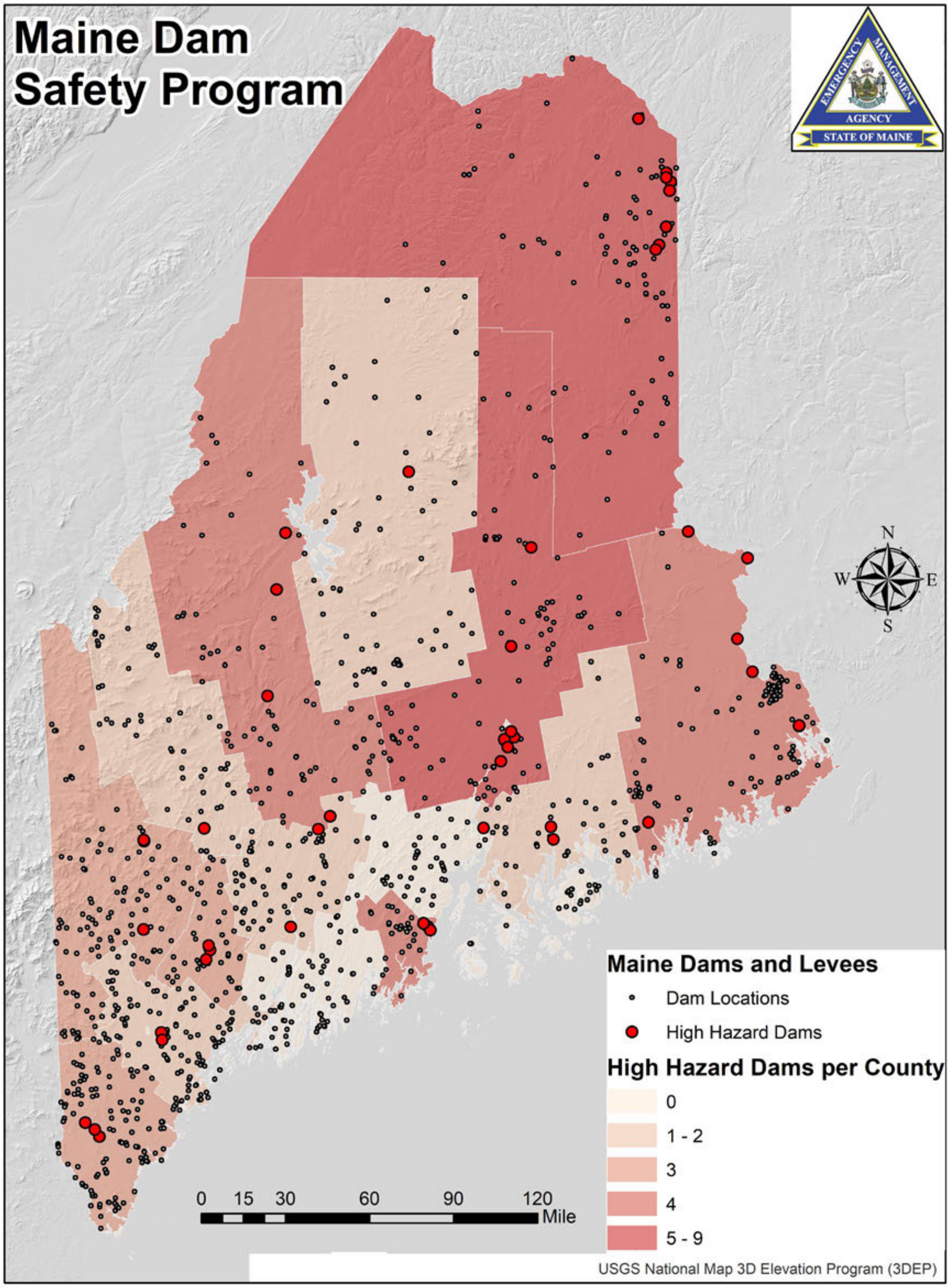


Figure 3.3 – An overview of dam locations in the State of Maine. Coordinates were last updated in 2022.

The Maine Office of Dam Safety maintains records of 1,145 dams, of which 743 meet definitions of dams that require regulation, apportioned as follows:

- (529) Five hundred and twenty-nine dams are regulated by the Maine Dam Safety Program.
- (155) One hundred and fifty-five jurisdictional dams are regulated by the Federal Energy Regulatory Commission.
- (59) Fifty-nine dams on the Maine–New Hampshire border are regulated by the New Hampshire Department for Environmental Services Dam Bureau (43) and the Federal Energy Regulatory Commission (16) (these are excluded in the state regulated numbers).
- (2) Two dams located on the Canadian border, Woodland and Grand Falls, are regulated by the Maine Dam Safety Program and the International Joint Commission (IJC) on dams (these are included in the state regulated numbers).

The hazard classifications for regulated dams in Maine are shown in Table 3.5. Refer to Appendix HHPD2 for a list of high hazard dam names and location/identification data.

Table 3.5: State and FERC Regulated Dams in the State of Maine (March 24, 2023)

Hazard	State Regulated Dams	FERC Regulated Dams	Totals Dams
High	39	34	73
Significant	67	17	84
Low	423	104	527
Total	529	155	684

Maine Dam Safety Program 2023

Maine law requires the High and Significant dams be inspected every six years respectively and the High and Significant dams have Emergency Action Plans (EAPs) to mitigate the effects of a failure. The FERC regulates 32 High Hazard and 9 Significant hazard dams in Maine and has up to 5 engineers to do the inspections. The state regulates 32 High Hazard and 72 Significant hazard dams and employs one engineer.

In its most basic form, the Emergency Action Plan requires a Notification Flowchart and Inundation Map. The Flowchart is a communications tool, a call down list, based on the Incident Command System for use by first responders and emergency personnel in notifying and evacuating downstream populations. The complexity of the inundation map is largely determined by the population downstream and available resources for producing such documents. Dams producing electricity tend to have the most engineered inundation maps because their owners have a vested interest in their continued operation. Current EAP compliance includes 100% of High Hazard and 100% of Significant hazard dams. According to the Association of Dam Safety Officials (ASDSO) website, Maine has one of the highest compliance rates in the nation.

3.6.3 Location of Coastal Flooding/Storm Surge

There are 152 jurisdictions in ten Counties in Maine that are vulnerable to flooding from storm surge (Figure 3.4). Storm surge locations are determined using the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model produced by the National Weather Service [29]. Numerous storm factors determine the overall extent of storm surge, therefore a composite approach is used, compiling thousands of modeled storm tracks to generate the Maximum Envelopes of Water (MEOWs) and Maximum of MEOWs (MOMs). The National Hurricane Center regards these as the best approach for determining storm surge location and vulnerability. This approach assumes landfalling hurricanes along the coastline during mean high tide, and outputs both storm tides and storm surge amounts. It is important to note that the SLOSH modeling does not account for the potential impacts from waves, extreme tides, freshwater flow, precipitation, or potential future scenarios of sea level rise. Storm surge maps are then used by communities to expand the local analysis of storm surge impact and designate evacuation zones that are susceptible to inundation. Refer to the Maine Hurricane Evacuation Dashboard for more information on designated evacuation zones [30] and Maine Geological Survey's SLOSH Maps viewer for location-specific information on storm surge [31]. SLOSH model products are continually updated and governed by the Interagency Coordinating Committee on Hurricanes (ICCOH).

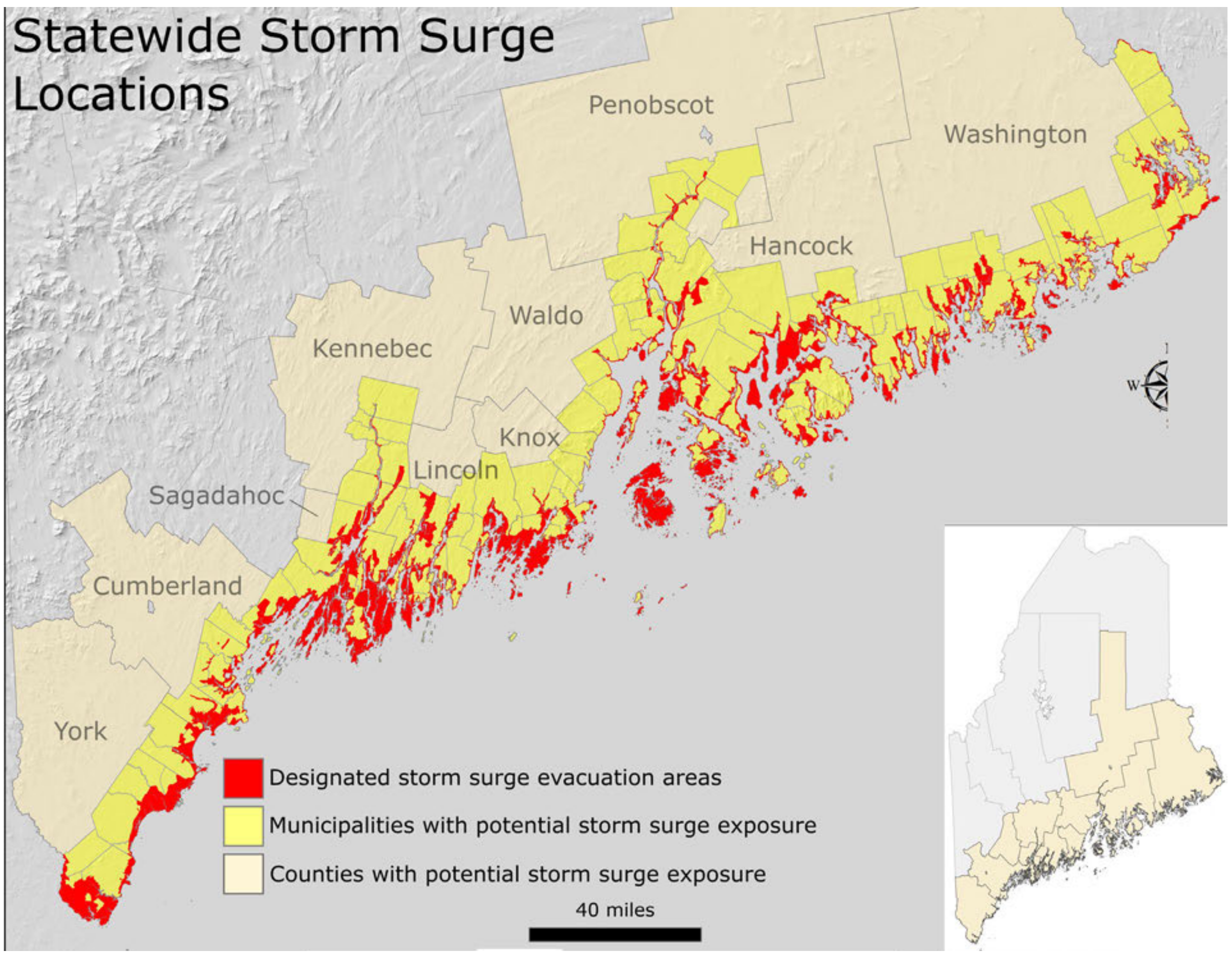


Figure 3.4: Statewide storm surge locations, evacuation areas determined based on storm surge models results.

[29] NOAA SLOSH models: https://www.nhc.noaa.gov/surge/slosh.php
[30] Maine Hurricane Evacuation Dashboard: https://storymaps.arcgis.com/stories/4fb502bf0ea6467693ff4191a1859e92
[31] Maine Geological Survey SLOSH Maps viewer: https://www.maine.gov/dacf/mgs/hazards/slosh/index.shtml

3.6.4 Location of Tsunami flooding

The State of California Governor's Office of Emergency Services states, in locations where tsunami maps and signs are unavailable, evacuation sites should be located 100 feet above sea level or greater or two miles inland, away from the coast. Maine has no official tsunami flood/evacuation map. Based on this general guidance, Figure 3.5 identifies the maximum area that may be impacted by a tsunami event. Tsunamis in Maine are a very unlikely occurrence, and if they do occur, they are anticipated to be much smaller events relative to these guidelines, which are more relevant to tectonically active coastal regions in the western United States [32].

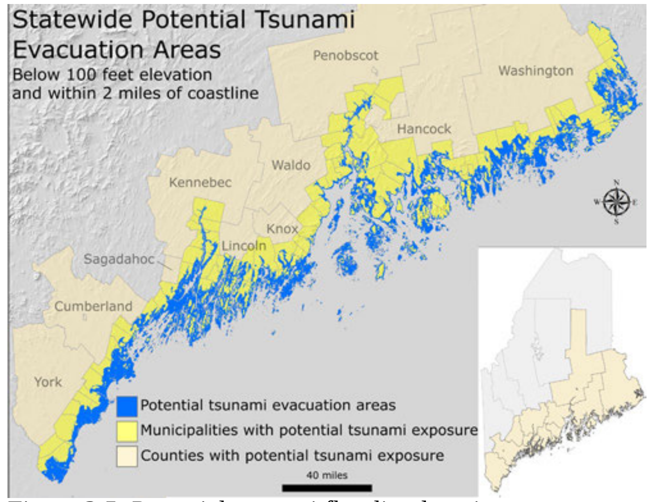


Figure 3.5: Potential tsunami flooding locations.

[32] USGS, "Could it Happen Here?": https://www.usgs.gov/centers/pcmsc/could-it-happen-here

3.7 Flooding – Intensity and Previous Occurrences [S3.a.2.]

Maine uses 'probability of occurrence' to measure the magnitude of a flood event and place it into historical context. Flooding from a 10-year rainfall event is less severe than flooding from a 100-year rainfall event, which is less severe than flooding from a 500-year rainfall event. Through coordination with the United States Geological Survey and National Weather Service, Maine uses stream gauges to measure river levels, which can also be used to estimate the magnitude and recurrence interval of a flood; and inundation depths at specific locations for determining the localized extent of flooding (Figure 3.6).

There are multiple areas in Maine that are not monitored by flood forecasting stream gauges. In these cases, the extent or intensity of flooding is most easily described by noting the speed at which floodwaters rise and the amount of time in which the area remains flooded.

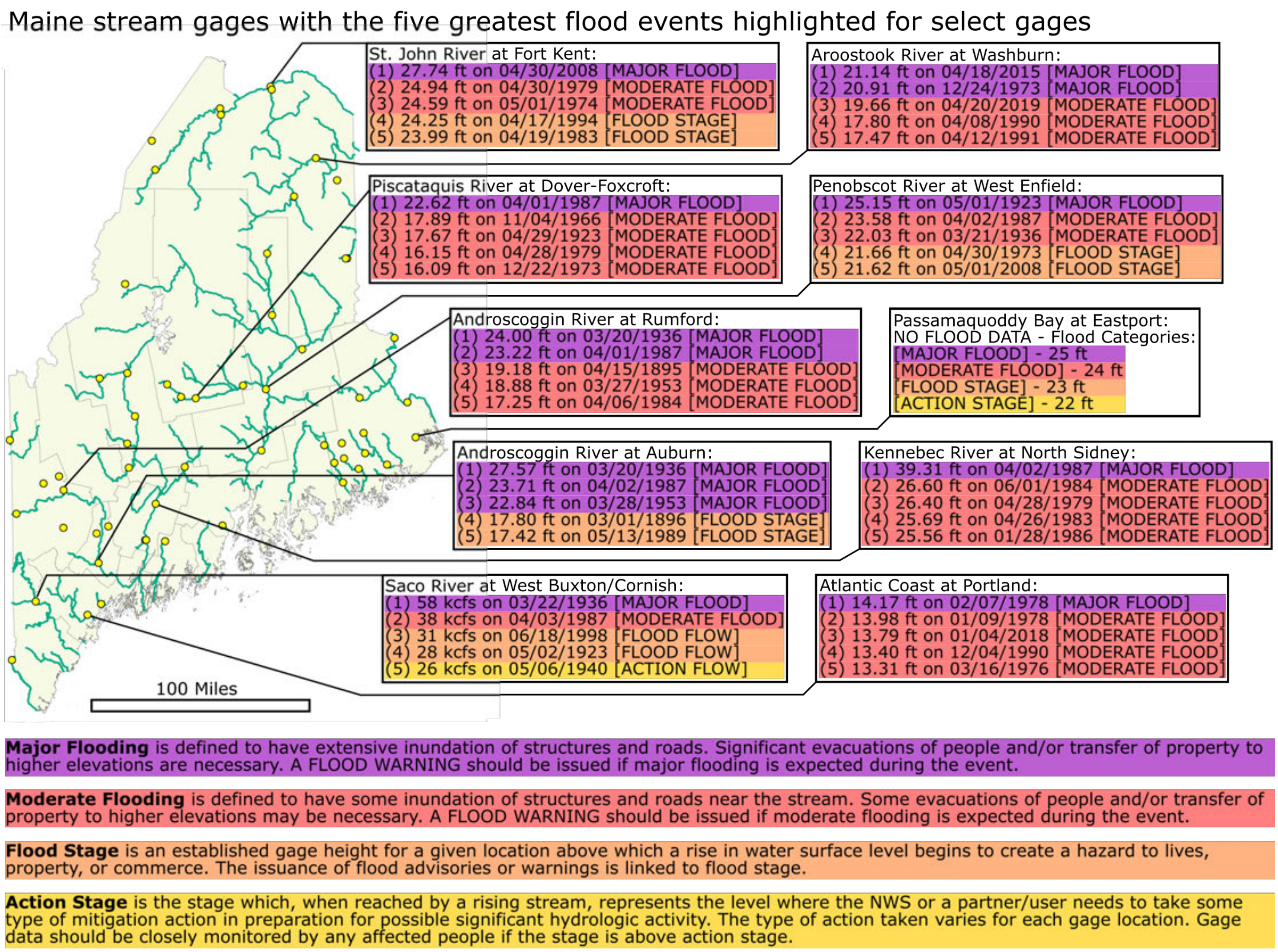


Figure 3.6: USGS stream gages (yellow points) with select peak flow events listed for key locations. Flood extent scales differ between locations based on local hydrologic conditions, terrain, and affected infrastructure. See the National Weather Service River Forecasts website for more detailed information [33].

[33] NWS River Forecasts: https://water.weather.gov/ahps/forecasts.php

3.7.1 Previous Occurrences

Table 3.6 Summarizes a 48-year record of major seasonal flooding occurrence in Maine’s 16 counties. Major flood occurrences are defined as Presidential Declarations, Emergency Declarations, or Small Business Administration claims. Though the 70’s, 90’s, and the first decade of the twenty-first century were flood prone decades, note that the years of 1987, 1993, 2005, and 2007 were the years where at least 75 percent of all Maine counties were affected. Though 2017 is also highlighted, the damages associated with this event include wind damage as well as flooding. More details on storms of record are provided below.

Table 3.6. Major floods by county

Major Floods	AN	AK	CD	FN	HK	KC	KX	LN	OD	PT	PS	SC	ST	WO	WN	YK	Total Counties	Estimated Damages (2022 USD)	
Mar 1846	X					X				X							3	$UNK	-
Mar 1896	X																1	$UNK	-
Apr 1923						X				X							2	$34,639,883	-
Mar 1936	X		X	X					X	X			X			X	7	5 deaths, $532,681,655	-
Aug 1946			X														1	$3,037,651	-
Apr 1950				X		X											2	3 bridges	-
Apr 1951		X															1	$UNK	-
Mar 1953	X		X			X			X								4	$UNK	-
May 1961															X		1	$9,905,3845	-
Jan 1970				X					X		X		X				4	$22,899,820	FEMA-284-DR-ME
Feb 1972			X													X	2	$UNK	-
Apr 1973		X		X					X	X				X	X		6	$6,059,525	Request denied
May1973		X															1	$UNK	SBA
Jul 1973		X		X					X	X				X			5	$UNK	SBA
Dec 1973		X				X		X		X		X	X	X			7	$20,011,554	-
May 1974		X															1	$18,022,576	-
May 1975			X				X									X	3	$1,651,511	SBA
Feb 1976										X					X		2	$13,533,297	SBA
Apr 1976		X															1	$1,041,023	-
Aug 1976		X															1	Crop damage $UNK	SBA
Mar 1977	X		X						X							X	4	$UNK	SBA
Feb 1978			X					X							X	X	4	$93,998,775	FEMA-550-DR-ME
Apr 1979		X				X				X	X						4	$2,645,550	SBA
Jun 1984	X		X			X				X		X	X				6	$UNK	-
Jan 1986	X		X	X		X		X	X			X	X			X	9	Roads, bridges, dams	-
Apr 1987	X		X	X	X	X	X	X	X	X	X	X	X	X		X	14	$260,713,908	FEMA-788-DR-ME
May1989	X			X					X								3	$3,334,599	FEMA-830-DR-ME
Apr 1991		X															1	$31,313,233	FEMA-901-DR-ME
Mar 1992	X		X	X		X	X		X	X			X	X		X	10	$7,309,887	FEMA-940-DR-ME
Apr 1993	X	X	X	X	X	X		X	X	X	X		X	X		X	13	$7,125,540	FEMA-988-DR-ME
Apr 1994		X															1	$11,391,192	FEMA-1029-DR-ME
Oct 1995				X			X		X								3	$UNK	-
Jan 1996	X			X					X	X	X		X	X			7	$4,117,268	FEMA-1106-DR-ME
Apr 1996	X		X				X		X							X	5	$5,042,116	FEMA-1114-DR-ME
Oct 1996			X						X							X	3	$16,985,947	FEMA-1143-DR-ME
Jun 1998	X			X		X			X				X			X	6	$4,577,855	FEMA-1232-DR-ME
Oct 1998			X													X	2	$3,629,557	FEMA-1263-DR-ME
Mar 2000	X	X		X		X			X		X		X		X		8	$4,960,618	FEMA-1326-DR-ME

Mar 2001				X		X			X	X					X	X	6	$2,947,609	FEMA-1371-DR-ME
Dec 2003				X		X			X		X	X	X	X			7	$3,882,012	FEMA-1508-DR-ME
Mar 2005	X	X		X	X	X	X	X	X		X		X	X	X		12	$10,569,049	FEMA-1591-DR-ME
May2006																X	1	$4,113,486	FEMA-1644-DR-ME
Mar 2007					X		X	X						X			4	$1,773,572	FEMA-1691-DR-ME
Apr 2007 [34]	X		X	X	X	X	X	X	X			X	X	X	X	X	13	$39,926,610	FEMA-1693-DR-ME
Jul 2007 [35]									X								1	$2,378,416	FEMA-1716-DR-ME
Apr 2008 [36]		X					X	X		X	X		X	X			7	$6,878,004	FEMA-1755-DR-ME
Jul 2008	X		X													X	3	$3,660,153	FEMA-1788-DR-ME
Dec 2008	X		X				X	X				X		X		X	7	$13,756,009	FEMA-1815-DR-ME
Jun 2009				X	X		X	X	X		X		X	X	X		9	$3,451,281	FEMA-1852-DR-ME
Feb-Mar 2010 [37]			X				X	X				X				X	5	$7,192,141	FEMA-1891-DR-ME
Mar-Apr 2010 [38]					X											X	2	$1,710,001	FEMA-1920-DR-ME
Dec 2010 [39]		X									X				X		3	$2,173,793	FEMA-1953-DR-ME
Oct 2017 [40]			X	X	X	X	X	X	X	X	X	X	X	X		X	13	$9,563,906	FEMA-4354-DR-ME
May 2018 [41]																X	1	$6,047,943	FEMA-4367-DR-ME
Oct 2021							X							X		X	3	$2,623,207	FEMA-4647-DR-ME
TOTALS	19	16	20	20	8	18	14	13	24	16	12	9	17	16	10	23	255	$1,332,425,578	31 Declarations
Major Floods	AN	AK	CD	FN	HK	KC	KX	LN	OD	PT	PS	SC	ST	WO	WN	YK	Total Counties		

KEY: County Codes

AN = Androscoggin	HK = Hancock	OD = Oxford	ST = Somerset
AK = Aroostook	KC = Kennebec	PT = Penobscot	WO = Waldo
CD = Cumberland	KX = Knox	PS = Piscataquis	WN = Washington
FN = Franklin	LN = Lincoln	SC = Sagadahoc	YK = York

SBA: Activation of Small Business Association Low Interest Loan Recovery Programs
DR: Presidential Disaster Declaration

[34] FEMA-1693-DR-ME: https://www.fema.gov/disaster/1693
[35] FEMA-1716-DR-ME: https://www.fema.gov/disaster/1716
[36] FEMA-1788-DR-ME: https://www.fema.gov/disaster/1788
[37] FEMA-1891-DR-ME: https://www.fema.gov/disaster/1891
[38] FEMA-1920-DR-ME: https://www.fema.gov/disaster/1920
[39] FEMA-1953-DR-ME: https://www.fema.gov/disaster/1953
[40] FEMA-4354-DR-ME: https://www.fema.gov/disaster/4354 (primarily wind damage)
[41] FEMA-4367-DR-ME: https://www.fema.gov/disaster/4367

Flood of Record: The Great Flood of 1936

The flooding on March 19, 1936, was significant throughout southwestern and central Maine [42]. The Kennebec, Androscoggin, and Saco River basins experienced the worst of the flood damage in Maine. According to the gaging station on the Androscoggin River at Auburn, the peak discharge was 135,000cfs, the largest discharge recorded at that site. Similarly, the peak discharge of the Mattawamkeag River near Mattawamkeag was the highest on record.

The meteorologic and soil conditions from the early winter season to just before March 19 were instrumental factors in the large discharges of the flood. In the early winter, the ground had frozen and was almost impermeable. Through January and February, many river basins of the State accumulated significant quantities of snow that created deep snowpack. The first warning sign came when warmer weather around March 9 began an early spring thaw. During the following 10 days, the Northeast experienced 2 major storms that only exacerbated the snowmelt and ice melt.

The first of the major storms, the March 11-12 storm coincided with the breakup of thick ice that had formed on streams during the winter months. Streamflow records indicate the runoff from this first storm was about equal to the rainfall: thus, snowmelt didn't contribute much to discharge after the first storm. While snowmelt was insignificant in the March 11-12 storm event, streamflow records report they had a much larger role in discharge during the second storm. Snowmelt, as well as the severe rainfall of the second storm, combined to release sizeable flows into already swollen river systems. Peak discharges after the second storm were far greater than those of the first storm.

While snowmelt and rainfall combined to dramatically elevate the water levels, large ice jams also played a major role in the heightening flood levels and damage. "Elevated river stages in Augusta and Hallowell, caused by ice jams, were 3.6 feet higher than the previous high-water records from March 2, 1896" (Maloney and Bartlett, 1991, p. 313). Another notable ice jam formed in a reach several miles long on the Androscoggin River just upstream from the pond of the powerplant above Lewiston. "According to powerplant records, this ice jam broke on March 20 and released a large volume of water that caused a rise of 1.75 feet in the pond in less than one-half hour" (p. 313). Those are just a couple of examples of the massive influence the ice jams had on increased flood levels.

When the ice jams released, the resulting ice flows compounded damage on several rivers by crashing through buildings and bridges downstream. Overall, the flood and ice floes destroyed or damaged 81 highway bridges. That is just one metric that highlights the immense damage the flood caused. In the aftermath of the flooding, five lives were lost, and property damage reached about $25 million. The one saving grace in this flood event was the timely warnings delivered to the public. Because the telephone, telegraph, and radio services kept the public advised about the severity of the floods well in advance of the flood crests, the loss of life was considerably lower than it could have been.

Flood of Record: The "April Fools Flood of 1987"

Records of past floods indicate that the April 1987 flood was one of the most significant in Maine's history. At selected sites, it was the worst since the area was settled more than 200 years ago. Flood damage in the Penobscot and Kennebec River basins in 1987 was the greatest for any flood (including March 1936) for which data is available.

[42] Maloney, T. J., & Bartlett, W. P. (1991). National Water Summary 1988–89 — Floods and Droughts: MAINE. U.S. Geological Survey Water-Supply Paper. https://doi.org/10.3133/wsp2375

Hydrometeorology conditions before the April 1987 flood gave no clear indication of the severity of the flooding that was to come. From December 1986 through March 1987, precipitation was below normal. In early March, the snowpack was below normal in northern Maine, normal in southern interior sections and above normal in coastal areas."[43] However, as spring approached, climatic conditions began to change and set the stage for trouble. March temperatures had finally gone above freezing, and then above normal, rapidly melting off the snowpack. Runoff was then above normal in upland areas of western Maine. From March 20 through April 2, multiple areas of low pressure moved slowly northeast toward Maine, bringing two storms that unleashed heavy rains. The resulting floods had only one missing factor – ice. Had there been ice jams, the damage would have been far worse. "In contrast to the 1936 flood, during which backwater from ice jams was common, peak stages for the 1987 flood reflect primarily free-flowing conditions.[44]

Still, the damages were far reaching, affecting 14 of the 16 counties and a wide range of enterprises. Many businesses had waterways instead of streets. Even in the first estimations, the Small Business Administration thought that 400 businesses had sustained losses totaling approximately $36,000,000. The Agricultural Stabilization and Conservation Service reported $300,000 worth of equipment and $100,000 in livestock losses. Pollutants in flood waters contaminated clam beds at the mouth of rivers, putting clam diggers out of business. That alone necessitated Disaster Unemployment Assistance funding of over $300,000.[45]

According to MEMA accounting records, the "April Fool's Flood" of 1987 was a $100,000,000 event. Were it to happen today, nearly 20 years later, the costs would be much higher, primarily because real estate and infrastructure values have continued to rise.

Flood of Record: The 2007 "Patriot's Day Storm"

According to the Gulf of Maine Ocean Observing System website, the Patriot's Day Storm of 2007 (Figure 3.7) will be long remembered for its meteorological significance and devastating power. Violent waves destroyed homes, businesses, coastal roads and beaches, while forceful winds tore down power lines, leaving many residents in the dark for days. Portland had a peak wind of 59 mph and winds in Cape Elizabeth exceeded 80 mph measured on April 16th. An abnormally high spring tide plus a storm surge of 3 feet (2.72 feet at the Portland tide gauge) produced a high tide of 13.28 feet (the 7th highest tide measured since the early 1900's).

Figure 3.7: Damage from the Patriot's Day Storm, 2007. Photo by John Cannon, National Weather

As the storm deepened it stalled over the area for a full day before it slowly moved to the northeast. Very heavy rain fell on the coast with 5 to 8" over a 3-day period leading to river flooding. In addition to the rain, strong winds caused significant storm surge and very large battering coastal waves. During this time there were four high tide cycles in which the water was near or above flood stage. Waves just off the coast were recorded at 25+ feet. This combination caused the tremendous amounts of damage seen during the storm. The flood resulted in peak streamflows with recurrence intervals greater than 100 years throughout most of York County, and recurrence intervals up to 50 years in Cumberland County[46, 47].

[43] "Flood of April 1987 in Maine," US Geological Survey Water Supply Paper 2424, p.37: https://pubs.usgs.gov/wsp/2424/report.pdf
[44] Ibid, p.27
[45] Interagency Hazard Mitigation Report, FEMA-788-DR-Maine, April 1987, p.2.: https://www.fema.gov/disaster/788
[46] Lombard, P.J., 2009, Flood of April 2007 in southern Maine: U.S. Geological Survey Scientific Investigations Report 2009–5102, 34 p., available only online at http://pubs.usgs.gov/sir/2009/5102.
[47] Lombard, P.J., 2009, Floods of May 2006 and April 2007 in Southern Maine: U.S. Geological Survey Fact Sheet 2009-3049, 2 p., available online at https://pubs.usgs.gov/fs/2009/3049.

Notable Flood: The 1976 "Groundhog Day Storm"

On February 2, 1976, downtown Bangor, Maine, was flooded with 12 feet (3.7 m) of water [48]. The water surface elevation reached 17.46 feet (5.32 m) above the national geodetic vertical datum of 1929 (NGVD), approximately 10.5 feet (3.2 m) above the predicted astronomical tide at Bangor. Analysis of meteorological and hydrologic data indicates that the major cause of the flooding at Bangor was the combination of storm surge and high astronomical tide (storm tide). Anomalously high storm tide inundated the Penobscot River from Penobscot Bay and prevented the Kenduskeag from discharging into the Penobscot. Fresh water from Kenduskeag then overflowed directly into downtown Bangor. The storm surge generated on the open coast from Brunswick to Eastport and in the Penobscot Bay was funneled and amplified by hurricane-level south-southeasterly winds that "piled up" water into the Penobscot River to Bangor. The storm surge was generated by a fast-moving extratropical cyclone that had originated in the Gulf of Mexico three days before the event. The resulting flood was the third highest in Bangor since 1846 and is the first documented tidal flood at Bangor. Previously recorded floods at Bangor had been attributed to streamflow or backwater from debris or ice jams.

Damages were estimated to be $2.6 million by the Maine Office of Civil Emergency Preparedness. No deaths were reported. Because the unusually high water in Bangor occurred suddenly, was of short duration, and involved a large volume of water, it was considered to be a "flash flood." The flood peak occurred late morning on February 2, 1976. Flood waters rose very quickly; it was estimated that it took less than 15 minutes for the water to reach maximum depth. Office workers could see the rising waters, but many could not get to their cars. Several people were caught by the flood as they tried to move their cars and had to be rescued. The flood submerged approximately 200 motor vehicles and many downtown businesses were inundated. Much of the damage was in flooded basements and in the cellar vaults of several downtown banks. There was a power loss in the area and electrical damage sparked at least two fires. Coastal areas from Brunswick to Eastport experienced substantial beach erosion and damage to coastal infrastructure. The storm surge reached a maximum height at Portland of 3.6 feet, Rockland 3.7 feet, and Bar Harbor 5.5 feet. Floodwaters began to recede an hour later. The following day, the rivers were well within their normal channels, but floodmarks remained visible and were used by the U.S. Geological Survey to document the extent of flooding.

Notable Flood: the 2021 "Halloween Storm"

On October 30-31, 2021 a rapidly developing area of low pressure tracked across western and southern Maine, delivering between 2-6.5 inches of rain within a matter of hours to various localities and driving extensive flash flooding and runoff. The annual probability of occurrence of this rainfall rate is 1 in 50, or 2%. Locations in Knox, Waldo, and York County experienced considerable damage to public infrastructure, as well as private homes and businesses, and the loss of electrical power to nearly 50,000 customers. Storm damage included culvert collapse and road washouts, flooding of a healthcare facility, and the most dramatic incident, the collapse of the Pepperell Mills Riverwalk along the Saco River in Biddeford. Damage estimates from flooding totaled $2.4 million.

[48] Morrill, R.A. et al. (1979), Maine coastal storm and flood of February 2, 1976, Geological Survey Professional Paper 1087: https://pubs.usgs.gov/pp/1087/report.pdf

History of Dam Failure/Breach

Known dam failures/breaches include the following:

- In 1952, Lovell Dam breached during a flood, washing away two mills. It was subsequently repaired.
- In the storm of October 20, 1996, Willet Brook Dam, owned by the town of Bridgton in Cumberland County, failed, and affected the public water supply for the town (population 4,307).
- In Alfred, York County, the Littlefield River Dam, owned by the Town of Alfred, was washed out.
- In 1997, the Owens Marsh Dam in Concord Township, owned by the Department of Inland Fisheries and Wildlife, had been built upon by beavers, and breached after three days of heavy rains causing over a million dollars in road damages.
- In 1997, the Apple Valley Dam in Monmouth breached, causing about $350,000 in damages.
- In 2000, Mt. Zircon Dam showed signs of extensive toe seepage; water level lowered as safety measure, but dam not repaired.
- In 2004, the Meadow Cove Dam in Boothbay breached, causing about $30,000 in damages.
- In 2005, during the April flooding events, the Sherman Lake Dam in Newcastle washed out.
- In 2008, Appalachee Pond showed signs of movement, subsequently repaired to include new spillway.
- In the spring runoff of March 30, 2010, Colcord Pond in Porter gave way, washing out two county roads. It has since been repaired.
- In 2011, the Southport Water Supply Dam showed signs of embankment leakage. It has since been repaired.

3.8 Flooding - Probability of Future Occurrence [S4.]

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies use historical records to determine the probability of occurrence for different flood recurrence intervals. The probability of occurrence is expressed in percentages as the chance of a flood of a specific recurrence interval in any given year. The most widely adopted design and regulatory standard for floods in the United States is the 1-percent annual chance flood and this is the standard formally adopted by FEMA. The 1-percent annual flood, also known as the base flood, or regulatory flood, has a 1 percent chance of happening in any particular year. It is also often referred to as the "100-year flood." Recurrence intervals can vary widely based on location.

The flood records presented in Table 3.6 can also be used to identify historic probability of occurrence for events reaching certain impact levels. For example, in the time interval between 2022 and the Great Flood of 1936, there have been 7 flood events impacting a majority of Maine counties, with an estimated annual exceedance probability (the chance an event that will impact more than 8 counties) of 8.1%. Within this same time interval, there have been 12 events with damages exceeding $5 million and 4 events exceeding $20 million, with estimated annual exceedance probabilities (the chance of events that meet or exceed these damage thresholds) of 13.9% and 4.7%, respectively. It is important to note that severe floods can occur at any time and these calculations provide only an averaged sense of flood event distribution over a multidecadal timespan.

Smaller floods occur more frequently than larger floods. Thus a "10-year" flood has a greater likelihood of occurring than a "100-year" flood. Table 3.7 shows a range of flood recurrence intervals and their probabilities of occurrence.

Table 3.7: Flood Recurrence Intervals and Probabilities [49]

Flood Recurrence Intervals	Percent Chance of Occurrence Annually	Percent Chance of Occurring in Flood Recurrence Interval	Percent Chance of Occurring in a 30-year Mortgage
10-year	10.0%	65%	95.8%
25-year	4.0%	64%	70.6%
50-year	2.0%	64%	45.5%
100-year	1.0%	63.4%	26.0%
500-year	0.2%	63.2%	5.8%

3.8.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Coastal Flood: Records of regional and global climate trends and model projections of future conditions indicate sea levels are rising, annual average atmospheric temperatures are increasing, and the rate of change for both is accelerating [50, 51, 52]. Sea level rise increases the baseline height of sea water, thereby potentially exacerbating other typical drivers of coastal flooding including storm surge, astronomical tides, waves, and runoff. For example, a flood event caused by high storm surge and astronomical tide is expected to impact a larger area and reach a cumulatively greater flood height in the future versus an equivalent historic event because of the base increase in flood height caused by a relatively higher sea level. Sea level rise may therefore impact coastal flooding by increasing the frequency of flood events of any magnitude, and increasing the maximum intensity of rare, record flood events (Figure 3.8) [53]. Currently for Maine, the average sea level has risen by 7 to 8 inches since the early 1900s. Sea level is projected to rise by another 1.5 feet by 2050 and 4 feet by 2100 [54].

[49] NOAA Flood Return Period Calculator: https://www.weather.gov/epz/wxcalc_floodperiod
[50] Maine's Climate Future: 2020 Update: https://digitalcommons.library.umaine.edu/cgi/viewcontent.cgi?article=1005&context=climate_facpub
[51] Maine Won't Wait 2020: https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/MaineWontWait_December2020.pdf
[52] IPCC Sixth Assessment Report: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf
[53] NOAA Sea Level Rise Technical Report and Companion Application Guide: https://oceanservice.noaa.gov/hazards/sealevelrise/sealevelrise-tech-report-sections.html
[54] Maine Climate Science Dashboard: https://climatecouncil.maine.gov/maine-climate-science-dashboard

Along the Maine Coast, the 10-year and 100-year storm elevations are only about one foot apart. Thus, a sea level rise of one (1) foot means a storm that had a 1 percent chance of occurring in any one year (the 100-year storm) will now have a 10 percent chance of occurring in any one year (the 10-year storm). As a result, more homes, businesses, public infrastructure such as roads, and entire communities will be subject to more devastating coastal storms, as well as coastal erosion and landslides, on a more frequent basis. In addition, nuisance flooding of low-lying areas that now occurs about 5 to 10 times a year will see a 10 to 15-fold increase with just one foot of sea level rise. There is also concern in the scientific community that global warming may be increasing the intensity of coastal storms [55].

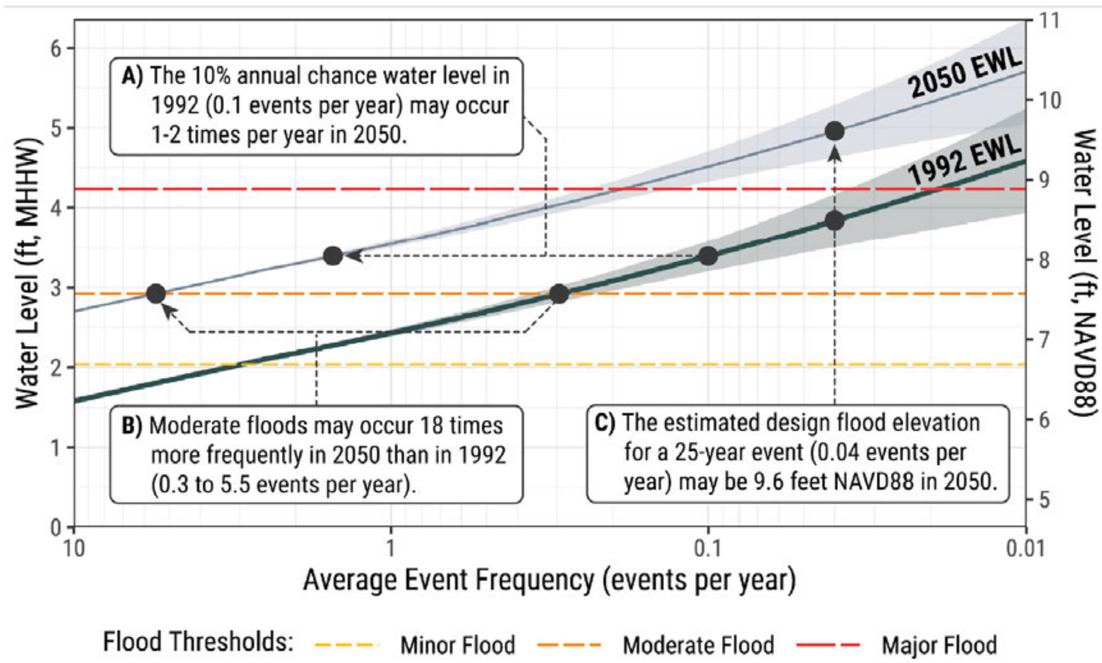
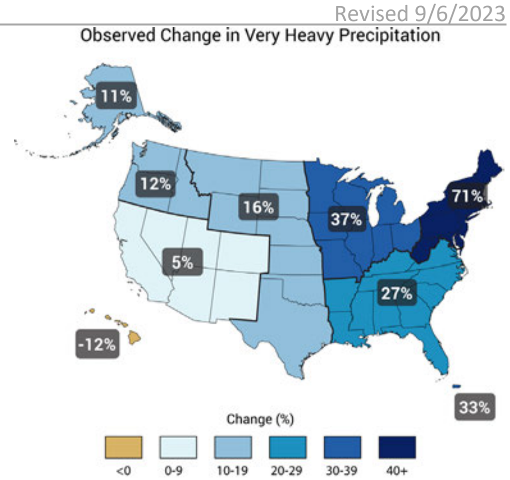
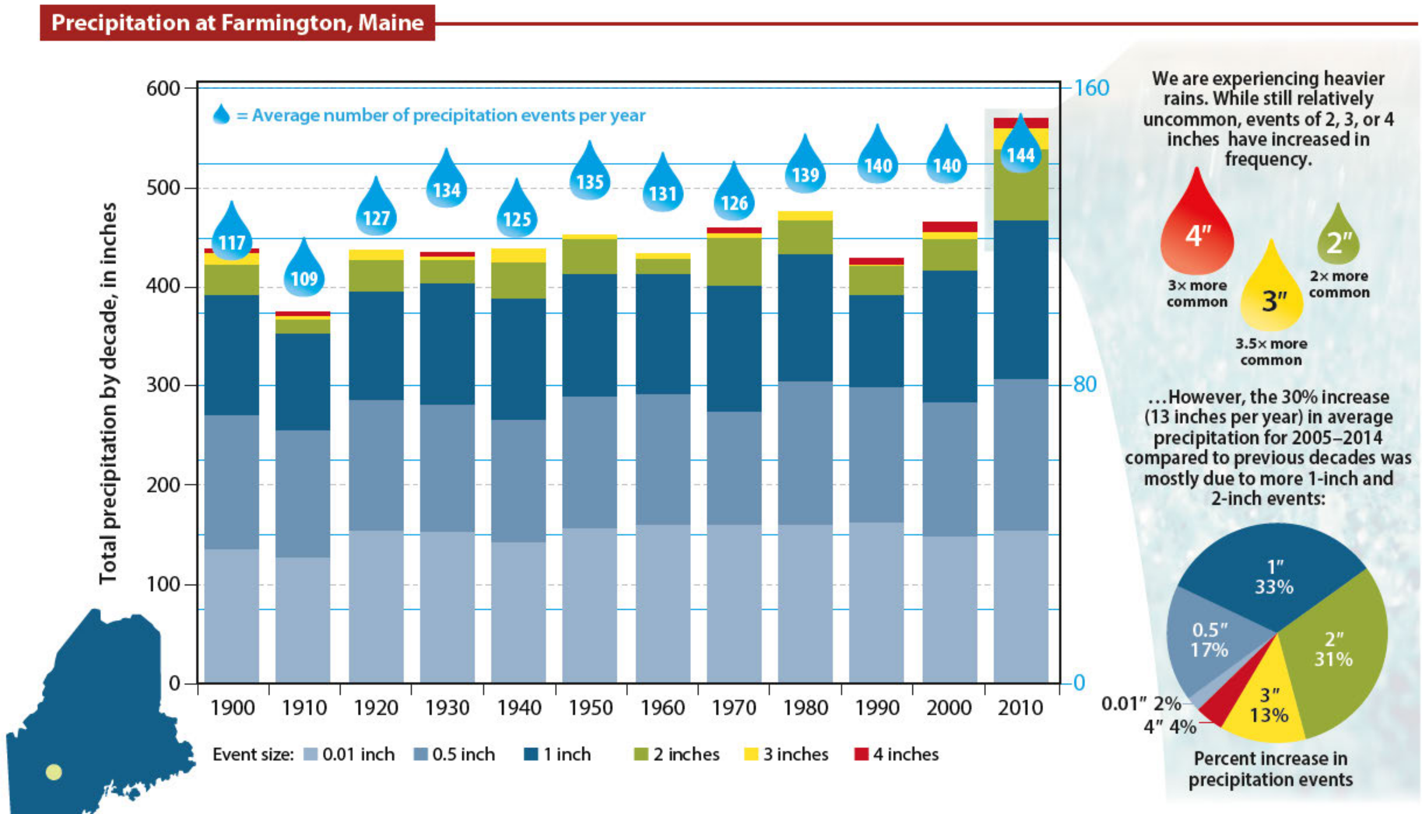


Figure 3.8: Change in frequency and magnitude of extreme coastal water level events in Portland, Maine, as sea level rises based on the supplementary extreme water level tables from the 2022 Technical Report. The lower curve represents extreme water levels (EWL) with average event frequencies ranging from 10 events per year to 0.01 events per year (the "100-year event") calibrated to the year 1992. Frequent events have lower magnitude water levels and vice versa. The upper curve represents the extreme water levels for the year 2050 using data from the Intermediate SLR scenario (approximately 1 foot). The Intermediate SLR scenario was selected because it is the upper bound for the observation-based extrapolation at this location. Local statistically derived flood thresholds are overlaid for context. Three annotations show **A)** the 10% annual chance event in 1992 shifts to an event that may occur at least once a year in 2050, **B)** the Moderate flood threshold may be exceeded 18 times more frequently in 2050 than in 1992 (which is more frequent than a Minor flood in 1992), and **C)** the design flood elevation for a 25-year event may increase from 8.5 to 9.6 feet NAVD88 between 1992 and 2050. This figure is from the NOAA 2022 Sea Level Rise Technical Report Companion Application Guide.

[55] Hurricanes and Climate Change: https://www.c2es.org/content/hurricanes-and-climate-change/



Inland Flood: Increasing atmospheric temperature contributes to a greater capacity for air to hold moisture and therefore a potentially greater occurrence of rainfall in the affected area relative to correct conditions. Annual precipitation trends show a general increase in the region and model projections indicate that this trend is expected to continue through 2100 (Figure 3.9)[56, 57]. Precipitation is expected to occur more frequently as rainfall and less frequently as snowfall when compared to historic trends, with potential impacts on the timing and extent of specific inland flood mechanisms such as snowmelt flooding and ice jams. Further, current trend analyses suggest that increasing precipitation coincides with an increase in the intensity of events. For example, decadal trends from Farmington, Maine indicate a two- to three-times greater occurrence of 2, 3, and 4-inch rainfall events during the recent decade 2004-2020, relative to all preceding decades (Figure3.10).



Total decadal precipitation and mean annual number of precipitation events for Farmington, Maine calculated from daily precipitation values, 1895–2014. Precipitation events are defined as days with measurable (>0.01 in) rain or water equivalent snow. Each bin represents a 10-year mean, centered on the year specified (i.e., 1900 represents data from 1895–1904). Data from the NOAA Global Historical Climatology Network (NOAA GHCN).

Figure 3.10: Decadal mean precipitation categorized by rain depth for individual events indicates a substantial rise in total precipitation and occurrence of large individual rainfall events. Original figure from [Maine's Climate Future: 2020 Update](#).

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[56] Nazari, Behzad, Dong-Jun Seo, and Ranjan Muttiah. "Assessing the impact of variations in hydrologic, hydraulic and hydrometeorological controls on inundation in urban areas." *Journal of Water Management Modeling* (2016), https://www.chijournal.org/C408.
[57] Walsh, J., D. Wuebbles and K Hayhoe. 2014. "Our Changing Climate." Chap 2 in *Climate Change Impacts in the United States: The Third National Climate Assessment.*, no. October: 19–67.

Maine peak flow analyses from 2020 shows some evidence of increasing annual peak flows and no evidence for decreasing annual peak flows. Peak flow trends vary substantially depending on the period analyzed and the stream gauge, making it difficult to attribute trends to known causes that are expected to continue into the future (Lombard and Hodgkins, 2020 [58]). Annual peak stream flows and other frequently occurring floods have increased at most stream gages during the last century for watersheds in Maine with minimal human influence (Hodgkins and Dudley, 2005 [59]; Collins, 2009 [60]; Hodgkins, 2010 [61]; Armstrong et al., 2011 [62]) Trends in peak flows that occur infrequently, such as the 100-yr peak flow, are more difficult to assess because analyses depend on very high peak flows that occur a few times per century or less. Changes in the frequency and magnitude of peak stream flows do not always track those in heavy precipitation in Maine — the 99th percentile precipitation only results in the 99th percentile streamflow 36% of the time in the United States (Ivancic and Shaw, 2015 [63]). In the Northeast, much of the increase in precipitation has occurred in seasons outside of the primary flood season (Small et al., 2006 [64]; Frei et al., 2015 [65]). Furthermore, decreases in winter snowpack modeled to occur with increasing air temperatures can offset increased flows caused by increased precipitation (Hodgkins and Dudley, 2013 [66]). Statistical hydrologic models such as Maine's peak flow equations (Lombard and Hodgkins, 2020) assume stationarity.

3.8.2 Probability of Dam Failure/Breach [HHPD2.a.]

As previously described, Maine Dam Safety Law [67] requires regular inspections, maintenance and current EAPs. Maine's approach to dam management recognizes that dam failure probability studies are prohibitively expensive, and that establishing a definitive risk of failure for specific dams is virtually impossible. Rather than insisting on the preparation of expensive dam failure studies, Maine has chosen to require EAPs be prepared for the possibility of dam failure.

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[58] Lombard, P.J., and Hodgkins, G.A., 2020, Estimating flood magnitude and frequency on gaged and ungaged streams in Maine: U.S. Geological Survey Scientific Investigations Report 2020–5092, 56 p., https://doi.org/10.3133/ sir20205092

[59] Hodgkins, G.A., Dudley, R.W. (2005). Changes in the magnitude of annual and monthly streamflows in New England, 1902–2002: U. S. Geological Survey Scientific Investigations Report 2005–5135, 37 p. [Also available at http://pubs.usgs.gov/sir/2005/5135/.]

[60] Collins, M.J. (2009). Evidence for changing flood risk in New England since the late 20th century: Journal of the American Water Resources Association, v. 45, no. 2, p. 279–290

[61] Hodgkins, G.A. (2010). Historical changes in annual peak flows in Maine and implications for flood-frequency analyses: U.S. Geological Survey Scientific Investigations Report 2010–5094, 38 p. [Also available at http://pubs.usgs.gov/ sir/2010/5094/.]

[62] Armstrong, W.H., Collins, M.J. and Snyder, N.P. (2011). Increased Frequency of Low-Magnitude Floods in New England 1. JAWRA Journal of the American Water Resources Association, 48(2), pp.306-320

[63] Ivancic, T.J. and Shaw, S.B. (2015). Examining why trends in very heavy precipitation should not be mistaken for trends in very high river discharge. Climatic Change, 133(4), pp.681-693

[64] Small, D., Islam, S., & Vogel, R.M. (2006). Trends in precipitation and streamflow in the eastern US: paradox or perception? *Geophys. Res. Lett.*, 33, 3, L03403

[65] Frei, A., Kunkel, K.E., Matonse, A. (2015). The seasonal nature of extreme hydrological events in the Northeastern United States. J. Hydrometeorol. 16 (5), 2065–2085

[66] Hodgkins, G.A., and Dudley, R.W. (2013). Modeled future peak streamflows in four coastal Maine rivers: U.S. Geological Survey Scientific Investigations Report 2013–5080, 18 p., http://pubs.usgs.gov/sir/2013/5080/

[67] Maine Dam Safety Program Website: https://www.maine.gov/mema/hazards/dam-safety

Flooding – Vulnerability Assessment

TIER 1 HAZARD

3.9 Flooding – Impacts

All structures in the floodplain and/or the storm surge inundation zone are vulnerable to damages from flooding; particularly assets that are situated below the base flood elevation (BFE). Utilities such as furnaces, generators, oil tanks, and electricity meters, often situated near or below ground level, are especially susceptible to water damage from flood events. As noted in Table 3.6, all counties have experienced at least eight floods substantial enough to warrant Disaster Declarations with nearly $300M in cumulative damages from flooding alone. Severe flooding can cause loss of life, property damage, disruption of communications, transportation, electric service and community services, crop and livestock damage, health issues from contaminated water supplies, molds and mildew within structural components, and loss and interruption of business. Public safety is also affected when firefighting efforts are compromised if fire fighters and equipment are responding to a flood emergency.

Roads, bridges, and ditches are the most vulnerable assets exposed to flooding. Flood damage to roads, bridges, and ditches continue to be a common occurrence throughout the state and a primary impact of flood disaster events. Most washouts are quickly repaired, but often are not mitigated. As a result, replacement culverts, ditching, and fill are just as susceptible to future flood damages as they were before the storm event. As noted in this Risk Assessment, impacts are greatest for road networks experiencing frequent and heavy traffic. In many cases the most heavily impacted infrastructure is aging, undersized for flood flows, or made of degrading, damaged, or inappropriate materials. Many high traffic roadways have historically been impacted by damage to small cross culverts inundated by extreme flows, requiring commuters and residents to take long detours or to shelter in place if they become completely isolated.

To provide mitigation leadership, the Maine Emergency Management Agency has partnered with the Local Road Center of the Maine Department of Transportation to provide workshops for local officials on the use of geo-synthetics to stabilize and protect transportation infrastructure from flooding. Workshops on the use of geo-synthetics have been included as part of the Local Road Center's continuing series of workshops for local transportation officials. Mitigation leadership is also provided on a continuing basis through the Department of Economic and Community Development's Code Enforcement Officer Certification and Training Program.

Transmission lines, though more vulnerable to damaging winds, ice, and flying debris, may also be impacted by flooding, especially along the many river crossings in the state. In some cases, substantial flooding and high velocity flows may damage the energy infrastructure and cause widespread power outages to portions of the state. Some power plants may also experience dangerous flooding, especially hydropower plants where flows exceed maximum discharge capacity. This again would potentially lead to power outages or a need to rebalance supply to meet demand.

3.10 Flooding – Vulnerability of State Assets [S5.]

The Maine Department of Administration and Financial Services Bureau of General Services provided location data on all state-owned and operated facilities and insured values of buildings and contents. With this information, Maine Emergency Management Agency used GIS to map and identify those state facilities which are located in areas of the state subject to flooding. Unfortunately, nearly half of the counties in the state do not have digital FIRM data, limiting this analysis and reducing our capability determine what state facilities are located in flood zones in those areas. Of these counties without digital FIRM resources, Hazus [68] was used to generate potential flooding areas based on a hypothetical 500-year flooding event.

Critical Infrastructure and Key Resources (CIKR) have been identified throughout the State of Maine in accordance with the sectors determined by DHS [69]. An all-hazards risk assessment of Maine's CIKR in each sector has been done. Natural hazards identified in this plan continue to pose the greatest risk to Maine's CIKR particularly those located near flood prone areas. Identification and risk assessment of Maine's CIKR have been done in accordance with the National Infrastructure Protection Plan (NIPP).

3.10.1 Potential Dollar Losses to State owned buildings, infrastructure, critical facilities

The following section is split into state building/structure assets and state road infrastructure due to the importance of road infrastructure and its unique vulnerability to flood damage.

State building/structure assets and summary of impacts

It was determined no state facilities that would be used during an emergency or disaster for response or recovery are located in the flood zone. However, MEMA identified 117 assets located within special flood hazard areas or Hazus-identified flood areas. The top 10 assets rated by valuation are listed in Table 3.8.

Table 3.8: 10 highest valued State assets located in potential flood areas. Note that one location may hold multiple assets.

Address	County	Occupancy type	Property Type	Year Built	Last Inspected	Total Valuation	Agency
78 Exchange St, Bangor	Penobscot	OFFICE	Class 4 building.	2009	7/1/2017	$65,000,000	MMB, MAINE MUNICIPAL BOND BANK
78 Exchange St, Bangor	Penobscot	OFFICE				$4,500,000	JUD, ADMIN. OFFICE OF THE COURTS
Ponce Landing	Cumberland	PIER	Wood framed.	2001	2/6/2006	$4,160,000	DOT, SOUTHERN REGION
Ferry Rd, Islesboro	Waldo	PIER	Wood framed.	2009	7/1/2011	$3,016,000	DOT, MAINTENANCE & OPERATIONS
20 McKay Rd, Lincolnville	Waldo	PIER	Wood framed.	2009	7/1/2011	$3,016,000	DOT, MAINTENANCE & OPERATIONS
79 Sands Rd, Vinalhaven	Knox	PIER	Wood framed.	1999	7/1/2011	$3,016,000	DOT, MAINTENANCE & OPERATIONS
288 ME-3, South China	Kennebec	STORAGE	Wood framed.	1968	7/1/2014	$642,720	DOT, MID COAST REGION
Swan Island Lndg, Richmond	Sagadahoc	PIER	Wood framed.	2017	11/1/2005	$442,000	IFW, BUREAU OF RESOURCE MANAGEMENT
Pepperrell Rd, Kittery	York	OFFICE	Wood framed.	1865	6/4/2014	$416,000	ACF, PARKS
78 Exchange St, Bangor	Penobscot	OFFICE				$404,000	ADF, OFFICE OF INFO TECH, COMPUTERS SERVERS ETC.

There is no guarantee that these assets will be damaged in a natural hazard event. Vulnerable state assets in Bangor may experience major impacts to the functioning of the Maine Municipal Bond Bank, judicial courts for one of the most populous counties in the State, and information technology capabilities for the State of Maine. However, Maine's Floodplain Management Program indicates that these assets have benefitted from flood mitigation efforts and are NFIP compliant. MaineDOT's ability to respond to local flooding may be impacted by flooding in one of their storage units. Several of the ferry piers on this list have also been identified as susceptible to frequent coastal flooding due in part to sea level rise since their original construction. Flooded ferry terminals are unable to operate, potentially stranding many island communities and preventing evacuation to the mainland.

[68] Hazus: https://www.fema.gov/flood-maps/products-tools/hazus
[69] DHS Critical Infrastructure Sectors: http://www.dhs.gov/critical-infrastructure-sectors

Since the 2020-Tiered State Framework, The Maine Floodplain Management Program has done flood hazard determinations on the following properties:

16 Deep Cove Rd, Eastport: Not located in SFHA.
70 Fish Hatchery Rd, Casco: Currently in SFHA, will be outside SFHA when the preliminary maps in Cumberland County go effective.
50 State Park Rd, Dover-Foxcroft: Inconclusive based on aerial photos/no DIFRM.
Warren Island, Islesboro: No buildings appear to be located in the SFHA based on aerial photos.
93 Cottage St, Bar Harbor: Not located in SFHA.
62 Fish Hatchery Rd, New Gloucester: Not located in SFHA.
78 Exchange St, Bangor: This building is in the SFHA, and it complies with Floodplain Management regulations

It is not expected that the state-owned and operated buildings will suffer 100% losses from a flooding event in Maine. Flood damage estimates reported here therefore account for only 20% of the valuation for assets and their contents located in flood areas. During a flood event, state employees would attempt to relocate the building contents to prevent content loss, but the rate of flooding may be too rapid for this to be successful.

The total valuation for all state assets is $3.3 Billion (2022 USD), with $89.7 million in assets identified within flood areas. Assuming 20% of each asset is damaged, total losses for the state would equal $17.9 million. These estimates are further disseminated by county in Table 3.9, and general locations are provided in Figure 3.11.

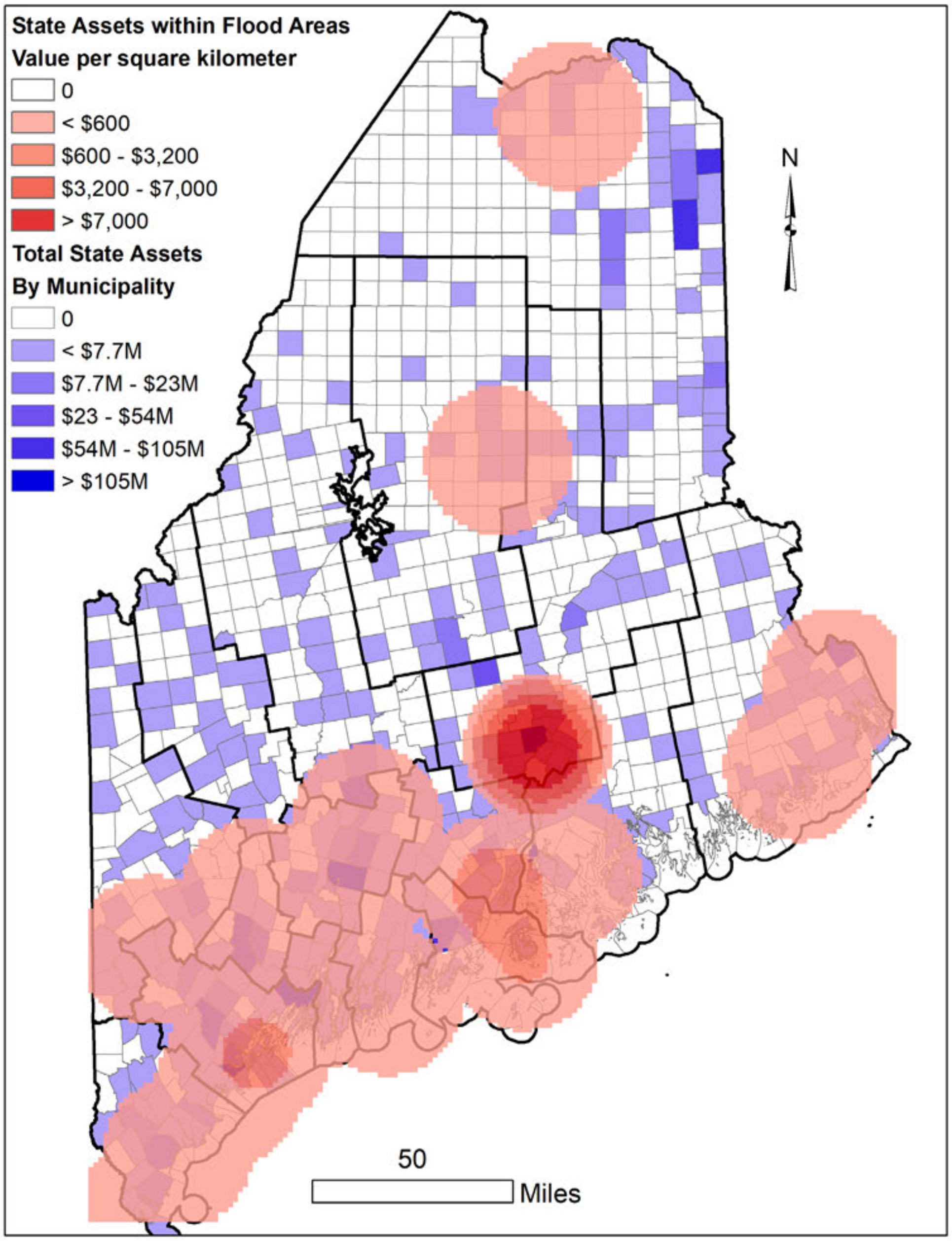

Figure 3.11.a: State Assts within SFHAs and potential losses.

Flooding caused by sea level rise is assumed permanent and therefore would account for 100% of damage to assets. For a scenario where sea level rises by 1.6 feet, as projected by NOAA for the year 2050, total losses for the state would equal $9.9 Million. A rise in sea level of 3.9 feet, projected by NOAA for the year 2100, would lead to $10.6 million in total losses to state assets. These models do not incorporate storm surge damages; refer to the section Tropical Cyclone – Vulnerability Assessment for asset damage estimates related to coastal storm surge.

Table 3.9: Potential dollar losses to state assets by flooding

Region	Totals		Assets in SFHA*			Assets inundated by 1.6 ft sea level rise			Assets inundated by 3.9 ft sea level rise			Assets inundated by 10.9 ft sea level rise		
	State Assets Count	Total Value (2022 USD)	State Assets Count	20% Losses (2022 USD)	% of total value	State Assets Count	100% Losses (2022 USD)	% of total value	State Assets Count	100% Losses (2022 USD)	% of total value	State Assets Count	100% Losses (2022 USD)	% of total value
State of Maine	3,769	$3,357,697,809	117	$17,931,645	0.5%	24	$9,950,520	0.3%	29	$10,605,408	0.3%	120	$120,097,015	3.6%
Androscoggin	103	$131,857,212	5	$11,469	0.0%									
Aroostook	421	$287,502,123	5	$119,464	0.0%									
Cumberland	604	$628,202,559	11	$942,346	0.2%	3	$5,833,360	0.9%	5	$6,217,328	1.0%	44	$32,091,576	5.1%
Franklin[a]	145	$21,036,865	6	$143,270	0.7%									
Hancock	153	$202,125,602	1	$1,200	0.0%							4	$646,520	0.3%
Kennebec	518	$990,500,148	11	$265,411	0.0%									
Knox	108	$163,413,511	4	$729,384	0.4%							7	$6,936,440	4.2%
Lincoln	80	$44,121,502	1	$1,560	0.0%				1	$7,800	0.0%	2	$85,800	0.2%
Oxford	109	$38,868,587	-	-	-									
Penobscot	355	$383,400,261	5	$13,997,360	3.7%							8	$70,430,801	18.4%
Piscataquis[b]	228	$32,190,309	30	$92,878	0.3%									
Sagadahoc	87	$28,347,445	15	$226,280	0.8%	1	$21,840	0.1%	1	$21,840	0.1%	16	$1,175,914	4.1%
Somerset	191	$130,572,689	-	-	-									
Waldo	179	$46,703,979	14	$1,376,390	2.9%	9	$3,339,710	7.2%	11	$3,602,830	7.7%	14	$6,881,950	14.7%
Washington	225	$122,944,012	3	$22,624	0.0%	2	$36,720	0.0%	2	$36,720	0.0%	6	$602,700	0.5%
York	263	$105,911,005	12	$145,278	0.1%	9	$718,890	0.7%	9	$718,890	0.7%	19	$1,245,313	1.2%

*SFHA: Special Flood Hazard Areas designated in FEMA Flood Insurance Rate Maps.

[a,b] estimates produced using Hazus-delineated 500-year flood areas

3.10.2 Community lifeline Risks

The facilities enabling continuous operation of community lifelines are not all necessarily managed by state authorities, but they are necessary for continued operation of state functions and services. Therefore, the description of community lifeline risks for this and other hazard profiles includes an assessment of resources that may or may not be managed by the State government. Not all hazards will impact each community lifeline in equal ways, therefore MEMA has chosen to focus only on specific lifelines that are directly impacted by each hazard. Flooding is anticipated to impact each lifeline to a potentially substantial degree.

State road assets

Though any type of road infrastructure could be vulnerable to flooding and associated erosion hazards, culverts and other small road stream crossings tend to be the most susceptible and are therefore the primary focus of this section. Maine DOT reports 38,251 small/cross culverts, 1,901 large culverts, and 10 bridges categorized as culverts. Culverts require regular maintenance and replacement when their design life is exceeded. Streambanks along the edges of culverts also require regular maintenance as they are particularly susceptible to slumping/erosion due to typically steep slopes, unstable ground, and heavy traffic. Table 3.10 lists the number of Maine DOT culvert assets by size class and the proportion of these culverts with a rating of "poor" or lower, assuming poorly performing culverts may indicate potential locations of structural failure under stresses of flooding and erosion. Using Maine DOT culvert asset data in a financial impact model developed by the New England Environmental Finance Center [70], the cost to fully replace these culverts including materials and construction labor exceeds $50 million.

Table 3.10: Maine DOT culvert assets and modeled replacement costs.

Culvert class	Total number of culverts	% with "Poor" culvert rating (≤3[a])	Cost to replace[b] "Poor" culverts (2022 USD)
Cross culverts	38,251	10.3%	$40,787,678
Large culverts	1,901	8.8%	$10,062,811
Bridge culverts	10	10%	$24,629
Total	40,162	10.2%	$50,875,118

[a] Culvert rating 3: Poor. Excessive amounts of spalling, heavy scaling, and wide cracks
[b] Replacement assumes installation of a new culvert of equal size and materials

Culvert replacements are scheduled regularly each year. Refer to Maine DOT's Work Plan Map for more details [71]. Larger construction projects can be found at Maine DOT's Current Projects website [72].

Culverts categorized undersized or otherwise unfit for flow conditions at their site require improvement to mitigate against future flooding. The most common approach to improve performance is to upsize the culvert and allow for more natural flow conditions to occur in and around the stream crossing point. Improved flow conditions also enhance freshwater ecosystems by reducing barriers for migratory organisms such as brook trout and endangered Atlantic salmon. Roy et al. (2020) [73] studied the dual benefits to flood and environmental mitigation provided by the improved design and spatially optimized selection of state-managed culverts distributed across watershed scales in Maine. Measuring the flood safety performance of culverts based on their capacity to function under different flow recurrence levels and maintenance needs, the study identified that $62 million invested in upsizing culverts would essentially halve current flood risk levels on state roads (dollar values converted to 2022 USD).

[70] NEEFC (2011), A Financial Impact Assessment of LD 1725: Stream Crossings Presentation: digitalcommons.usm.maine.edu/economicsfinance/4/
[71] Maine DOT Work Plan Map: https://www.maine.gov/mdot/mapviewer/?show=Work%20Plan%2023-24%2cWork%20Plan%202022%2cHighway%20Corridor%20Priority&hide=Wetlands
[72] Maine DOT Current Projects: https://www.maine.gov/mdot/projects/
[73] Roy, S. G., Daigneault, A., Zydlewski, J., Truhlar, A., Smith, S., Jain, S., & Hart, D. (2020). Coordinated river infrastructure decisions improve net social-ecological benefits. *Environmental Research Letters*, *15*(10), 104054, https://doi.org/10.1088/1748-9326/abad58.

Coastal causeways and sea level rise

Several coastal communities rely on causeways to connect to the mainland. Coastal causeways were often constructed on top of sand bars or other low-lying coastal landforms that are now more frequently submerged by king tides and storm surge due to sea level rise, putting island communities at risk of being separated from services on the mainland. Maine DOT, in collaboration with local communities, is studying options to rehabilitate or replace causeway structures that carry state or state aid roads, including the Machias Dike Bridge Project [74] and the Deer Isle Causeway [75].

Conserved Lands

Conserved lands may also be potentially exposed to flooding if they are located in flood zones (Table 3.11a). Flooding may be a common occurrence for conserved lands located along riparian corridors or coastal preserves that were established to protect natural areas from development. Impacts can include flood damage to structures and erosion.

Table 3.11a: area of conserved lands located in special flood hazard areas (SFHAs), delineated from effective and preliminary Flood Insurance Rate Maps.

Interest type	Lands in SFHAs acres (thousands)	Portion of all conserved lands
State	28	2.1%
Municipal	5	11.9%
Private	39	1.5%
Federal	20	6.6%
Total	92	2.1%

Hazardous Material Regulated Sites

Maine Department of Environmental Protection has conducted a geospatial vulnerability assessment of their regulated sites, including but not limited to fuel storage tanks, wastewater locations, remediation sites, and closed municipal landfills [76]. From this assessment and under a sea level rise scenario of 1.6 feet, a total of 34 fuel tanks, 3 waste discharge sites, 11 remediation sites, and 2 municipal landfills will be flooded. Further impacts are expected for higher sea level rise and large inland flooding events.

Water: Regulated Public Water Utility Sites

Maine's Department of Health and Human Services Drinking Water Program monitors conditions at 2,085 public wells across the state. Water utilities serve just under half the population of Maine with the rest using privately owned wells to access water. Any event that impacts water utilities would limit potable water access to hundreds to thousands of people. MEMA conducted a hazard-asset overlay analysis of well locations to identify potential vulnerabilities from riverine, coastal, storm surge, and sea level rise flooding (Table 3.11b). The Drinking Water Program proposes to target these public water systems for flood mitigation funding and assistance in the future. The overlay analysis does not account for any pre-existing mitigation efforts at each site. For more information on storm surge flooding, review the section Tropical Cyclone – Hazard Profile.

Table 3.11b: Potential flood exposure of wells monitored by Maine Drinking Water Program.

Flood type or data source	Total (% of wells)
Riverine/Coastal: FIRM*	85 (4.1%)
Category 1 storm surge	3 (0.1%)
Category 2 storm surge	7 (0.3%)
Category 3 storm surge	21 (1%)
Category 4 storm surge	37 (1.8%)
1.6 feet sea level rise	1 (~0%)
3.9 feet sea level rise	8 (0.4%)
6.1 feet sea level rise	10 (0.5%)
10.9 feet sea level rise	20 (1%)

Digital Flood Insurance Rate Maps are not available in all parts of the state.

[74] Machias Dike Bridge Project: https://www.maine.gov/mdot/projects/machiasbridge/
[75] Deer Isle Causeway: https://storymaps.arcgis.com/stories/b51eb909a1fb4c489be56e88561469d2
[76] Maine DEP Vulnerable Sites and Infrastructure: https://www.arcgis.com/home/item.html?id=783cab9dc7754893ac6bd16c74dce011

Shelter

Shelter sites are managed at the local government level. Site selection is determined by local emergency managers who have historic knowledge of hazardous sites in their town and draw upon the knowledge of road commissioners, public works directors, town planners, and code enforcement officers when available to inform these decisions. Shelter sites would only be opened in the event of an emergency and the activation of sites would be dependent on the type, extent, and location of the hazard. For example, sites prone to flooding or access issues would be excluded from selection. Currently there are no shelter sites located in FEMA special flood hazard areas. Schools are commonly selected as shelter sites. Of the 784 public schools in Maine, none are located in FEMA special flood hazard areas.

Energy

Power plants, transmission lines, and other energy-related infrastructure may be vulnerable to flooding. MEMA performed a hazard-asset overlay analysis for power plant locations and transmission lines for the entire state (Table 3.11c). Hydropower plants are excluded from riverine flooding analysis because they are intentionally positioned in rivers. A single solar power plant is located within the 100-year floodplain.

Table 3.11c: Potential flood exposure of energy infrastructure, number of power plants and transmission line miles exposed.

Flood type or data source	Power plants (%)	Transmission line miles (%)
Riverine/Coastal: FIRM*	1 (0.9%)	118 (4.3%)
Category 1 storm surge	1 (0.9%)	4.6 (0.2%)
Category 2 storm surge	2 (1.9%)	9.14 (0.3%)
Category 3 storm surge	2 (1.9%)	14.9 (0.5%)
Category 4 storm surge	4 (3.8%)	20.9 (0.8%)
1.6 feet sea level rise	0 (0%)	0.7 (~0%)
3.9 feet sea level rise	1 (0.9%)	2.7 (0.1%)
6.1 feet sea level rise	1 (0.9%)	5 (0.2%)
10.9 feet sea level rise	3 (2.8%)	11.4 (0.4%)

Digital Flood Insurance Rate Maps are not available in all parts of the state.

A total of 2,751 miles of transmission lines cross rivers and higher order streams a total of 357 times in the State of Maine, and though they are designed specifically to mitigate against surface-level hazards such as flooding, certain types of flooding events may impact service. Other hazards related to wind, wildfire, and debris damage are therefore more likely to cause failure in energy services.

Safety and Security

The primary challenge of disaster response by fire service and law enforcement is access to impacted sites caused by road flooding and debris damage. However, there are critical facilities that are also directly impacted by flooding which would hinder the ability to respond to a flooding event. Of the 568 fire stations in Maine, 14 (2.5%) are located within a FIRM-designated floodplain. Of the 153 law enforcement offices in Maine, only one is located in the floodplain, located in the Town of Camden, Knox County.

Medical and Healthcare

The primary vulnerability of Maine’s medical lifeline is accessibility and energy issues caused by road flooding and transmission line failure rather than flooding of the facility itself. Refer to the state road data described above. Of the 71 medical facilities and 107 assisted living centers in Maine, none are in the floodplain as designated in effective and preliminary FIRMs.

Food

The primary vulnerability of the food community lifeline is threatened access to a food source caused by road flooding and power outages rather than flooding of the facilities themselves. Please refer to the road and energy sections above for more information. A breakdown in the food community lifeline would require emergency intervention to avoid issues of malnutrition and starvation.

Communications

No communication towers, nor the agencies responsible for sending emergency alerts, warnings, and message are located in the floodplain. One concern may be loss of power to communication towers, though many of these facilities have backup diesel generators to provide emergency power until the grid is restored.

Historic and Cultural Resources

The Maine Historic Preservation Commission (MHPC) has developed a Historic Properties Toolkit [77], including a map of properties listed in the National Register of Historic Places, Landmarks, or museums/archives overlain with flood, fire, sea level rise, and storm surge layers.

Using the limited spatial scope of digital FIRMs for Maine, 105 of the 1,266 historic places in Maine (8.3%) are located in special flood hazard areas. Many of these historic places are coastal. Of these, 60 (4.7%) would be affected by 1.6 feet of sea level rise, and 68 (5.4% would be affected by a 3.9-foot rise. It is important to note that, though many of these sites are coastal, there are historic places in central Maine communities located on tidal rivers, such as the cities of Augusta and Bangor, that will also see the detrimental impacts of sea level rise. If these sites were impacted, Maine would potentially lose an irreplaceable part of its history.

[77] Weathering Maine: https://www.maine.gov/mhpc/programs/protection-and-community-resources/climate-change

3.11 Flooding – Vulnerability of Jurisdictions and Disadvantaged communities [S6.]

3.11.1 Identifying Jurisdictions with greatest vulnerability [S6.a.1.]

In all Maine counties, the greatest amount of damage from flooding events occurs to the state and local roadway system. This is followed in severity and probability with damage to homes and businesses located along the shores of rivers, lakes and the coastal waters.

Flood mitigation needs in Maine currently exceed available resources. As noted in previous SHMP updates, and again in this update, the completion of FEMA-approved hazard mitigation plans for 16 counties and the jurisdictions within them, and the University of Maine System has resulted in the identification of 2,276 hazard mitigation projects amounting to $223 million. At least 90 – 95 percent of these projects are flood mitigation projects.

Disadvantaged Communities

The objective of the disadvantaged community's assessment is to identify potential disadvantages felt by communities who are disproportionately impacted by natural hazards both historically and under future projections. Flooding is a prominent hazard in Maine with a wide distribution of locations that may be impacted, though these locations are predictably located in low lying areas adjacent to bodies of water. However, waterfront properties are generally considered to be more valuable, unless they are frequently damaged by floods, lack flood insurance, or are not regulated by a local floodplain ordinance.

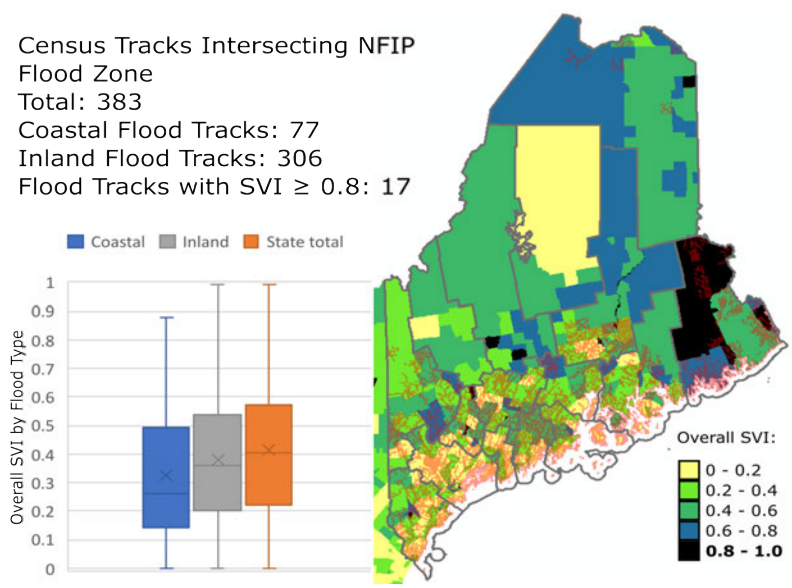

Figure 3.12: Potential impact of flooding on census tracts with elevated SVI. Higher SVI scores indicate greater vulnerability. For coastal and inland flood zones, average SVI distributions trend lower than the state average (box and whisker plots, lower left). NFIP flood zones are also not available in digital format for the majority of the state by area, preventing a full statewide equity assessment.

In Maine, the average overall SVI score is 0.42, greater than averages from areas prone to coastal and inland flooding (Figure 3.12), indicating that potentially disadvantaged communities compose a smaller portion of the overall population exposed to flooding. SVI for coastal flood areas is the lowest, and therefore considered to be less vulnerable than the state average, with an average value of 0.33, while inland flood areas average SVI is 0.39. This trend initially suggests that communities with less overall social vulnerability reside in areas with greater overall flooding vulnerability. However, 17 of the 19 (89.5%) census tracts with SVI ≥ 0.8 (indicating a potentially disadvantaged community) intersect with flood zones, and it is likely that more would be identified if digital Flood Insurance Rate Maps were available in all parts of the state. Further, many households in these tracts, particularly in the urban centers of Portland, Lewiston, and Bangor, speak limited English, ranging from 6.7-17% limited English, posing communication challenges for hazardous weather updates, flood preparedness/safety instructions, and if need be, evacuation instructions (Census data accessed using FEMA's RAPT tool [78]).

[78] FEMA RAPT tool: https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6

Of these communities at risk of flooding, the following have the greatest measured vulnerability: Northern/Central Washington County, Town of Machias, Eastern Washington County and Passamaquoddy Nation at Sipayik, Penobscot Nation at Indian Island, City of Bangor, City of Gardiner, City of Lewiston, Town of Livermore, City of Portland/Bayside neighborhood, and City of Sanford. These communities are located in urban and rural settings. In summary, the impacts to these communities are similar to the general impacts described above, but they are amplified due to the already high vulnerability of community members caused by disabilities, lack of transportation, older adults, and people with limited English proficiency. The ability to get services to these areas or to evacuate from these areas will be limited by the physical impacts of flooding, but also during the recovery phase where socially vulnerable community members are not always appropriately represented in assistance programs. The impacts to these communities will therefore be long term, making recovery difficult, unless more equitable assistance can be provided.

These results suggest disadvantaged communities are likely exposed to flood risks but are poorly represented within the larger census tracts. The resolution of SVI data likely misses truly disadvantaged communities that remain in flood prone areas, such as urban centers, working shorelines, and rural communities with less capacity to enact and enforce flood plain ordinances and building codes. Further, many community members may be unable to afford the cost of living in these areas but commute to work where flood hazards may disrupt their livelihoods or limit their access to critical services. This analysis is therefore not a comprehensive assessment of flood hazard vulnerability because it may be more responsive to the coarse resolution of available data, lack of a statewide digital floodplain dataset, and the conflicting distribution of property values and public services that likely vary below the resolution of census tracts.

National Flood Insurance Program (NFIP)

The National Flood Insurance Program (NFIP), managed by FEMA, enables homeowners, business owners and renters in participating communities to purchase federally backed flood insurance. This insurance offers an insurance alternative to disaster assistance to meet the escalating costs of repairing flood damage to buildings and their contents. Participating communities agree to adopt and enforce floodplain management ordinances to reduce future flood damage. There are now more than 20,600 participating communities across the United States and its territories.

Federal flood insurance is available for residents and business owners in both high-risk and moderate-to-low risk areas. The insurance is required for buildings in high-risk areas that have loans from federally regulated or insured lenders. This requirement extends to disaster assistance loans from the Small Business Administration.

Flood Insurance Rate Maps (FIRMs)

Communities maintain a repository of Flood Insurance Rate Maps (FIRMs) for residents to use to determine whether a property location is in an area with a 1 percent or greater chance of flooding annually [79]. These maps are usually available at the planning and zoning department where building permits are obtained, or they can be accessed online [80]. FEMA also provides some communities with digital FIRMs [81].

Digital FIRMs are still not available for many communities in Maine (Figure 3.1), making it more challenging to identify whether properties are located within special flood hazard areas. In the past, FEMA's National Flood Insurance Program (NFIP) remapping efforts have been limited by technology and funding. In recognition, in 2003, Congress committed to a five-year Flood Map Modernization Program (FMMP), also known as Map Modernization. The goal of Map Modernization was to upgrade flood hazard data and mapping to create a more

[79] Benefits.gov NFIP: https://www.benefits.gov/benefit/435
[80] FEMA Map Service Center: http://msc.fema.gov
[81] FEMA National Flood Hazard Viewer: hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd

accurate digital product to improve floodplain management across the country. This was undertaken with priority given to areas of greater population, need and ability to leverage resources. Digitizing is one more step towards FEMA's goal to acquire more accurate mapping. Digitizing does not address all of the flaws in existing maps; however, it will make it easier to change the maps in the future and reduce the costs of printing maps in the long run.

Repetitive Loss Properties

FEMA maintains a file of repetitive and severe repetitive loss properties (properties that have experienced more than one flood loss). The following is a summary of the repetitive loss properties by county and municipality. Some properties have benefitted from mitigation actions. If a structure has been mitigated, then it should suffer no, or fewer, damages. It also lowers the insurance premium cost for the property owner.

A number of repetitive loss properties in Maine are not insured. FEMA's statistics on repetitive loss properties include only properties having flood insurance. There are other properties suffering repetitive flood losses but are not insured and often unreported. Therefore, statistics on these properties are not tabulated unless damaged during a declared individual disaster (Table 3.12, 3.13).

Table 3.12: Repetitive loss properties by community (10/7/2022). Repetitive Losses involve 4 or more claims.

Municipality	Repetitive Loss Properties	Residential	Non-residential	Total losses	Total Building payments	Total Contents payments	Properties mitigated (by county)
TOTAL - STATE	284	205	79	787	$13,616,256.90	$3,589,849.91	23
Androscoggin County	3	3	0	6	$34,937.87	$2,020.45	0
GREENE	1	1	0	2	$6,752.51	$0.00	
MECHANIC FALLS	1	1	0	2	$17,481.69	$2,020.45	
WALES	1	1	0	2	$10,703.67	$0.00	
Aroostook County	30	21	9	92	$1,352,813.02	$381,862.31	5
EAGLE LAKE	2	2	0	4	$26,250.17	$10,332.47	
EASTON	1	1	0	2	$7,402.03	$0.00	
FORT FAIRFIELD	16	10	6	56	$849,250.46	$138,686.50	
FORT KENT	7	4	3	22	$387,920.89	$213,404.40	
ISLAND FALLS	1	1	0	2	$13,796.15	$0.00	
OAKFIELD	1	1	0	2	$8,883.26	$0.00	
SHERMAN	1	1	0	2	$7,310.06	$0.00	
WALLAGRASS	1	1	0	2	$52,000.00	$19,438.94	
Cumberland County	15	13	2	37	$226,774.35	$50,827.91	0
CAPE ELIZABETH	1	1	0	3	$6,319.28	$1,264.23	
CASCO	3	3	0	8	$38,886.06	$17,011.00	
FALMOUTH	1	1	0	2	$7,805.31	$700.60	
GORHAM	1	1	0	2	$7,373.09	$1,656.34	
GRAY	1	1	0	3	$19,459.76	$0.00	
HARRISON	1	1	0	2	$19,526.03	$0.00	
NAPLES	1	1	0	2	$3,281.42	$0.00	
PORTLAND	1	1	0	2	$3,838.49	$0.00	
SCARBOROUGH	2	2	0	5	$36,150.86	$1,152.80	
SOUTH PORTLAND	1	1	0	3	$25,475.29	$0.00	
WESTBROOK	1	0	1	3	$50,000.00	$29,042.94	
YARMOUTH	1	0	1	2	$8,658.76	$0.00	
Franklin County	6	5	1	15	$280,306.26	$39,892.41	1
CARRABASSETT VALLEY	2	2	0	6	$99,066.28	$20,615.81	

Municipality	Repetitive Loss Properties	Residential	Non-residential	Total losses	Total Building payments	Total Contents payments	Properties mitigated (by county)
FARMINGTON	1	0	1	3	$21,472.09	$15,600.00	
KINGFIELD	2	2	0	4	$157,551.85	$1,530.48	
TEMPLE	1	1	0	2	$2,216.04	$2,146.12	
Kennebec County	32	8	24	98	$1,330,137.99	$789,005.73	3
AUGUSTA	9	1	8	34	$945,251.59	$534,175.70	
GARDINER	7	1	6	21	$81,046.31	$171,701.55	
HALLOWELL	8	0	8	26	$123,898.87	$46,997.03	
WAYNE	3	3	0	7	$48,208.53	$5,607.05	
WINSLOW	5	3	2	10	$131,732.69	$30,524.40	
Knox County	1	1	0	2	$10,099.89	$0.00	0
OWLS HEAD	1	1	0	2	$10,099.89	$0.00	
Lincoln County	6	3	3	18	$539,086.36	$61,723.18	1
BOOTHBAY	2	1	1	4	$10,277.30	$0.00	
BOOTHBAY HARBOR	1	0	1	8	$445,050.70	$48,593.18	
BRISTOL	1	1	0	2	$22,620.06	$0.00	
SOUTH BRISTOL	1	0	1	2	$46,947.40	$0.00	
SOUTHPORT	1	1	0	2	$14,190.90	$13,130.00	
Oxford County	17	14	3	43	$543,700.87	$124,814.96	1
BETHEL	1	1	0	2	$9,728.65	$1,022.00	
CANTON	7	6	1	16	$138,976.25	$52,989.10	
FRYEBURG	5	5	0	16	$227,359.87	$47,061.27	
MEXICO	1	0	1	2	$116,331.36	$0.00	
NORWAY	1	1	0	2	$7,720.88	$2,698.81	
RUMFORD	2	1	1	5	$43,583.86	$21,043.78	
Penobscot County	18	18	0	47	$327,788.38	$79,345.04	1
BRADLEY	3	3	0	11	$108,995.38	$7,484.39	
CHESTER	1	1	0	2	$25,447.85	$13,517.01	
DREW PLANTATION	1	1	0	2	$23,640.85	$705.96	
GLENBURN	1	1	0	2	$6,017.58	$0.00	
GRINDSTONE	4	4	0	10	$59,256.44	$25,079.82	
MEDWAY	2	2	0	5	$19,312.79	$11,501.89	
MILFORD	4	4	0	11	$65,927.72	$20,129.22	
OLD TOWN	2	2	0	4	$19,189.77	$926.75	
Piscataquis County	9	6	3	23	$834,436.98	$705,289.52	3
BROWNVILLE	1	1	0	2	$12,661.99	$2,603.59	
DOVER-FOXCROFT	2	1	1	6	$19,322.41	$3,595.20	
GUILFORD	4	2	2	10	$738,957.24	$683,284.63	
MILO	2	2	0	5	$63,495.34	$15,806.10	
Sagadahoc County	3	1	2	9	$355,254.18	$51,791.17	0
BATH	1	0	1	4	$290,957.13	$51,791.17	
BOWDOINHAM	1	0	1	2	$46,308.51	$0.00	
PHIPPSBURG	1	1	0	3	$17,988.54	$0.00	

Municipality	Repetitive Loss Properties	Residential	Non-residential	Total losses	Total Building payments	Total Contents payments	Properties mitigated (by county)
Somerset County	5	5	0	11	$76,299.31	$22,957.20	1
ANSON	1	1	0	3	$12,213.10	$5,787.70	
FAIRFIELD	1	1	0	2	$14,019.74	$5,417.50	
HARTLAND	1	1	0	2	$14,960.51	$1,752.00	
NORRIDGEWOCK	1	1	0	2	$24,398.95	$10,000.00	
SKOWHEGAN	1	1	0	2	$10,707.01	$0.00	
Waldo County	3	1	2	12	$273,294.77	$222,616.61	0
BELFAST	1	0	1	6	$151,369.10	$221,128.53	
LINCOLNVILLE	1	0	1	3	$105,063.98	$0.00	
UNITY	1	1	0	3	$16,861.69	$1,488.08	
York County	131	102	29	363	$7,364,382.76	$1,046,597.42	6
ACTON	2	2	0	8	$107,311.42	$0.00	
ARUNDEL	1	1	0	2	$37,092.19	$8,726.10	
BERWICK	2	1	1	4	$243,380.09	$0.00	
BIDDEFORD	5	5	0	10	$67,481.59	$14,850.58	
BUXTON	1	1	0	2	$5,517.14	$0.00	
DAYTON	1	1	0	2	$5,349.64	$0.00	
KENNEBUNK	22	19	3	66	$1,010,495.26	$148,878.25	
KENNEBUNKPORT	9	6	3	31	$778,445.20	$246,664.26	
KITTERY	2	1	1	5	$15,339.86	$0.00	
NORTH BERWICK	1	1	0	3	$92,114.92	$0.00	
OGUNQUIT	9	2	7	25	$1,120,991.88	$126,831.77	
OLD ORCHARD BEACH	9	8	1	22	$205,091.28	$23,000.34	
SACO	18	17	1	53	$1,114,408.26	$228,780.10	
SANFORD	3	2	1	8	$285,136.05	$482.45	
SOUTH BERWICK	4	4	0	13	$264,319.43	$28,480.36	
WELLS	14	14	0	37	$470,447.58	$36,859.57	
YORK	28	17	11	72	$1,541,460.97	$183,043.64	
UNKNOWN	5	4	1	11	$66,943.91	$11,106.00	1

Maine Dept. of Agriculture, Conservation and Forestry Floodplain Management Program 2022.

Table 3.13: Severe Repetitive Loss Properties by community (10/7/2022). Severe Repetitive Losses involve 4 or more claims.

Municipality	Severe Repetitive Loss Properties	Residential	Non-residential	Total losses	Total Building payments	Total Contents payments
TOTAL - STATE	35	20	15	174	$3,015,005.49	$1,063,819.05
Aroostook County	6	3	3	36	370110.58	295287.13
EAGLE LAKE	1	1	0	2	$4,185.80	$0.00
FORT FAIRFIELD	3	2	1	23	$317,075.24	$83,352.94
FORT KENT	2	0	2	11	$48,849.54	$211,934.19
Franklin County	1	0	1	3	21472.09	15600
FARMINGTON	1	0	1	3	$21,472.09	$15,600.00
Kennebec County	4	0	3	27	283298.61	174947.85
AUGUSTA	1	0	1	13	$155,410.13	$116,085.59
GARDINER	1	0	1	5	$40,793.86	$46,796.31
HALLOWELL	2	0	1	9	$87,094.62	$12,065.95
Lincoln County	1	0	1	8	445050.7	48593.18
BOOTHBAY HARBOR	1	0	1	8	$445,050.70	$48,593.18
Oxford County	1	1	0	5	61962.7	5000
FRYEBURG	1	1	0	5	$61,962.70	$5,000.00
Penobscot County	2	2	0	10	89965.95	10828.39
BRADLEY	1	1	0	7	$83,048.61	$7,484.39
MEDWAY	1	1	0	3	$6,917.34	$3,344.00
Waldo County	1	0	1	6	151369.1	221128.53
BELFAST	1	0	1	6	$151,369.10	$221,128.53
York County	19	14	5	79	1591775.76	292433.97
KENNEBUNK	3	3	0	14	$136,429.24	$26,051.43
KENNEBUNKPORT	2	0	2	15	$455,578.35	$122,348.32
OLD ORCHARD BEACH	1	1	0	2	$17,456.70	$647.70
SACO	1	1	0	4	$111,964.47	$0.00
SOUTH BERWICK	2	2	0	9	$224,771.70	$27,287.36
WELLS	3	3	0	10	$132,341.69	$4,462.10
YORK	7	4	3	25	$513,233.61	$111,637.06

Maine Dept. of Agriculture, Conservation and Forestry Floodplain Management Program 2022.

Community Rating System (CRS)

The Community Rating System (CRS) is a voluntary incentive program recognizing and encouraging community floodplain management practices that exceed the minimum requirements of NFIP. Over 1,500 communities participate nationwide [82]. Currently 16 Maine communities participate in CRS (Table 3.14).

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.

Table 3.14: Communities participating in CRS as of October 2022.

Community	County	CRS Class	% Savings Flood insurance policies in the SFHA
Auburn	Androscoggin	9	5%
Lewiston	Androscoggin	8	10%
Cape Elizabeth	Cumberland	8	10%
Portland	Cumberland	8	10%
Farmington	Franklin	8	10%
Southwest Harbor	Hancock	9	15%
Old Town	Penobscot	7	15%
Dover-Foxcroft	Piscataquis	9	5%
Arrowsic	Sagadahoc	8	10%
Skowhegan	Somerset	8	10%
Alfred	York	8	10%
Ogunquit	York	8	10%
Old Orchard Beach	York	7	15%
Saco	York	8	10%
South Berwick	York	7	15%
York	York	7	15%

Maine Dept. of Agriculture, Conservation and Forestry Floodplain Management Program 2022.

Flood Insurance Trends [S8.a.3]

The number of NFIP policy holders has in general decreased since the last SHMP update (Table 3.14b). All counties except Knox County saw a noticeable drop in NFIP policy holders, and many counties witnessed a drop in policies from a high of 2009 to a low in 2023. The Maine Floodplain Management Program (FMP) has noted that this drop may be due to a larger number of Maine homeowners who choose not to continue investing in flood insurance after they pay off their mortgage. Another likely reason is that more homeowners wish to continue investing in flood insurance, but they may find a more affordable private insurance option. Whatever the case, FMP identifies that Mainers may be underinsured when it comes to flooding. Refer to Section 6 – Mitigation Strategy for a list of mitigation actions to address this issue.

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[82] FEMA Community Rating System: https://www.fema.gov/floodplain-management/community-rating-system

Table 3.14b: NFIP policy trends in Maine from 2009-2023				
County	1/29/09	7/26/18	3/1/23	% Change since 2009
Androscoggin	302	202	139	-53.97
Aroostook	295	158	106	-64.07
Cumberland	1343	1421	1148	-14.52
Franklin	190	137	60	-68.42
Hancock	344	339	235	-31.69
Kennebec	493	382	215	-56.39
Knox	228	341	264	15.79
Lincoln	343	400	280	-18.37
Oxford	434	287	184	-57.60
Penobscot	468	391	256	-45.30
Piscataquis	104	65	42	-59.62
Sagadahoc	159	169	125	-21.38
Somerset	287	189	104	-63.76
Waldo	167	151	104	-37.72
Washington	94	113	73	-22.34
York	3505	3583	2795	-20.26
State Total	**8756**	**8328**	**6130**	**-29.99**
Green = highest value from 2009-2023 Red = lowest value from 2009-2023				

3.11.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Hazard-Asset Footprint Overlay Analysis

It is not expected buildings will suffer 100% losses from a flooding event in Maine. Flood damage estimates reported here therefore account for only 20% of the valuation for assets and their contents located in flood areas. Given prior warning of a flood event, residents may attempt to relocate the building contents to prevent content loss, but the rate of flooding may be too rapid for this to be successful.

The total estimated valuation for all building assets is $329 billion (2022 USD), with $10.5 billion in assets identified within flood areas. Assuming 20% of each asset is damaged statewide, total losses would equal $2.1 billion. These estimates are further disseminated by county in Table 3.15.

Conversely, flooding caused by sea level rise is assumed permanent and therefore would account for 100% of damage to assets. For a scenario where sea level rises by 1.6 feet, as projected by NOAA for the year 2050, total losses to all buildings are estimated to equal $1.9 billion. A rise in sea level of 3.9 feet, projected by NOAA for the year 2100, may lead to $4.1 billion in total losses to buildings. These models do not incorporate storm surge damages; refer to the section Tropical Cyclone – Vulnerability Assessment for asset damage estimates related to coastal storm surge.

Table 3.15: Potential dollar losses to all building assets by flooding in millions (2022 USD).

Region	Totals		Assets in SFHA*			Assets inundated by 1.6 ft sea level rise			Assets inundated by 3.9 ft sea level rise			Assets inundated by 10.9 ft sea level rise		
	Assets Count	Total Value	Assets Count	20% Losses	% of total value	Assets Count	100% Losses	% of total value	Assets Count	100% Losses	% of total value	Assets Count	100% Losses	% of total value
State of Maine[a,b]	758,999	$329,411	22,192	$2,102	1.38%	3,454	$1,945	0.26%	7,445	$4,095	0.54%	21,034	$10,440	1.38%
Androscoggin	40,678	$20,282	584	$95	2.35%	0	$0	0.00%	0	$0	0.00%	0	$0	0.00%
Aroostook[b]	47,211	$21,437	314	$19	0.44%	0	$0	0.00%	0	$0	0.00%	0	$0	0.00%
Cumberland	120,034	$60,316	2,608	$289	2.40%	481	$466	0.77%	1,183	$1,082	1.79%	4248	$2,810	4.66%
Franklin[a]	21,643	$8,534	1,269	$98	5.77%	0	$0	0.00%	0	$0	0.00%	0	$0	0.00%
Hancock	47,129	$17,737	1,524	$143	4.03%	389	$263	1.48%	688	$388	2.19%	2517	$1,125	6.34%
Kennebec	65,768	$29,533	2,000	$216	3.66%	4	$10	0.03%	9	$20	0.07%	43	$65	0.22%
Knox	28,812	$11,720	1,197	$106	4.50%	372	$178	1.53%	664	$313	2.67%	1913	$796	6.80%
Lincoln	27,821	$10,680	957	$82	3.86%	305	$169	1.58%	500	$248	2.33%	1482	$670	6.28%
Oxfordb	40,062	$16,050	2,196	$221	6.88%	0	$0	0.00%	0	$0	0.00%	0	$0	0.00%
Penobscot[b]	79,169	$35,301	827	$92	1.31%	24	$98	0.28%	54	$123	0.35%	187	$264	0.75%
Piscataquis[a]	16,376	$5,782	1,010	$95	8.22%	0	$0	0.00%	0	$0	0.00%	0	$0	0.00%
Sagadahoc	20,394	$8,210	487	$53	3.23%	173	$120	1.46%	305	$261	3.18%	967	$518	6.31%
Somerset[b]	38,723	$15,823	148	$9	0.29%	0	$0	0.00%	0	$0	0.00%	0	$0	0.00%
Waldo	26,926	$10,879	447	$40	1.82%	42	$45	0.41%	83	$61	0.56%	281	$191	1.76%
Washington[b]	24,214	$8,175	577	$43	2.65%	212	$90	1.10%	428	$175	2.14%	1521	$524	6.41%
York	107,149	$45,785	6,047	$2,102	5.45%	1,452	$505	1.10%	3531	$1,423	3.11%	7875	$3,477	7.59%

*SFHA: Special Flood Hazard Areas designated in FEMA Flood Insurance Rate Maps (FIRMs).

[a] incomplete digital FIRM record. Estimates produced using Hazus-delineated 500-year flood areas.

[b] incomplete digital FIRM record.

3.12 Impact of a Dam Failure/Breach [HHPD2.b]

3.12.1 *Cascading impacts [HHPD2.b.1]*

Dams may fail because of the occurrence of other natural hazards causing an unprecedented load on the dam structure. For example, a poorly designed or mis-operated dam may overtop during a flood, posing a safety risk for downstream communities. Overtopping may occur in a structurally sound dam, but overtopping may also lead to a dam breach with catastrophic implications for downstream communities. The flood itself could occur due to heavy rain and/or rapidly melting snowpack during severe summer, winter or tropical storms [83]. Overfilling of a dam often leads to greater upstream flood hazard risks. Ground accelerations from earthquakes may directly damage the dam structure or cause nearby mass wasting that makes a dam likely to fail and challenging to operate [84]. Mass wasting at the dam site may cause structural failure, while upstream mass wasting may displace enough water to quickly overwhelm operations. Mass wasting itself can form natural dams that may rapidly fill, breach, and pose significant and imminent flood risks [85]. Upstream erosion in reservoir dams may hinder dam operations [86]. Wildfires and other hazards that reduce cohesion on steep vegetated slopes may increase the vulnerability of erosion and failure in heavy rainfall events, particularly for earthen dams [87]. Earthen dams are also susceptible to internal erosion that may contribute to dam failure even during "blue sky" conditions. Finally, the deep and rapid floodwaters expected with a dam failure would trigger many instances of erosion and mass wasting downstream contributing much more to the flood risk itself.

3.12.2 *Economic, environmental, social impacts of dam failure [HHPD2.b.2, HHPD2.b.3]*

Dam breaches are extremely rare in Maine based on the Maine Dam Safety Program incident database. There are very few dams in Maine capable of causing significant downstream infrastructure damage due to operation or mis-operation. These dams tend to be some of the larger dams in the state, and therefore managed by professional operators with controls to prevent mis-operation. These controls are reviewed by the State Dam Safety Program or Federal Energy Regulatory Commission (FERC) depending on jurisdiction.

The economic, environmental, and social impacts of potential dam failures are mitigated through enforcement of floodplain ordinances for a vast majority of municipalities and the entirety of the Unorganized Territory in Maine. Floodplain ordinances implement land use restrictions in floodplains determined by Flood Insurance Rate Maps (FIRMs) produced for the National Flood Insurance Program. Though the location and extent of inundation by a dam failure may vary significantly from the floodplains identified with FIRMs, they provide a useful general assessment of flood risk for a majority of dam-related flood hazards. Much like other flood-related hazards, Maine's road infrastructure may be the most vulnerable to dam failure. Numerous road-stream crossings in Maine are undersized for flood conditions, causing inundation and washout risks for anyone attempting to cross them. Please refer to Flooding – Hazard Profile and Flooding – Vulnerability Assessment for more detail.

Maine dams were constructed incrementally over a period of 300 years. Businesses harnessed the abundant fast flowing rivers and rocky rapids for the development of energy and transportation. Many dams throughout the country are now aged, and in Maine the majority of these structures are nearly 100 years old and beyond the normal design life of civil engineering works. Many are low head dams constructed by using local materials of stone, timber, and earth. Some old dams have now been removed or lie in ruins. Unfortunately, some of the old

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[83] FEMA Dam Failure document: https://www.fema.gov/sites/default/files/2020-08/fema_dam-safety_aware-community_fact-sheet_2016.pdf

[84] Wieland, M. (2006). Earthquake safety of existing dams: https://episodesplatform.eu/eprints/207/1/paper4010.pdf

[85] Marui, H., & Nadim, F. (2009). Landslides and multi-hazards. *Landslides–disaster risk reduction*, 435-450: https://link.springer.com/chapter/10.1007/978-3-540-69970-5_23

[86] Wang, G., Wu, B., & Wang, Z. Y. (2005). Sedimentation problems and management strategies of sanmenxia reservoir, yellow river, china. *Water resources research*, *41*(9): https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1029/2004WR003919

[87] Moody, J. A., Shakesby, R. A., Robichaud, P. R., Cannon, S. H., & Martin, D. A. (2013). Current research issues related to post-wildfire runoff and erosion processes. *Earth-Science Reviews*, *122*, 10-37: https://www.sciencedirect.com/science/article/pii/S0012825213000536

(or unmonitored) sites have been built upon by beavers, impounding enough water to cause minor road washouts when they breach after heavy rains.

Table 3.15b provides information on specific rivers and streams where high hazard dams are located, the total number of dams, names of downstream towns and cities, state and federal road crossings, and the number of transmission line crossings below the dams. Main’s Dam Safety Program does not calculate populations at risk, but the information provided here may give an estimate of communities and infrastructure that may pursue dam failure mitigation resources. The communities, road crossings, and transmission line crossings downstream of high hazard potential dams would potentially be impacted by a major dam breach or failure. There are no known state owned or operated assets (other than assets noted below) within dam breach inundation zones.

Table 3.15b: High hazard dams and downstream communities and infrastructure

Watershed	Number of HH Dams	Downstream municipalities	State/Fed Road Crossings	Transmission line crossings (count)
Mousam	3	Sanford, Shapleigh, Kennebunk	I-95, Rt. 1, Rt. 9	4
Saint Croix	2	Baileyville, Baring, Calais	3 International border crossing points	3
Narraguagus	1	Cherryfield	Rt. 1	2
Penobscot	9	Millinocket, Medway, Lincoln, Howland, Orono, Old Town, Bradley, Bangor, Brewer	I-395, Rt. 15B, Rt. 2, Rt. 155, Rt. 116 (twice), I-95, Rt. 11	8
Sebasticook	1	Dexter, Corinna, Rt. 23, Rt. 7, Rt. 43	None	3
Zircon Brook	1	Rumford	None	0
Saco	2	Fryeburg, Brownfield, Baldwin, Cornish, Hollis, Biddeford, Saco	Rt. 113 (twice), Rt. 160, Rt. 5 (twice), Rt. 11, Rt. 25, Rt. 35, Rt. 202, I-95, Rt. 1	6
Megunticook	3	Camden	Rt. 105 (twice)	1
Tannery	1	Gorham	Rt. 202	0
Lower West Bay Stream	1	Sullivan	Rt. 1	0
Narramissic	2	Orland	Rt. 1, Rt. 166	0
Wilson Pond	1	Monmouth	Rt. 11	0
Presumpscot	3	Portland, Falmouth, Westbrook, Gorham, Windham	I-295, I-95, Rt. 1, Rt. 100, Falmouth Spur, Presumpscot Falls Bridge, Rt. 302, Babb's Covered Bridge, Rt. 35	2
Prestile stream	2	Easton, Westfield, Mars Hill	None	3
Libby Brook	2	Fort Fairfield	None	1
Limestone, Durepo, Noyes Streams	3	Limestone	Rt. 1A, Rt. 229	0
Hanson, Mantle, Violette Brooks	3	Presque Isle, Mapleton, Cyr Plantation, Presque Isle Airport	Rt. 1, Rt. 163	1
Dunham, Davee Brooks	2	Dover-Foxcroft	Rt. 6	0
Howard Pond	1	Hanover	Rt. 2	0
Cobbosseecontee	2	Gardiner	Rt. 201	0
Sebec	1	Sebec, Milo	Rt. 6	0

Watershed	Number of HH Dams	Downstream municipalities	State/Fed Road Crossings	Transmission line crossings (count)
Androscoggin	1	Lewiston, Auburn, Durham, Lisbon Falls, Topsham, Brunswick	Rt. 202, I-95, Rt. 125, I-295, Rt. 201, Rt. 196	8
Mooselookmeguntic	1	Rangeley	Rt. 4, Rt. 16	0
Magalloway, Abbott	2	Lincoln Plt.	Rt. 16	0
Bobbin Mill Brook	1	Auburn	Rt. 4	0
Scopan Stream	1	Masardis, Ashland	Rt. 11	1
Rapid	2	Richardson Twp. Twp. C	None	0
Kennebec	6	Moscow, Pleasant Ridge, Bingham, Solon, Madison, Norrigewock, Skowhegan, Fairfield, Waterville, Winslow, Halifax State Historic Site, Bailey Farm Windmill, Vassalboro, Sidney, Augusta, Hallowell, Gardiner, Farmingdale	Rt. 197, Rt. 27, R. 202, Rt. 3, Rt. 137, Rt. 201, Rt. 100, I-95, Rt. 23, Rt. 201, Rt. 201A (4x)	8
Dead	1	Dead River Twp., Flagstaff Lake, The Forks	None	0
Millinocket Stream	1	Millinocket	Rt. 157	3
Union	3	Ellsworth	Rt. 1A, Rt. 1	1
Messalonskee Stream	1	Oakland, Waterville	Rt. 137 (twice), I-95, Rt. 11	2
Moose	1	Jackman, Moose River, Rockwood	Rt. 201, Rt 6	0
Mill Stream	1	Madison, Skowhegan	Rt. 150	1

3.12.3 Methodology and Assumptions [HHPD2.b.4]

It can be difficult to determine the impacts of dam failure due to the need for specialized technical modeling software and incorporation of multiple data sources. Maine law, consistent with federal law, classifies the hazard potential of dams as High, Significant or Low. Generally speaking, failure of high hazard dams could cause loss of life; Significant hazard dams could cause significant property damage and low hazard dams would generally cause damage only to the owner's property. Therefore, it's possible a small (low head) dam located above a large community could be rated high hazard while a structurally larger dam sited in an unpopulated area could have a low hazard potential. Three analyses are combined to interpret dam hazard and are central to an Emergency Action Plan (EAP) [88]:

- Measuring the flow expected from a modeled uncontrolled release of the reservoir
- Determining the flood inundation area from the model release
- Identifying the potential consequences of flooding in the inundation area

Every high hazard dam in Maine has an EAP on file with Maine's Dam Safety Program available for review on request. These documents include either paper and digital failure inundation maps. Very few maps are in a georeferenced format that can easily be combined with other geographic-based data important for calculating Population at Risk. Further, EAPs for FERC-regulated dams are under restricted release. Currently the Maine Dam Safety Program does not have the capacity to convert existing map images into a georeferenced format. One future opportunity for modeling and presenting dam failure risk for non-FERC regulated dams is available through the Decision Support System for Water Infrastructural Security (DSS-WISE) Lite tool [89]. However, this tool still requires substantial knowledge of the dam site, local communities, and technical/GIS knowledge to run accurate simulations.

3.12.4 *Dam Safety Limitations [HHPD2.c]*

Though Maine's Dam Safety Program has achieved full dam regulation compliance, the program lacks the capacity to expand on current progress. For example, greater capacity is needed to develop digital resources for EAPs. More staff will be needed to monitor dam-related issues extending beyond the base requirements for dam safety inspections and EAP publication. Currently the Dam Safety Program is working collaboratively with other divisions of the Maine Emergency Management Agency, as well as other regulatory state agencies to share resources and improve GIS capabilities for updating the dam database and supporting dam safety compliance. Recently there has been a reclassification of the Program's Dam Safety Engineer position to encourage greater interest from professional engineers, and there is an Assistant Dam Safety Engineer position advertised by local university engineering programs. When these baseline requirements are addressed, the Dam Safety Program can begin to establish a HHPD funding prioritization strategy that is suited for the State of Maine.

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[88] Maine EAP guidelines: https://www.maine.gov/mema/hazards/dam-safety/emergency-action-plan
[89] DSS-WISE: https://dsswiseweb.ncche.olemiss.edu/

3.13 Severe Summer Weather – General Definition and Types of Events [S3.a., S3.b.]

For the purposes of this plan, severe summer weather events are defined as those characterized by violent weather phenomenon producing winds, heavy rains, excessive heat, lightning, and hail that can cause injuries, and destruction of property, crops, and livestock. Note: While considered "summer weather," drought and hurricanes are not included in this profile as they are profiled separately within this section of the plan.

3.13.1 Severe Weather

Thunderstorm

A thunderstorm is formed from a combination of moisture, rapidly rising warm air, and a force capable of lifting air such as a warm or cold front, or a sea breeze. All thunderstorms have lightning and can occur singly, in clusters or in lines. Lightning is an electrical discharge that results from the buildup of separated positive and negative charges within a thunderstorm. When the buildup becomes strong enough, an electric current forms between the separated charges, commonly known as a 'bolt' of lightning. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling causes thunder [90].

Tornado

Tornadoes are violently rotating columns of air touching the ground, usually generated by especially severe thunderstorms. Tornadoes are nature's most violent storms, develop extremely rapidly, and may dissipate just a quickly. Most tornadoes are on the ground for less than 15 minutes. Spawned by powerful thunderstorms, tornadoes can cause fatalities and devastate a neighborhood in seconds. Winds of a tornado may reach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long. Strong downburst (straight-line) winds may also occur due to the same thunderstorm, but these are independent of tornado winds. Hail is very commonly found very close to the tornadoes, as the strongest thunderstorms that spawn tornadoes are formed under the atmospheric conditions that are also highly likely to make hail [91]. For all their destructive fury, tornadoes are relatively small when compared to some other extreme weather events. Hurricanes, for example, can span hundreds of miles, whereas the biggest tornado ever recorded measured 4.2 kilometers (2.6 miles) wide. They are also very short lived, lasting from a few seconds to a few hours as opposed to days or weeks at a time [92].

Strong straight-line winds

Damaging winds are often called "straight-line" winds to differentiate the damage they cause from tornado damage. Strong thunderstorm winds can come from a number of different processes. Most thunderstorm winds that cause damage at the ground are a result of outflow generated by a thunderstorm downdraft. Damaging winds are classified as those exceeding 50-60 mph [93].

[90] NWS Thunderstorm definition: https://www.weather.gov/phi/ThunderstormDefinition
[91] NWS Tornado definition: https://www.weather.gov/phi/TornadoDefinition
[92] Tornadoes and Climate Change: https://education.nationalgeographic.org/resource/tornadoes-and-climate-change
[93] NWS wind definition: https://www.nssl.noaa.gov/education/svrwx101/wind/

Microburst

A microburst is a localized column of sinking air (downdraft) within a thunderstorm and is usually less than or equal to 2.5 miles in diameter. Microbursts can cause extensive damage at the surface, and in some instances, can be life-threatening. There are two primary types of microbursts: 1) wet microbursts and 2) dry microbursts. Wet microbursts are accompanied by significant precipitation. Updrafts within thunderstorms may be strong enough to suspend large amounts of water droplets and hailstones as a “core” in the upper portions of the thunderstorm. Evaporation from lofted water droplets and hail cools the air (evaporational cooling), causing it to sink and eventually weakening the updraft. As a result, the core plummets to the ground causing very strong straight-line winds to spread out in all directions. The location in which the microburst first hits the ground experiences the highest winds and greatest damage [94].

Hail

Hail is a form of precipitation occurring when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into ice. Hailstones then grow by colliding with liquid water drops that freeze onto the hailstone’s surface. The hail falls when the thunderstorm's updraft can no longer support the weight of the hailstone, which can occur if the stone becomes large enough or the updraft weakens [95]. Hailstones larger than 1 inch in diameter are capable of causing property damage. But from an agricultural perspective, hailstones below 1 inch diameter can wipe out a crop of apples, peaches, strawberries, and other fruit in a matter of seconds. Hail is a common cause of crop loss in apples and protective netting is used in regions where hailstorms are more prominent.

3.13.2 Extreme Heat

Extreme heat is defined as summertime temperatures that are much hotter and/or humid than local and seasonal average conditions. Maine’s Center for Disease Control classifies an extreme heat event as one with temperatures above 90 degrees lasting for three or more days. Heat is the leading cause of weather-related deaths in the United States. Heat-related illnesses, like heat exhaustion or heat stroke, happen when the body is not able to properly cool itself. While the body normally cools itself by sweating, during extreme heat, this might not be enough. In these cases, a person’s body temperature rises faster than it can cool itself down. This can cause damage to the brain and other vital organs [96].

3.14 Severe Summer Weather – Location of Hazard [S3.a.1]

3.14.1 Storm-related events

The entire state is vulnerable to one or more severe summer storms each year, usually in the form of thunderstorms, strong winds, and heavy rain. Fortunately, the effects are often more common in the less populated areas of the western, mountainous regions, and less noticeable along the more populated Atlantic coast where the cooling effects of the ocean tend to suppress thunderstorm conditions. Weather events such as hail, tornadoes, and microbursts may also occur anywhere in the state but are less common with more localized impacts (Figure 3.13).

[94] NWS Microburst definition: https://www.weather.gov/bmx/outreach_microbursts
[95] NWS Hail definition: https://www.nssl.noaa.gov/education/svrwx101/hail/
[96] CDC Extreme Heat website: https://www.cdc.gov/disasters/extremeheat/heat_guide.html

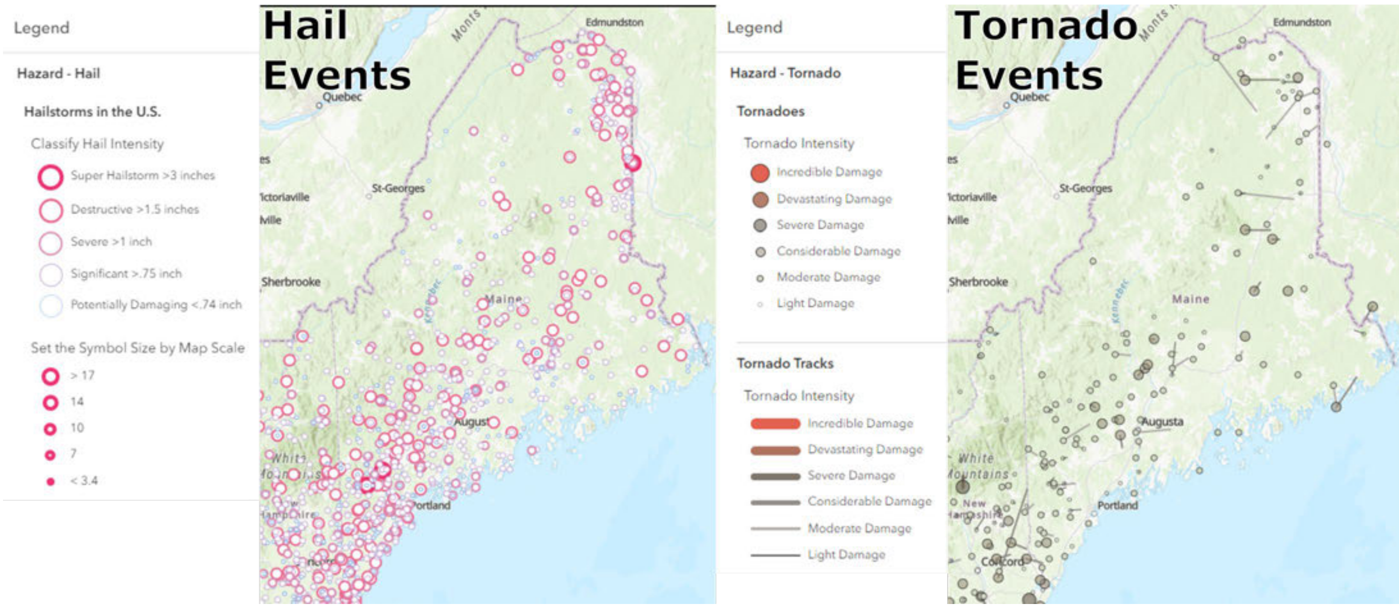

Figure 3.13: NOAA historic reports of hail (left) and tornado (right) events in Maine.
Hail: https://maine.maps.arcgis.com/home/item.html?id=5972242f44714758b97c415a62a49ad5
Tornado: https://maine.maps.arcgis.com/home/item.html?id=0db253f3e83a4c5f9f5ab9577f2dcb49

3.14.2 Extreme Heat

Extreme heat can occur throughout the entire state, with southern counties generally experiencing a greater number of days with high heat index. Locations susceptible to extreme heat are expected to increase with the rise in average global temperatures [97] (Figure 3.14). Of these locations, urban centers are susceptible to heat-related impacts due to the urban heat island effect [98] (Figure 3.15a). However, rural populations are found to be even more vulnerable to extreme heat, suffering heat-related illnesses at five to ten times the rates of people in urban areas (www.aamc.org/news/rural-americans-find-little-escape-climate-change). Maine CDC has conducted some preliminary assessments of the heat island effect in a few urban centers. Some refined work in Biddeford indicates a relatively large and impactful urban heat island effect in the city, though not to the degree seen in large urban centers outside of Maine. This work is benchmarked using studies from New York City. However, the impacts may be greater for Maine residents acclimated to a lower average summer temperature. Heat-related health risks are more common in York, Cumberland, and Androscoggin counties relative to other northern regions. Occurrences are rare in Aroostook County (Figure 3.15b).

[97] Killer heat un the United States: the future of dangerously hot days

[98] Li Y, Odame EA, Silver K, Zheng S (2017) Comparing Urban and Rural Vulnerability to Heat-Related Mortality: A Systematic Review and Meta-analysis. J Glob Epidemiol Environ Health 2017: 9-15. doi:https://doi.org/10.29199/2637-7144/GEEH-101016

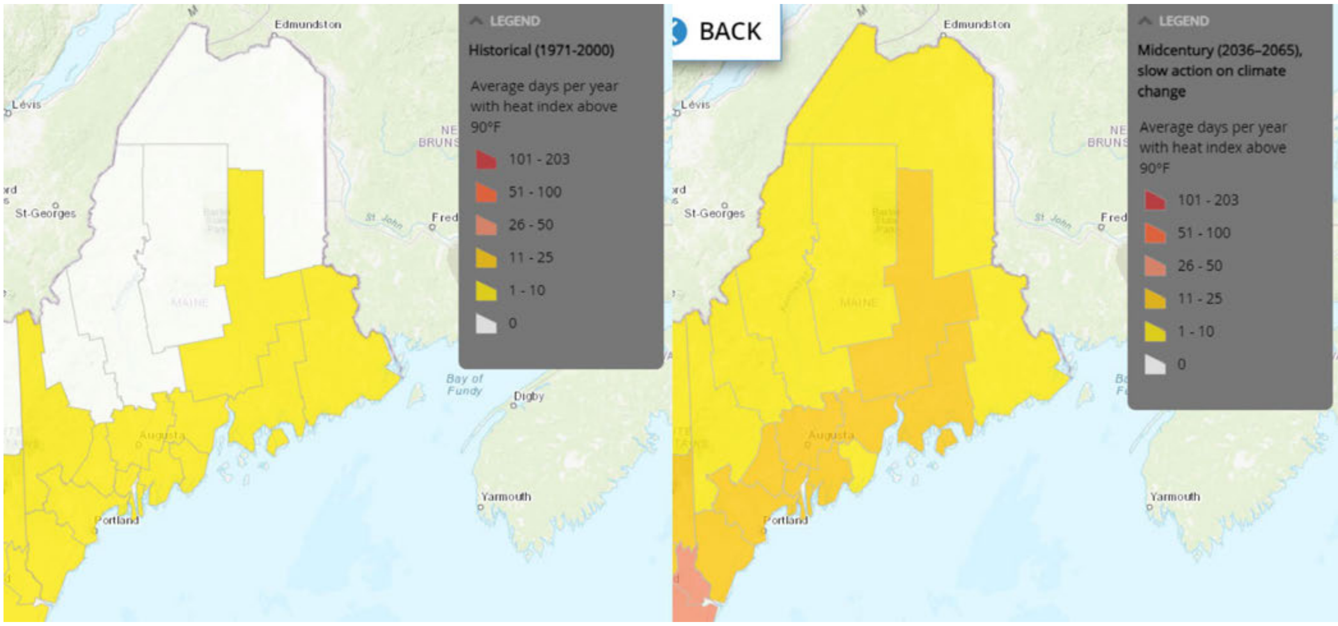

Figure 3.14: Historic (left) and midcentury model-projected (right) average number of days with heat index above 90° F. https://ucsusa.maps.arcgis.com/apps/MapSeries/index.html?appid=e4e9082a1ec343c794d27f3e12dd006d

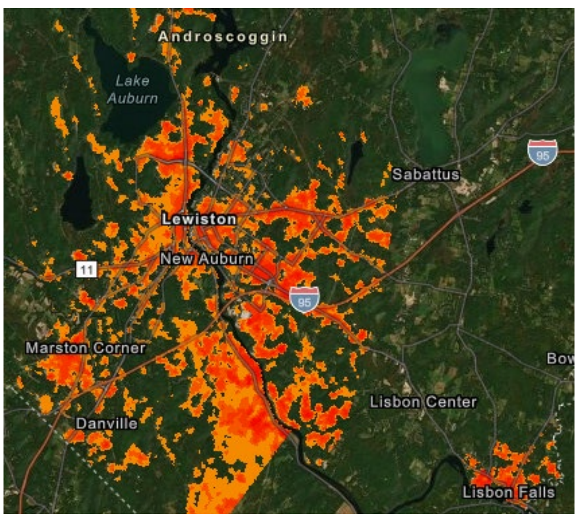

Figure 3.15a: example of urban heat island effect in Lewiston-Auburn Area. Red shaded area indicates elevated temperatures, deeper red color indicates greater heat intensity.

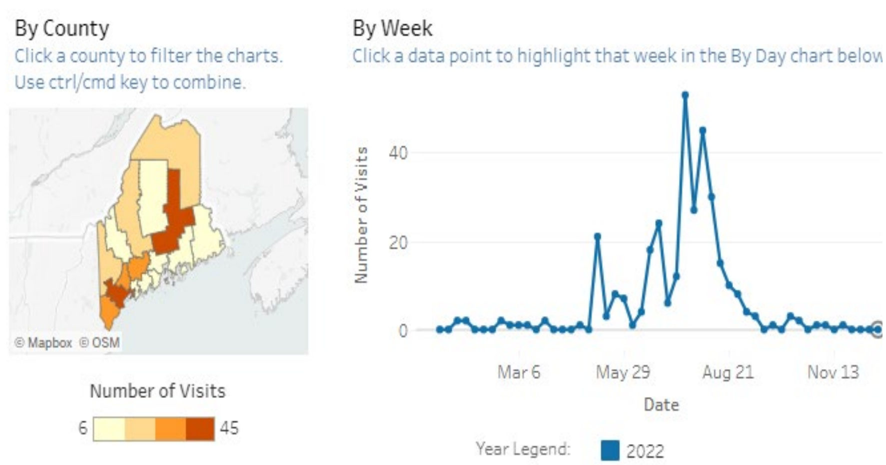

Figure 3.15b: [Heat-related illness trends in Maine by county and date](#).

3.15 Severe Summer Weather – Intensity and Previous Occurrences [S3.a.2.]

The methods outlined below are used to classify the strength or magnitude of possible severe summer weather events.

3.15.1 Thunderstorm

The National Weather Service defines severe thunderstorms as damaging wind gusts greater than 58 mph and/or hail stones greater than 1". Considerable thunderstorm damage is defined as 70 mph winds and 1.75" hail. Destructive thunderstorm damage is defined as 80 mph winds and 2.75" hail.

3.15.2 Lightning

The extent of a lightning event can be measured by the amount of energy discharged. However, *all* lightning strikes present an immediate threat to life safety and potential wildfires, so the extent of a lightning event will not be discussed further in this plan.

3.15.3 Tornado

Maine uses the Enhanced Fujita Tornado Scale to classify the extent of a tornado (Table 3.16).

Table 3.16: The Enhanced Fujita Tornado Scale (abbreviated)

Scale	3 Second Gust	Typical Effects
EF0	65-85 mph	Gale tornado (weak); light damage to chimneys; breaks twigs and branches off trees; pushes over shallow-rooted trees; damages signboards; some windows broken.
EF1	86-110 mph	Moderate tornado (weak); Moderate damage: peels surface off roofs; mobile homes pushed off foundations or overturned; outbuildings demolished; moving autos pushed off roads; trees snapped or broken.
EF2	111-135 mph	Significant tornado (strong); considerable damage: roofs torn off frame houses; mobile homes demolished; frame houses with weak foundations lifted and moved; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
EF3	136-165 mph	Severe tornado (strong); severe damage: roofs and some walls torn off well-constructed houses; trains overturned; most trees in forests uprooted; heavy cars lifted off the ground and thrown; weak pavement blown off roads.
EF4	166-200 mph	Devastating tornado (violent); devastating damage: well-constructed homes leveled; structures with weak foundations blown off some distance; cars thrown and disintegrated; large missiles generated; trees in forest uprooted and carried some distance away.
EF5	Over 200 mph	Incredible tornado (violent); Strong-framed, well-built houses leveled; steel-reinforced concrete structures damaged, tall buildings collapse or have severe deformations; some vehicles can be thrown great distances.

Source: The Enhanced Fujita Scale (EF Scale), National Weather Service. (https://www.weather.gov/oun/efscale)

Maine tornados have been documented on the NOAA website; see Table 3.17. Because there have been no F3 or greater tornados reported, only the worst occurrences, F2s, are captured below. When the history of occurrences in Maine is considered, there have been a total of 19 F2 tornados over a 71-year period, averaging 0.27 F2 tornados per year. A total of 139 tornados of any magnitude have occurred in Maine since reporting began in 1950, averaging 1.96 tornados per year in Maine.

Table 3.17: F2 & EF1 Tornados in Maine (1950 –2021) [99]					
Tornado Scale	Reported Occurrences	Deaths	Injuries	Damages	Damages per Event
F0 or EF0	35	0	1	$131,000	$3,723
F1 or EF1	73	0	13	$30,411,000	$416,589
F2 or EF2	19	1	4	$1,450,250	$76,329
Undefined	12	0	2	$315,250	$26,271

3.15.4 Hail

The extent of damage from a hailstorm event is generally measured based on the average range of hail sizes. One example of this is the TORRO Hailstorm Intensity Scale or H Scale [100].

There have been 1,163 reports of hailstorms in Maine with average ail size equal to or greater than ¾ inch since the first reported event in 1957 (Table 3.18). One-third of these hailstorms have occurred in June, while roughly one-quarter have each occurred in July and August. A minority of hailstorms have occurred outside of the summer season. Of these reports, approximately 23% of all hailstorms generated hail greater than an inch in diameter. There have been three reports of hail reaching four inches in diameter, roughly equal to grapefruit size.

Table 3.18: Hailstorms in Maine (1950 –2021) [101]			
Hailstone Size	Reported Occurrences	Injuries	Damages
< 1 inch	477	0	$160,000
1 – 2 inches	651	2	$1,701,000
> 2 inches	35	0	$500

3.15.5 Extreme Heat

The severity of an extreme heat event can be a result of one exceptionally warm day or from the cumulative effect of a series of consecutive warm days. Maine CDC uses these thresholds and terminology to categorize an extreme heat event:

Danger (NWS Excessive Heat Warning): Heat index values of 105 or greater lasting two hours or more.

Extreme Caution (NWS Heat Advisory): Heat index values of 94 to 104 for two or more hours.

[99] NOAA Storm Events Database: https://www.ncdc.noaa.gov/stormevents/
[100] H Scale: https://www.torro.org.uk/research/hail/hscale
[101] NOAA Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

NOTE: The highest temperature ever recorded in Maine is 105° F on July 10th, 1911, in Bridgton.

From 2018 to 2021 there have been 9 heat wave episodes reported in NOAA's Storm Events Database with elevated heat indices impacting 6 of 16 counties. Nationally, extreme heat has been the greatest weather-related cause of death in the US for the past 30 years, killing over 700 people per year [102] (Figure 3.16).

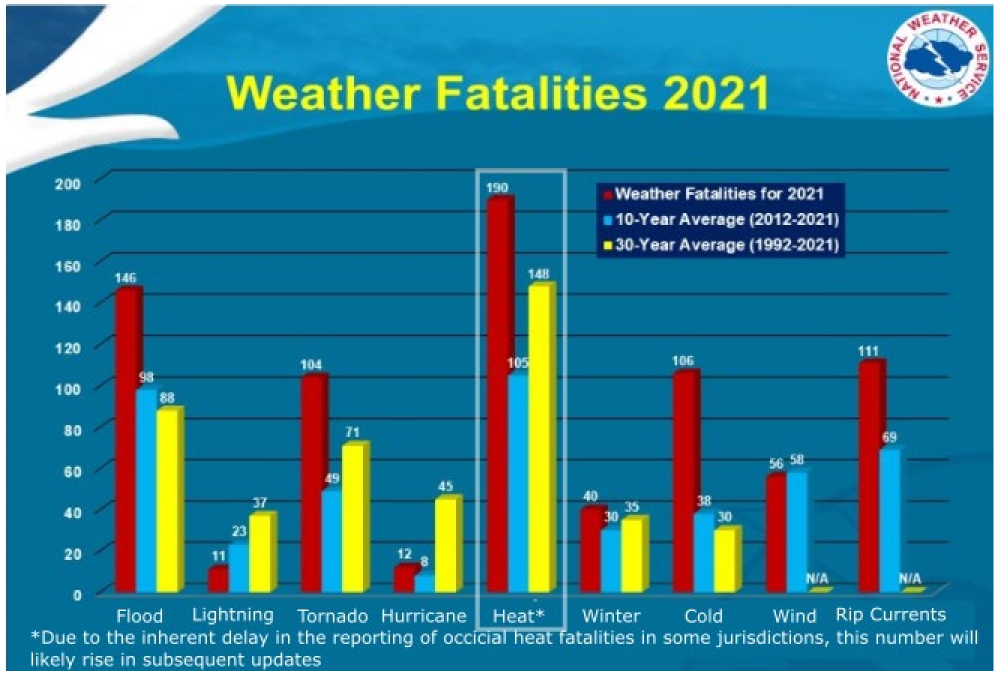

Figure 3.16: fatalities reported by weather related hazards. https://www.weather.gov/hazstat/

102 NOAA Weather Related Fatality and Injury Statistics: https://www.weather.gov/hazstat/

3.16 Severe Summer Weather – Probability of Future Occurrence [S4.]

3.16.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Summer Storm

Based on past experiences, and the frequency of National Weather Service Warnings, there is a high probability the state can expect thunder and lightning every year, especially in the summer months. According to NOAA, there were 211 lightning events and 2,713 thunderstorm wind events recorded in Maine between 1950 and 2021. Based on historical records, Maine can expect several lightning events and thunderstorms each year.

Climate change projections indicate a growing prevalence of warm, moist air conducive to thunderstorm activity in Maine. The occurrence of thunderstorms in Maine is therefore expected to increase through the next five years and indeed through future Plan updates.

EF2-5 Tornado

While the state has not done probability studies, historically, the probability of an EF2 strength tornado or greater is low. The National Weather Service recorded 79 tornados, with a magnitude of (E)F1 or greater in Maine between 1954 and 2014. Based on that history of previous occurrences, Maine can expect an average of approximately 1.33 tornados a year.

As noted by the National Geographic Resource Library [103], predicting whether climate change will have an effect on the frequency and power of tornadoes is a challenge. The brief, highly localized damage caused by tornadoes is challenging to capture in broadscale climate projection models. Scientists therefore instead focus on how climate change might affect the individual weather "ingredients" that support the development of supercell thunderstorms (the type that produce tornadoes), including the co-occurrence of warm, moist air; an unstable atmosphere; and sufficient wind shear.

As global temperatures rise, the hotter atmosphere is able to hold more moisture. This increases atmospheric instability, a vital supercell ingredient. On the other hand, as the planet warms, wind shear (another vital ingredient) is likely to decrease. These two forces work against each other, and it is difficult to anticipate which might have a greater impact on tornado formation.

Some studies predict that climate change could provide the opportunity for more severe thunderstorms to form. However, this does not necessarily mean that more tornadoes will occur, especially in light of the fact that only about 20 percent of supercell thunderstorms produce tornadoes. To complicate things further, no one fully understands how tornadoes are formed.

Hail

Research is inconclusive on whether hailstorms will become more common in Maine, and it is not known whether use of protective netting will need to become standard practice for fruit production.

Extreme Heat

As noted above, occurrences of high heat index days and heat-related illnesses are expected to increase, and more communities will be impacted by heat as annual average temperatures continue to rise.

[103] Tornadoes and Climate Change: https://education.nationalgeographic.org/resource/tornadoes-and-climate-change

Severe Summer Weather – Vulnerability Assessment

TIER 1 HAZARD

3.17 Severe Summer Weather – Impacts

Maine generally experiences comfortable summer weather, which encourages residents from in state and away to recreate out of doors, and often times away from permanent structures. Those recreating on trails, in boats, or in campgrounds are vulnerable to immediate physical damage from a severe summer weather event. Economic stakeholders of Maine's tourism industry are susceptible to economic damage in the event of hazardous summer weather.

Flooding is a viable consequence of severe summer weather with location-specific impacts, refer to the flooding vulnerability assessment for reference.

Strong straight-line winds are one of the most damaging consequences of severe summer weather, often from trees falling onto buildings, roads, railways, and power lines. Refer to the tropical cyclone vulnerability assessment for further reference. Though rare in Maine, tornadoes have significant damage potential within a focused path. Hail has a potential to cause damage to homes, crops, forests, and infrastructure but historically the impact of hail has been relatively limited in Maine. Most severe summer weather events tend to be highly localized, causing substantial damage in a relatively small area.

Power outages are the primary impact of damaging winds. Maine experienced the greatest number of power outages than any other state on average from 2015 to 2019 [104]. Power outages can be widespread and may extend beyond the scale of the damaging summer storm itself, especially in rural areas without redundancies in the local energy grid. The impacts of power outages are many, and may include loss of perishable food supplies, temporary loss of business and services, and temporary loss of medical equipment and air conditioning requiring power, which may potentially lead to loss of life. State offices are unable to function without power and so all non-critical state functions would halt until power is restored. Luckily, most critical state functions, such as MEMA's Emergency Operations Center, are supported by backup generator power. Installation of generators in critical facilities is a common mitigation strategy in Maine.

According to the U.S. Center for Disease Control, older adults, the very young, people with mental illness, and chronic diseases are the most vulnerable to feeling the impacts of an extreme heat event (https://www.cdc.gov/disasters/extremeheat/heat_guide.html). If extreme heat coincides with a loss of power, the impacts of heat-related diseases, and stress on the critical medical services deployed to address these incidents, increases substantially.

Wind damage can have major impacts on working forests and natural areas protected by the state. Damage to standing timber will impact Maine lumber, pulp, and other wood products industries which compose a major part of the State's economy. Wind and flood damages to protected areas may lead to long-term or permanent impacts to Maine's unique ecosystems. Debris blown onto roads and power lines requires lengthy cleanup efforts and detours for commuters.

In the summer, southwest to southerly winds tend to become prevalent across the state. Because of the frequent formation of sea breezes, southerly winds prevail along the Mid-Coast and "Down East" portions during the

[104] Power outage statistics: https://www.mroelectric.com/blog/most-least-power-outages

summer months. When severe summer storms arrive in the state, high winds can cause fallen trees and branches onto power lines, causing power and communication outages. Heavy rains that often accompany thunderstorms can result in flash flooding or erosion. Hail can cause crop damage for farmers and backyard gardeners. Lightning strikes can start fires. Any of these weather events can cause personal injury or property damage.

Because of Maine's sparse population, there have been no significant amounts of property damage or personal injury. Reports of tornado damage are usually limited to individual properties that have been struck. If a tornado were to strike a mobile home park, there would inevitably be substantial damage. The tornados experienced in recent history in Maine have been generated by severe summer storms with the southwestern and central sections of the state most often affected.

Due to severity of summer storms Maine residents often experience brief power outages, posing an increased risk to elderly and disabled populations.

3.18 Severe Summer Weather – Vulnerability of State Assets [S5.]

Summer storm damages such as thunderstorms and F0-F2 tornadoes to state owned or operated buildings or infrastructure are no more likely than damages to other buildings or infrastructure. General damage can be caused by flooding or wildfires, but these are covered in their own sections. Costs typically come from the overtime use of Maine Department of Transportation and National Guard personnel and equipment to clear state-maintained roads of debris. Although utilities can be damaged during summer storms, the utilities are owned and operated by private utility companies.

Structure asset data provided by the Maine Department of Administration and Financial Services Bureau of General Services forms the basis for this assessment. All locations within Maine are potentially susceptible to severe summer weather, therefore a GIS analysis is not provided for this section, nor are there selected state assets that are particularly vulnerable to these hazards.

3.18.1 Potential Dollar Losses to State owned buildings, infrastructure, critical facilities

State facilities that would be used during an emergency or disaster for response or recovery are not at an elevated risk from severe summer weather, though all state assets may be at minor risk of damages and temporary power outages.

Wind, hail, and tornado damages are anticipated to be localized and would likely impact wood framed structures to a greater degree through direct wind, precipitation, or falling debris damage. No probability spatial overlays for these hazards exist for Maine. The occurrence of wind damage is expected to be local, from isolated thunderstorms that may be scattered throughout a larger impacted area. Therefore, damage estimates for strong winds (damaging 70 mph gust [105]) account for 2% of the total valuation for wood structure assets [106]. Total losses for the state, assuming a statewide disaster, may equal $16.4 million. Conversely, the impacts of hailstorms and tornadoes are expected to be highly localized, assumed here to only damage 0.2% of all assets with a total amount equal to $1.6 million. There is no guarantee that these assets will be damaged in a natural hazard event.

[105] NOAA wind threat definitions: www.weather.gov/mlb/wind_threat

[106] Pita, G., Pinelli, J. P., Gurley, K., & Mitrani-Reiser, J. (2015). State of the art of hurricane vulnerability estimation methods: a review. *Natural Hazards Review*, *16*(2), 04014022.

3.18.2 Community lifeline Risks

Severe summer weather is anticipated to primarily impact transportation, energy, medical, and communication lifelines to the greatest degree.

Transportation

Summer storms can require a significant amount of debris cleanup before roads are reopened to the public. This means that access to other critical facilities may be hindered until debris cleanup is complete. Debris cleanup resource needs are difficult to estimate due to huge variations of the amount of debris involved in any given event, whether debris is tangled in utility lines, and where it's being hauled to. A ballpark estimate for brush removal is around $20,000 per shoulder mile for roads managed by MaineDOT. Non-tropical severe summer weather events are not typically substantial enough to warrant a disaster declaration, but in the past these impacts have cost towns and State Government hundreds of thousands of dollars in damages, labor costs, and indirect impacts to commerce, shipping, and service coverage. Damages from tornadoes would be more focused and likely far more destructive than thunderstorm winds. Damage by hail alone would be less significant but would have the greatest impact on structures designed with less resilient building materials such as wood and vinyl siding, both of which are common materials used in Maine.

Energy

Primary impacts of severe summer storms on the energy sector are strong winds damaging transmission lines. The impacts of power outages are similar to that of flooding. After large summer storms, it often takes several days to clear debris and restore power. Power outages are a very common occurrence across the entire state, but rural areas tend to have far more prolonged outages.

Severe summer storm events such as hail and tornadoes may have direct impacts on energy production. Table 3.19 presents observational records of hail and tornado occurrence discussed above by tracking the occurrence of these events within 10 miles of power plant locations. Power plants do not have any higher level of exposure to these hazards than other types of infrastructure based on the distribution of power plant sites in Maine, combined with the reported locations of hailstorms and tornadoes. Location-specific vulnerability data are not currently available for transmission line exposure because there is generally equal risk of wind damage across the state from severe summer weather.

Table 3.19: Occurrence of hailstorms and tornadoes within 10 miles of current power plant locations, 1950-present.

Type of Power Plant (total count)	Hailstorms	Tornadoes
All types (106)	603	62
Solar (8)	121	20
Wind (18)	94	13

Maine solar energy farms have grown sevenfold in the last few years. Many solar panel manufacturers affirm that installed panels can resist damage from the magnitude of hailstorms and windstorms commonly experienced in Maine. However, under extreme conditions, damage to Maine's solar infrastructure would have substantial long-term impacts on Maine's grid resilience and goals for green energy production.

Medical

Extreme heat can result in substantial medical impacts, as noted in Maine CDC's Extreme Heat Plan [107]. In addition to the concerns identified in the hazard profile, an additional concern is that not all assisted living centers have installed air conditioning. More specifically, many coastal nursing homes have relied on typically more moderate temperatures but now require air conditioning due to rising atmospheric temperatures. All 90 nursing

[107] Maine CDC Extreme Heat Plan: https://www.maine.gov/dhhs/mecdc/public-health-systems/phep/documents/mainecdcallhazheat.doc

homes in Maine could be at risk of power outages, though not all at once would be at risk of power outages by localized severe summer weather events. It is unknown how many of these have backup generators.

Communication

Thunderstorm winds are the likeliest hazard to stress Maine's ability to effectively distribute emergency communications to the public. Wind can cause cyclical loading on towers and guy wires. After a certain point, this cyclical loading will cause permanent damage that can lead to failure. Any tower should be checked on a regular basis for this type of wear before it leads to a major problem [108]. Impacts to cell service are expected to be localized based on the location and extent of the wind event. Though cell towers usually have backup generators, the tower would still be nonfunctional if there was direct damage to the structure itself. State employees and public citizens alike depend heavily on cell service for communication and a large outage event would cause major issues. The threat of thunderstorm winds is uniform across the state.

3.19 Severe Summer Weather – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

Similar to state assets, the greatest impacts of severe summer weather, such as hail and tornadoes, are expected to occur in localized areas. Damaging winds and flooding may impact a broader area, please refer to the tropical cyclone and flooding sections for more information.

3.19.1 Identifying Jurisdictions with greatest vulnerability [S6.a.1.]

All jurisdictions are potentially vulnerable to damages from severe summer weather. Other than wind and lightning damage, there is no conclusive indication that any one jurisdiction is more likely to experience an event than others (Figure 3.17). However, regions that are more densely populated, such as Cumberland and York counties, or jurisdictions with relatively less community resilience, may host a greater total impacted population if an event were to occur. Jurisdictions with a greater proportion of elderly or disabled community members may also be at greater risk from hazards such as summer heatwaves.

[108] Common causes for tower failure: https://www.tower-engineers.com/unnamed

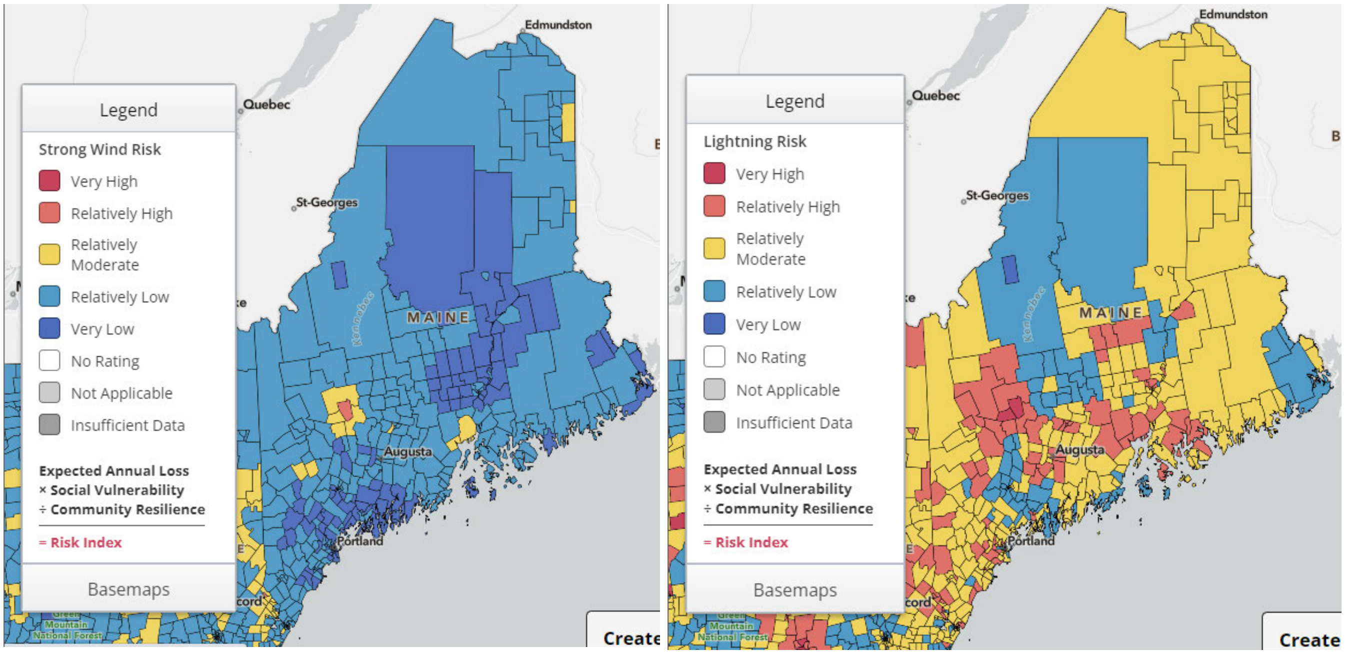

Figure 3.17: National Risk Index maps of strong wind (left) and lightning (right) risk. https://hazards.fema.gov/nri/map#

Disadvantaged Communities

The objective of the disadvantaged communities' assessment is to identify potential disadvantages felt by communities who are disproportionately impacted by natural hazards both historically and under future projections. Severe summer weather contains a large number of hazards that may occur individually or together in a larger storm. Based on analysis of FEMA's National Risk Index, severe summer weather events are not expected to occur any more frequently in disadvantaged communities than elsewhere, though the vulnerability of these communities is expected to be much greater due to a relative deficit of infrastructure, services, social networks, and the financial means of mitigating against natural disasters.

Heat waves and high heat index days are anticipated to increase within the next decade, with amplified impacts expected for disadvantaged communities experiencing socioeconomic, health, and environmental deficits. Strategies for equitable heat adaptation will be crucial to offset the growing risk of heat-related illness and death in hardest hit communities. Extreme heat mortality disproportionately affects Native American and Black communities, as well as those living in the urban core or very rural neighborhoods, according to the Centers for Disease Control and Prevention (CDC) [109]. For Maine, these urban centers include Portland, Lewiston/Auburn, and Bangor, All of which also host high SVI values and therefore are inherently vulnerable.

[109] https://www.noaa.gov/news-release/biden-administration-launches-heatgov-with-tools-for-communities-facing-extreme-heat

3.19.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Damage Assessments from Disaster Declarations

The windstorm of October 2017 caused substantial damage across 13 of 16 counties (185 municipalities), much of which came in the form of downed trees on roads and power lines. Though it is a fall storm, debris damages from summer events would be similar. MEMA's Public Assistance Program reports that debris removal costs for the entire impacted region amounted to $8.3 million (2022 USD). Given that the total amount of state and municipal roads in the impacted areas is approximately 23,000 miles (39% state/state aid, 61% townway), the cost of debris cleanup per mile for an equivalent event is $361 per mile. Please note that the total number of impacted roadways is unknown, therefore this cost per mile is spread over the entirety of the impacted counties and is considered a substantial underestimate.

Hazard-Asset Footprint Overlay Analysis

Much like state assets, it is not expected buildings will suffer 100% in losses from severe summer weather. Wind damage estimates reported here therefore account for only 2% of the valuation for assets.

The total estimated value of all identified buildings in Maine is $329 billion. The proportion of more vulnerable wood framed structures is unknown but assumed to make up the majority of construction in Maine. Assuming widespread strong winds (damaging 70 mph gust [110]) damaging 2% of all identified buildings in the state, the total amount may equal $6.6 billion. The impacts of hailstorms and tornadoes are expected to be highly localized, assumed here to only damage 0.2% of all assets with a total amount equal to $658.8 million.

[110] NOAA wind threat definitions: www.weather.gov/mlb/wind_threat

Tropical Cyclone – Hazard Profile

TIER 1 HAZARD

3.20 Tropical Cyclone – General Definition and Types of Events [S3.a., S3.b.]

Tropical cyclones are warm-core non-frontal synoptic-scale cyclones, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere. In this way they differ from extratropical cyclones, which derive their energy from horizontal temperature contrasts in the atmosphere (baroclinic effects). Tropical cyclones rotate counterclockwise in the northern hemisphere. Hurricanes and tropical storms are classifications of tropical cyclones [111].

Tropical cyclones are a cause of several natural hazards. The primary hazards associated with tropical cyclones, as identified by the National Hurricane Center, are listed below and further defined in the Flooding and Severe Summer Weather Events Hazard Profiles above.

3.20.1 Inland Flood

Inland flooding is the inundation of normally dry land due to heavy precipitation during tropical cyclones. It is common for fast moving tropical systems to provide between 6 to 12 inches of precipitation in a very short amount of time, while slower moving systems (including tropical storms that have been downgraded to "lows") may result in even more precipitation. Such large amounts of precipitation overwhelms streams, rivers, and stormwater infrastructure, commonly resulting in inland flooding of low-lying areas.

3.20.2 Coastal Flood: Storm Surge and Waves

One of the largest risks with tropical cyclones is storm surge. Storm surge is the abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. Storm surge is generally caused by a storm's winds pushing water onshore. The amount of storm surge at any given location depends on the shape of the coastline (straight, open coast vs. peninsulas), the orientation of the coastline in relation to a storm track; the intensity, size, and speed of the storm; and the local bathymetry [112]. Land areas within enclosed bays or at the heads of rivers can be especially susceptible to storm surges though they may be several miles from the open coastline. Along the open coast, an additional factor is coastal waves that form during tropical systems. As storm winds blow across the surface of the ocean, the continual disturbance creates waves. When storm winds blow for extended periods of time and over large distances, wave heights increase. Tropical systems that stay well out to sea can produce large swells with long periods (time between wave crests), but these typically don't cause much damage. However, as systems approach the coastline, these waves can batter the coastline, resulting in erosion, overtopping, flooding, and damage to infrastructure.

3.20.3 Strong Straight-Line Winds

Strong straight-line winds are common in tropical cyclones. The degree of damage from the winds depends on the strength of the storm and its angle of approach. These winds, named for their damage path, are distinct from tornadoes because their destruction lies in a straight line, pushing debris in the same direction that the storm is moving [113]. The classification of a tropical cyclone is based on wind speed.

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[111] NHC Tropical cyclone definition: https://www.nhc.noaa.gov/aboutgloss.shtml
[112] NOAA Bathymetry: https://oceanservice.noaa.gov/facts/bathymetry.html
[113] Straight-line winds: https://www.aspwindows.com/damaging-types-of-wind-prep/

3.20.4 Tornado

Hurricanes and tropical storms can produce tornadoes. These tornadoes most often occur in thunderstorms embedded in rain bands well away from the center of the hurricane; however, they can also occur near the eyewall. Most tornadoes associated with tropical systems occur in the right front quadrant of the storm. This area typically has the best wind shear and instability. Tornadoes will scatter damage debris in various directions. Usually, tornadoes produced by tropical cyclones are relatively weak and short-lived, but they still pose a significant threat [114].

3.21 Tropical Cyclone – Location of Hazard [S3.a.1.]

Tropical cyclones that can threaten Maine originate in the Atlantic basin which includes the Atlantic Ocean, Caribbean Sea, and the Gulf of Mexico. Hurricanes typically weaken before reaching Maine, but it is possible for strong systems to reach the state. NOAA's Historical Hurricane Tracks tool indicates that 65 tropical systems cyclones have passed through Maine's borders since 1851. According to this same tool, only five of these systems have been hurricanes and actually made direct landfall along the Maine coastline. However, it is important to note that systems do not need to make "landfall" in Maine to have significant impacts due to coastal and inland flooding. Hurricane forecasts will have uncertainty due to variables of the hazard which include storm track and approach, storm speed, wind speed, storm size, and precipitation [115].

All of Maine is susceptible to high winds and inland flooding associated with hurricanes. Between York and Washington Counties, there are 152 local jurisdictions within ten counties that are vulnerable to inundation from storm surge. Refer to Figure 3.18 below for more information.

[114] NWS tropical tornadoes: https://www.weather.gov/cae/tropicaltornadoes.html

[115] MGS Potential Hurricane Inundation Mapping – Frequently Asked Questions: https://www.maine.gov/dacf/mgs/hazards/slosh/faq.htm

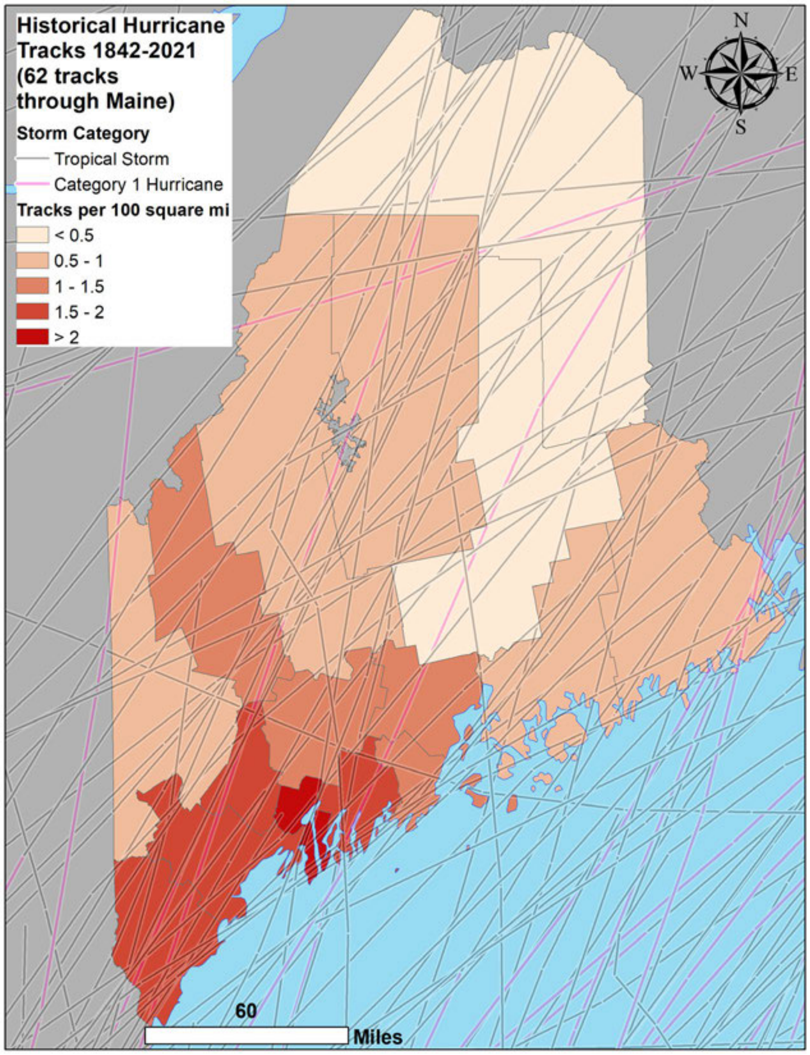

Figure 3.18: Historic storm tracks and occurrence by county [116].

116 NOAA Historical Hurricane Tracks viewer: https://coast.noaa.gov/hurricanes/

3.22 Tropical Cyclone – Intensity and Previous Occurrences [S3.a., S3.b.]

The Saffir-Simpson scale is used to determine the intensity/magnitude of tropical cyclones (Table 3.20). The scale rating is based on sustained wind speeds, but as indicated above, there are many additional hazards that coincide with strong winds that may not be fully represented by these storm categories. For example, a large Category 1 hurricane may produce a greater amount of rainfall and cause flooding and other damages over a more expansive area compared to a relatively more compact but higher wind speed Category 2 hurricane. Hurricanes with sustained winds greater than 110 mph (Category 3, 4, and 5) are considered major hurricanes.

TABLE 3.20: Saffir-Simpson Hurricane Scale with excerpt of Beaufort Wind Scale for tropical depression category

Category	Sustained Wind speed	Effects
Tropical Depression	0 to 38 mph	Tropical disturbances originate in tropical waters
	Beaufort Scale 5 19-24 mph	Moderate waves (6-10 ft), small trees begin to sway
	Beaufort Scale 6 25-31 mph	Large waves (9-13 ft), large branches in motion
	Beaufort Scale 7 32-38 mph	High wind, moderate gale, Large 13-19 ft waves, sea "heaps up," large trees in motion
Tropical Storm	Winds: 39-73 mph	Sustained winds capable of causing structural damage
Strong Tropical Storm: winds ≥ 58 mph, threshold for damaging winds		
Category 1	Winds: 74–95 mph	Very dangerous winds will produce some damage
Category 2	Winds: 96–110 mph	Extremely dangerous winds will cause extensive damage
Category 3	Winds: 111–129 mph	Devastating damage will occur
Category 4	Winds: 130–156 mph	Catastrophic damage will occur
Category 5	Winds: 157+ mph	Catastrophic damage will occur

3.22.1 Previous Occurrences

Table 3.21 summarizes the occurrences and estimated damages of tropical cyclones dating back to 1938. Damages from these events were caused by a combination of coastal storm surge, inland flooding, damaging winds, and other hazards defined above. Many of these storms did not make landfall in Maine but did pass through or near the state.

Table 3.21: History of Hurricanes

Month of Occurrence	Category	Year	County (ies)	Estimated Damage (2022 $USD)	Declaration
Sep 21	Tropical Storm	1938	Androscoggin, Cumberland, York	$2,836,685	
Sep 14	Tropical Storm	1944	Cumberland		
Aug 31 "Carol"	Category 1	1954	Cumberland, Knox, Lincoln, Sagadahoc, Waldo, York	$55,069,888 3 Deaths Power outages Downed trees	SBA
Sep 11	Category 1	1954	STATEWIDE	$77,097,844	DR-24-ME

Table 3.21: History of Hurricanes

Month of Occurrence	Category	Year	County (ies)	Estimated Damage (2022 $USD)	Declaration
"Edna"			(flooding)	8 Deaths Power outages	
Sep 12 "Donna"	Tropical Storm	1960	Cumberland	$2,502,331 Power outages	
Oct 6 "Daisy"	Category 1	1962	Cumberland (flooding)	2 Deaths Power outages	
Oct 29 "Ginny"	Category 2	1963	STATEWIDE		
Aug 9-19 "Belle"	Post-Tropical Storm	1976	Aroostook (flooding)	$20,646,411 Agricultural loss (potato crop)	SBA
Sep 6 "David"	Tropical Storm	1979	Coastal	Minor Damage	
Sep "Diana"	Tropical Storm (did not make landfall)	1984	Coastal Counties Threatened		
Sep 17 "Gloria"	Tropical Storm	1985	Androscoggin, Cumberland, Franklin, Kennebec, Somerset, York	3 Injuries Downed trees Power failures (up to 14 days, 250,000 people affected)	
Sep 10 "Bob"	Tropical Storm	1991	Androscoggin, Cumberland, Franklin, Kennebec, Sagadahoc, York	$11,980,449 3 Deaths >150,000 Power outages	DR-915-ME
Sep 16-19 "Floyd"	Tropical Storm	1999	Androscoggin, Cumberland, Kennebec, Oxford, Somerset	$2,135,525	DR-1308-ME
Aug 27-29 Tropical Storm "Irene"	Tropical Storm	2011	Franklin, Lincoln, Oxford, York	$3,478,354 Extensive flooding Power Outages Debris cleanup from high winds	DR-4032-ME
October "Sandy"	Tropical Storm (did not make landfall)	2012	N/A	Though NY and NJ had billions in damages, the storm did not cause any significant damages in Maine	N/A
July "Arthur"	Tropical Storm (did not make landfall)	2014	Washington, Hancock		N/A
September "Dorian"	Tropical Depression (did not make landfall)	2019	Washington, Hancock	Debris cleanup	N/A
September "Isaias"	Tropical Storm	2020	Sagadahoc, Cumberland, York, Waldo, Knox, Lincoln, Franklin, Oxford, Androscoggin	Limited to moderate impacts, 125,000 power outages, debris cleanup	N/A

Table 3.21: History of Hurricanes

Month of Occurrence	Category	Year	County (ies)	Estimated Damage (2022 $USD)	Declaration
Note: There have been no Presidential Declarations for Tropical Cyclones in Maine since 2011. SBA: Activation of Small Business Association Low Interest Loan Recovery Programs DR: Presidential Disaster Declaration					

Storm of Record: Hurricanes Edna & Carol in 1954

The worst hurricane damage in Maine occurred in 1954 when Hurricanes Edna and Carol swept into the state within a two-week period. Hurricane Edna made landfall near Mount Desert Island, while Carol made landfall in Connecticut and moved north toward western Maine. Maine suffered a total of 11 deaths and damages of $17 million (more than $130M in 2022 USD) as a result of these two storms. Storm force winds took down trees, debris, and powerlines. Precipitation induced inland flooding washed cars into ditches. Edna became the costliest hurricane in the history of Maine, where the hurricane caused flooding that washed out roads and rail lines. There were 21 deaths in New England, eight of whom in Maine due to drownings. Later, high winds severely damaged crops in Atlantic Canada. Though the impacts of Carol were marginally less in Maine compared to Edna, overall, the storm caused 72 fatalities and damage totaled $462 million (more than $5 billion in 2022 USD), making it the costliest hurricane in the history of the United States, at the time.

Storm of note: Hurricane Gloria, September 1985

Hurricane Gloria was a powerful hurricane that caused significant damage along the east coast of the United States and in Atlantic Canada during the 1985 Atlantic hurricane season. It was the first significant tropical cyclone to strike the northeastern United States since Hurricane Agnes in 1972 and the first major storm to affect New York City and Long Island directly since Hurricane Donna in 1960. Gloria was a powerful Cape Verde hurricane originating from a tropical wave on September 16 in the eastern Atlantic Ocean. Though it did not make landfall in Maine, Gloria made two subsequent landfalls on Long Island and across the coastline of western Connecticut, before becoming extratropical on September 28 over New England. The remnants moved through Atlantic Canada and went on to impact Western Europe, eventually dissipating on October 4.

In Maine, about 600,000 people lost power due to the storm; this was the most since the passage of hurricanes Carol and Edna in 1954. Wind gusts in Maine reached 86 mph (138 km/h), and the storm knocked down about 100 power poles in addition to the downed lines. Downed trees blocked roads and damaged houses and cars. The winds damaged roofs, including the 127-year-old spire of a church in Groveville. Damage to the apple crop was estimated at $3 million. High waves along the coast damaged lobster traps and dozens of boats, many of which were driven ashore [117].

Storm of note: Hurricane Bob, August 1991

Hurricane Bob was the second named storm and first hurricane of the 1991 Atlantic Hurricane Season. Bob developed from an area of low pressure near The Bahamas on August 16. The depression steadily intensified and became Tropical Storm Bob late on August 16. Bob curved north-northwestward as a tropical storm, but recurved to the north-northeast after becoming a hurricane on August 17 (Figure 1). The storm would brush the Outer Banks on August 18 and August 19, and subsequently intensified into a major Category 3 hurricane. After peaking in intensity with Maximum Sustained Winds of 115 mph, Bob weakened slightly as it approached the coast of New England [118].

[117] NOAA Storm Data September 1985: https://www.ncei.noaa.gov/pub/orders/IPS/IPS-42DDDF86-7D23-451F-B310-5B7A19B28650.pdf
[118] NWS Hurricane Bob: https://www.weather.gov/mhx/HurricaneBob1991EventReview

After passing over the Gulf of Maine, Bob made landfall near Rockland on the evening of August 19 as a tropical storm. A wind gust of 92 miles per hour was observed in Wiscasset. Portland received over eight inches of rainfall in just a 36-hour period. Mainers who lived within a quarter mile of the coast were urged to evacuate. Sadly, three Mainers were killed by the impacts of Bob. Over 150,000 people were left without power. The storm caused millions in damages, most of which occurred in the Portland area [119].

3.23 Tropical Cyclone – Probability of Future Occurrence [S4.]

Hurricane season in the Atlantic runs from June 1 to November 30, and hurricane threats increase late in the summer as ocean temperatures have warmed, with a peak of September 10th (Figure 3.19). Hurricane return periods in Maine range from 29 years in eastern Maine to 50 years in the midcoast/Penobscot Bay area (Figure 3.20). In other words, during the past 100 years, a Category 1 hurricane has passed within 58 miles of these locations approximately 2-3 times. Probabilistically, there is a 2-3.5% chance per year of a hurricane reaching Maine. For a major hurricane of Category 3 or greater, the occurrence period ranges from 180 years in southern and eastern Maine to 290 years in midcoast Maine, with annual probability of occurrence ranging from 0.3-0.6%.

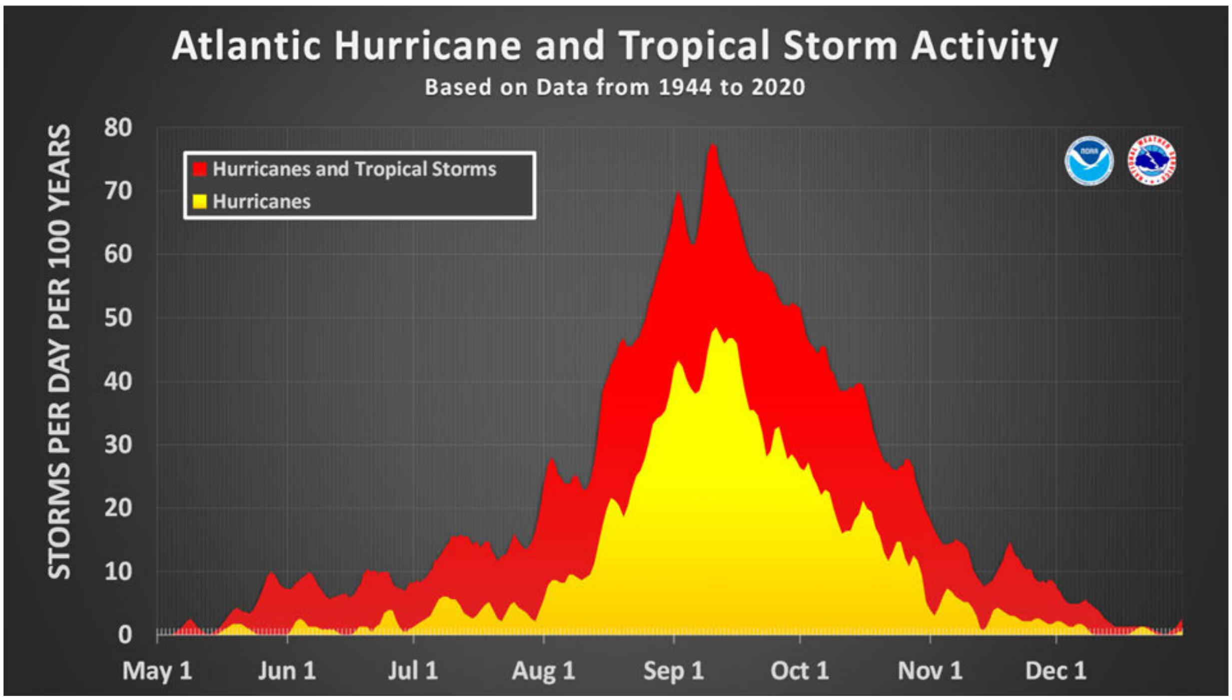

Figure 3.19: Atlantic Hurricane season tropical cyclone occurrence by classification.

[119] WGME: 30 Years later: remembering Hurricane Bob and its impact on Maine: https://wgme.com/news/local/30-years-later-remembering-hurricane-bob-and-its-impact-on-maine

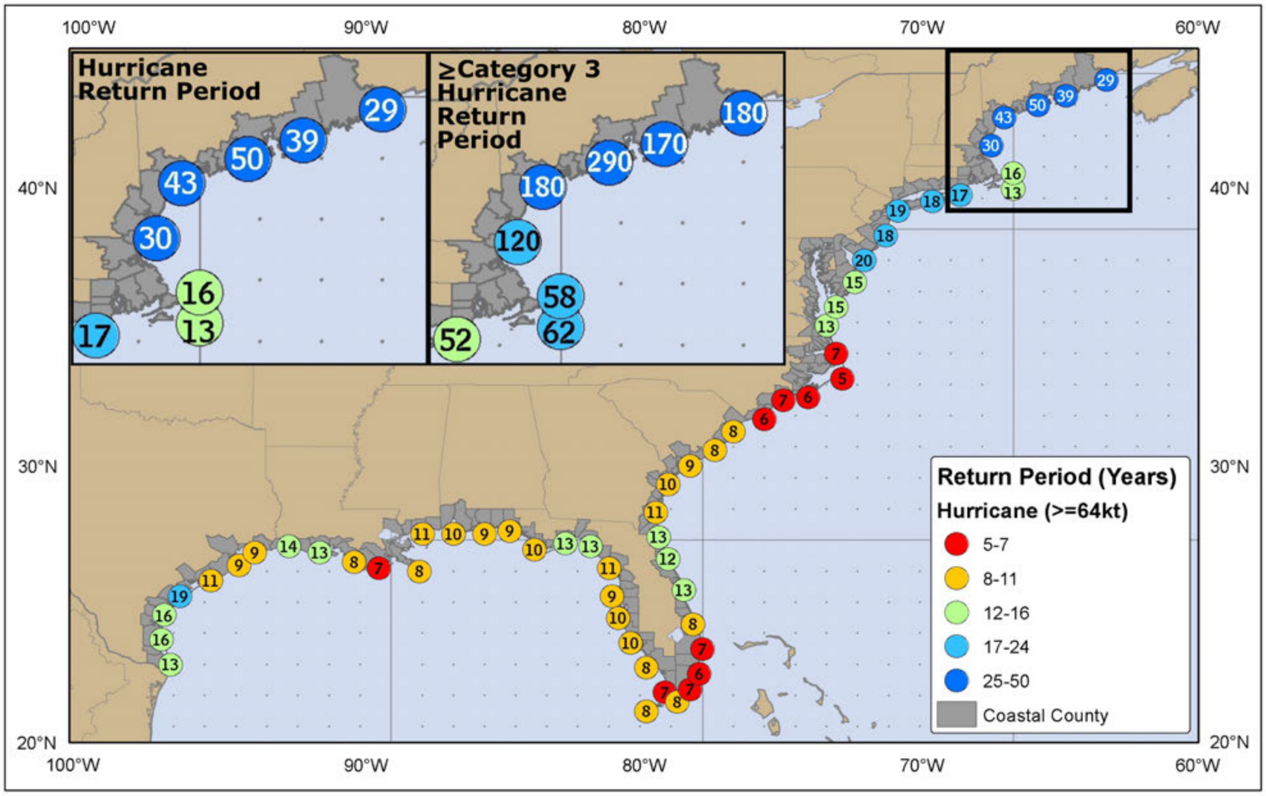

Figure 3.20: Estimated return period in years for hurricanes passing within 50 nautical miles of various locations on the U.S. Coast [120]. Black rectangle denotes map insets for Maine coast on upper left.

3.23.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Recent NOAA projections of hurricane activity originating in the Atlantic Basin support the notion of an increased intensity of approximately four percent, and higher rainfall rates of between 10 and 15 percent. The following section uses language from NOAA's Geophysical Fluid Dynamics Laboratory overview of current research results relating global warming to hurricane activity [121]. Historically, hurricanes tend to weaken before hitting the Maine coastline, but rising sea levels combined with a projected increase in intensity could result in an increase of the number of hurricanes actually reaching the coast. However, even with increasing threats, occurrence of a Category 2 or stronger storm on a year-to-year basis is still a low percentage event in Maine. Different factors of climate change are expected to influence tropical cyclone activity now and in the future:

- Sea level rise should cause higher coastal inundation levels for tropical cyclones that do occur
- Tropical cyclone rainfall rates are projected to increase in the future (*medium to high confidence*) due to anthropogenic warming and accompanying increase in atmospheric moisture content. Modeling studies on average project an increase on the order of 10-15% for rainfall rates averaged within about 100 km of the storm for a 2-degree Celsius global warming scenario.
- Tropical cyclone intensities globally are projected to increase (*medium to high confidence*) on average (by 1 to 10% according to model projections for a 2-degree Celsius global warming). This change would imply an even larger percentage increase in the destructive potential per storm, assuming no reduction in storm size. Storm size responses to anthropogenic warming are uncertain.

[120] NOAA hurricane return periods: http://www.nhc.noaa.gov/climo/#returns
[121] Global Warming and Hurricanes: An Overview of Current Research Results: https://www.gfdl.noaa.gov/global-warming-and-hurricanes/

- The global *proportion* of tropical cyclones that reach very intense (Category 4 and 5) levels is projected to increase (*medium to high confidence*) due to anthropogenic warming over the 21st century. There is less confidence in future projections of the global *number* of Category 4 and 5 storms, since most modeling studies project a decrease (or little change) in the global frequency of all tropical cyclones combined.
- One study finds an increase in the fraction of tropical cyclone intensity estimates of at least Category 3 intensity both globally and in the Atlantic basin, over the past four decades.
- A study of rapid intensification of Atlantic hurricanes finds an observed increase in the probability of rapid intensification (1982-2009) which is highly unusual compared to one climate model's simulation of internal multidecadal climate variability. Rapid intensification suggests that tropical cyclones may strengthen to hurricane winds more quickly after formation.

There is no strong evidence of century-scale increasing trends in U.S. landfalling hurricanes or major hurricanes, Similarly for Atlantic **basin-wide** hurricanes (after adjusting for observing capabilities), there is not strong evidence for an increase since the late 1800s in hurricanes, major hurricanes, or the proportion of hurricanes that reach major hurricane intensity.

3.24 Tropical Cyclone – Impacts

All of Maine is vulnerable to tropical cyclone induced hazards, depending on the location of the storm track. Many structures in Maine are traditionally not designed to handle sustained storm force winds. The impact of a tropical cyclone will also vary significantly depending on whether it strikes a rural or urban population. Potential impacts of each hurricane associated hazard are as follows:

3.24.1 Inland Flooding

Inland flooding can also cause loss of life, rainfall accounted for 27 percent of tropical cyclone related deaths between 1963 and 2012, according to the National Hurricane Center. Inland flooding can also damage to roads, property, and lifeline utilities. Residents located in the base floodplain, delineated to some degree by FEMA Flood Insurance Rate Maps [122], are vulnerable to rainfall induced inland flooding.

3.24.2 Storm Surge

According to the National Hurricane Center, storm surge is potentially the deadliest hazard associated with hurricanes, accounting for 49 percent of tropical cyclone related deaths in the United States between 1963 and 2012. Storm surge can also cause extensive damage to property and lifeline utilities.

In general, coastal communities are vulnerable to storm surge, though the potential extent of storm surge is greater in the lower lying southern counties, which are also the most densely populated. Other locations, such as the City of Bangor on the tidal portions of the Penobscot River, are also historically vulnerable to storm surge. Maine Geological Survey collaborated with the U.S. Army Corps of Engineers to update Hurricane Storm Surge Inundation Maps for every coastal community using the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model in 2020 [123]. The SLOSH model outputs storm tide elevations, which are a combination of predicted normal tides (for mean tide and mean high tide) and storm surge associated with Category 1 to 4 landfalling storms. The resulting maps show potential areas of inundation, and depth of inundation, associated with these events. However, the model and maps do not take into account the potential impacts from waves, extreme tides, freshwater flow, precipitation, or potential future scenarios of sea level rise.

3.24.3 Tornadoes

Tornadoes can also threaten life safety and cause damage to property and lifeline utilities. Refer to the Severe Summer Weather Hazard Profile.

3.24.4 Strong Straight-Line Wind

Storm force winds can cause extensive damage to structures and trees, and wind-blown debris can become deadly projectiles during hurricanes and tropical storms.

Mobile homes (trailers) and substandard structures are highly vulnerable to storm force winds, as are glass structures that can be shattered from flying debris. Powerlines are vulnerable to damage from wind induced flying debris and fallen trees. Roads can become inaccessible from the debris. The same can be said for tornadoes.

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[122] FEMA Flood Map Service Center: https://msc.fema.gov/portal/home
[123] Maine Geological Survey hosted SLOSH maps: http://www.maine.gov/dacf/mgs/hazards/slosh/index.shtml

3.25 Tropical Cyclone – Vulnerability of State Assets [S5.]

Hurricane damages to state owned or operated buildings or infrastructure are no more likely than damages to other buildings or infrastructure. Costs typically come from the overtime use of Maine Department of Transportation and National Guard personnel and equipment to remove state-maintained roads of debris. Although utilities can be damaged during winter storms, the utilities are owned and operated by private utility companies.

The Maine Department of Administration and Financial Services Bureau of General Services provided location data on all state-owned and operated facilities and insured values of buildings and contents. With this information, Maine Emergency Management Agency used GIS to map and identify those state facilities which are located in areas of the state that may be subject to storm surge associated with strong coastal storms, including tropical or extratropical cyclones. These areas were identified using NOAA's Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model and more specifically based on the Storm Surge Maximum of the Maximum Envelope of High Water (SLOSH MOM) model results that represent a worst-case snapshot for a particular storm category under "perfect" storm conditions [124]. These inundation areas were also used by MEMA and county EMAs to designate evacuation zones that would be activated under different storm categories.

3.25.1 Potential Dollar Losses to State owned buildings, infrastructure, critical facilities

MEMA identified 28 to 139 state assets located within storm surge inundation areas from category 1 to 4, respectively. The top 10 assets within a category 2 storm surge area, rated by valuation, are listed in Table 3.22.

Table 3.22: 10 highest valued State assets located in potential Category 2 storm surge inundation areas.

Address	County	Occupancy	Property Type	Year Built	Last Inspected	Total valuation	Agency
78 Exchange St, Bangor, Maine, 04401	Penobscot	OFFICE	Class 4 building	2009	7/1/2017	$65,000,000	MMB, MAINE MUNICIPAL BOND BANK
78 Exchange St, Bangor, Maine, 04401	Penobscot	OFFICE		0		$4,500,000	JUD, ADMIN. OFFICE OF THE COURTS
Ferry Rd, Islesboro, Maine, 04848	Waldo	PIER	Wood framed	2009	7/1/2011	$3,016,000	DOT, MAINTENANCE & OPERATIONS
20 McKay Rd, Lincolnville, Maine, 04849	Waldo	PIER	Wood framed	2009	7/1/2011	$3,016,000	DOT, MAINTENANCE & OPERATIONS
460 Commercial St, Portland, Maine, 04101	Cumberland	OFFICE	Wood framed	2012	2/8/2022	$2,250,000	MPA, MAINE PORT AUTHORITY
Bangor, Maine	Penobscot	RADIO EQUIP/TOWER	Steel/ Masonry	1900	6/4/2015	$416,000	ADF, OFFICE OF INFO TECH, RADIO
460 Commercial St, Portland, Maine, 04101	Cumberland	MISC.	Unknown	2010	2/8/2022	$80,000	MPA, MAINE PORT AUTHORITY
460 Commercial St, Portland, Maine, 04101	Cumberland	MECHANICAL AREA	Unknown	2012	2/8/2022	$77,000	MPA, MAINE PORT AUTHORITY
460 Commercial St, Portland, Maine, 04101	Cumberland	MECHANICAL AREA	Unknown	2012	2/8/2022	$55,068	MPA, MAINE PORT AUTHORITY
468 Commercial St, Portland, Maine, 04101	Cumberland	OFFICE	Steel structure	2014	2/8/2022	$33,592	MPA, MAINE PORT AUTHORITY

[124] NOAA SLOSH MOMs: https://www.nhc.noaa.gov/surge/momOverview.php

There is no guarantee that these assets will be damaged in a natural hazard event. Under a Category 2 scenario, state assets managed by the Maine Municipal Bond Bank and Office of the Courts may experience severe impacts. Maine's communities may hit financial challenges if they need to access low-cost capital funds for normal projects or for rebuilding after a disaster event. If court offices are damaged or inaccessible, the Judicial Branch may face challenges administering court proceedings. It is unknown whether vital records are held on these premises. This property has previously benefitted from flood mitigation, but these efforts are based on designation of special flood hazard areas prone to flooding for a 100-year riverine flood event. Therefore, the asset is untested for storm surge flooding and may be vulnerable.

Maine Port Authority assets are also within category 2 storm surge inundation zones. Flooding or damage to these assets may impact the ability to fulfill state port and intermodal responsibilities to the detriment of Maine's economy. MaineDOT ferry terminals would also potentially be impacted by a Category 2 storm, threatening ferry services and accessibility for many island communities until recovery is completed.

Though it is not expected the state-owned and operated buildings will suffer 100% losses from a storm surge event in Maine, damages are expected to be greater than from a normal flood due to destructive waves. Storm surge damage estimates reported here therefore account for 75% of the valuation for assets and their contents located in potential storm surge areas. During an event, state employees would attempt to relocate the building contents to prevent content loss, but the rate of flooding may be too rapid for this to be successful.

The total valuation for all state assets is $3.3 Billion (2022 USD), with $110.4 million in assets identified within Category 2 storm surge inundation zones. Assuming 75% of assets are damaged, total losses for the state would equal $82.8 million. These estimates are further disseminated by county in Table 3.23, and general locations are provided in Figure 3.22.

Wind damages are anticipated to be more widespread and would primarily impact wood framed structures. No spatial overlays for wind hazard exist for Maine. Given Maine's densely forested landscape the likeliest cause of building damage from high winds is falling tree debris, causing substantial but highly localized roof and structural damage primarily to wood framed buildings. The occurrence of wind damage is expected to be driven by local wind gusts that would be scattered throughout the impacted area, therefore damage estimates for Category 2 winds (100 mph sustained, 130 mph gust [125]) account for 5% of the total valuation for wood structure assets [126]. Total losses for the state, assuming a statewide disaster, would equal $41 million.

3.25.2 Community lifeline Risks

Tropical cyclones are anticipated to have similar community lifelines impacts to flooding and severe summer weather. Please refer to those sections for more details. Here we provide more information on location specific impacts to transportation, energy, and critical services/facilities in Maine's coastal region. This assessment of community lifeline impacts are based on modeled impacts of a large category 2 hurricane, which is an unprecedented event for Maine.

Transportation

Culverts are typically the first type of infrastructure to be impacted by flooding. Under category 2 storm surge conditions, 308 cross culverts (<1% of cross culverts) would potentially be impacted by high storm surge and 73 large culverts (3.8% of large culverts) would be impacted. Though the number of impacted culverts are small

[125] Engineering Guidance regarding Wind-Caused Damage Descriptors: https://www.nhc.noaa.gov/pdf/SSHWS-Masters-et-al.pdf

[126] Pita, G., Pinelli, J. P., Gurley, K., & Mitrani-Reiser, J. (2015). State of the art of hurricane vulnerability estimation methods: a review. *Natural Hazards Review*, *16*(2), 04014022.

relative to the total across the state, these are critical stream crossing points for coastal communities who will experience issues with access to many other services.

Food, Water, Shelter

Refer to Flood – Vulnerability Assessment section above for details on storm surge impacts to food, water, and shelter access. There is a tendency to focus on coastal storm surge for tropical cyclones, though inland flooding can also be a significant factor of risk. The spatial extent of tropical cyclone hazards can be very large, requiring greater coordination between municipalities and County EMAs to appropriately coordinate activation of shelter sites well out of the expected range of flooding and wind hazards.

Schools are commonly selected as shelter sites. Of the 784 public schools in Maine, none are located in category 1 or 2 storm surge inundation areas, three are located in category 3 areas, and nine are located in category 4 areas.

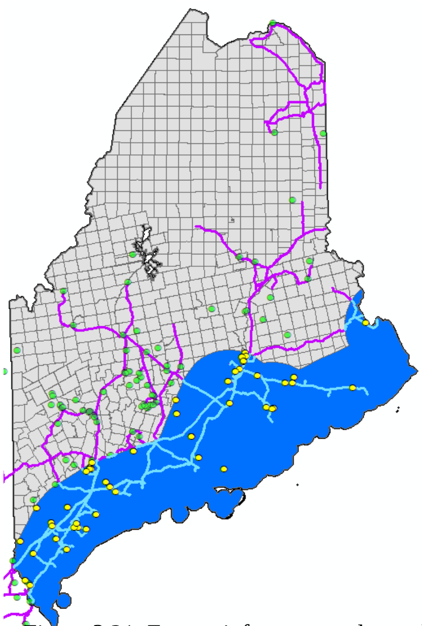

Figure 3.21: Energy infrastructure located within 25 miles of the coast (blue = within 25 miles of coast, cyan = transmission lines, yellow = power plants)

Energy

Unlike severe summer weather, wind damages from tropical cyclones are anticipated to be greatest along coastal Maine. Assuming the greatest wind impacts would occur within 25 miles of the coastline (Figure 3.21), a total of 1,906 miles of transmission lines may be exposed to hurricane strength winds. This exposure constitutes 49.8%, nearly half, of all transmission lines in Maine with a statewide length of 3,829 miles. Fifty power plants are located within the 25-mile coastline buffer. These include 22 hydropower projects, eight biomass plants, four natural gas plants, three petroleum plants, seven solar projects, and six wind turbine projects. Refer to Flooding – Vulnerability Assessment for a determination of transmission line and power plant exposure to storm surge hazards.

Safety and Security

Access issues for emergency response are the greatest issue for safety and security. Direct impacts caused by storm surge are limited. Under an unprecedented category 2 hurricane scenario, nine (1.5% of all stations) coastal fire stations would be directly flooded by storm surge. No law enforcement offices are directly threatened by category 2 storm surge.

Communications

Referring once again to cellular and radio tower GIS data, just under half of all cell towers in Maine are located within 25 miles of the coast. These towers may be more susceptible to hurricane-level wind damage as this part of the state would see the greatest winds during landfall.

Historic and Cultural Resources

Using historic locations data overlain with storm surge inundation layers, 24 historic sites of 1,266 total in Maine (1.9%) would be impacted by category 1 storm surge, 39 (3.1%) by category 2, 64 (5.1%) by category 3, and 97 (7.7%) by category 4. The vast majority of these impacted sites are coastal, but still others are located on tidal rivers in central and Downeast Maine.

Table 3.23: Potential dollar losses to state assets by storm surge, Category 2 winds

Region	Totals		Assets in Category 1 Inundation Zone		Assets in Category 2 Inundation Zone		Assets in Category 3 Inundation Zone		Assets in Category 4 Inundation Zone		Assets in Category 2 winds (wood framed structures)	
	State Assets Count	Total Value (2022 USD)	Count	75% Losses (2022 USD)	Count	75% Losses (2022 USD)	Count	75% Losses (2022 USD)	Count	75% Losses (2022 USD)	Count	5% Losses (2022 USD)
State of Maine	3,769	$3,357,697,809	28	$59,646,429	71	$82,786,374	116	$96,519,563	139	$132,210,032	2,238	$41,001,017
Androscoggin	103	$131,857,212		$0		$0		$0		$0	54	$504,988
Aroostook	421	$287,502,123		$0		$0		$0		$0	227	$3,967,327
Cumberland	604	$628,202,559	8	$1,827,869	32	$18,917,037	46	$20,744,038	52	$26,471,227	365	$6,843,459
Franklin	145	$21,036,865		$0		$0		$0		$0	110	$927,144
Hancock	153	$202,125,602	3	$2,459,340	6	$5,482,789	16	$11,059,804	24	$25,996,144	97	$3,595,225
Kennebec	518	$990,500,148		$0		$0		$0		$0	156	$8,089,614
Knox	108	$163,413,511		$0		$0	9	$5,209,170	9	$5,209,170	62	$1,999,911
Lincoln	80	$44,121,502		$0	3	$135,330	2	$129,480	3	$14,189,640	56	$1,974,240
Oxford	109	$38,868,587		$0		$0		$0		$0	72	$1,455,142
Penobscot	355	$383,400,261	7	$52,802,101	9	$52,825,441	17	$53,285,250	17	$53,285,250	174	$2,453,306
Piscataquis	228	$32,190,309		$0		$0		$0		$0	201	$1,369,336
Sagadahoc	87	$28,347,445		$0	1	$33,384	1	$33,384	1	$33,384	69	$565,473
Somerset	191	$130,572,689		$0		$0		$0		$0	125	$2,172,931
Waldo	179	$46,703,979	3	$2,459,340	6	$4,918,680	6	$4,918,680	6	$4,918,680	148	$1,019,048
Washington	225	$122,944,012	2	$27,540	3	$41,580	5	$227,025	7	$510,525	156	$2,281,986
York	263	$105,911,005	5	$70,240	11	$432,133	14	$912,733	20	$1,596,013	166	$1,781,887

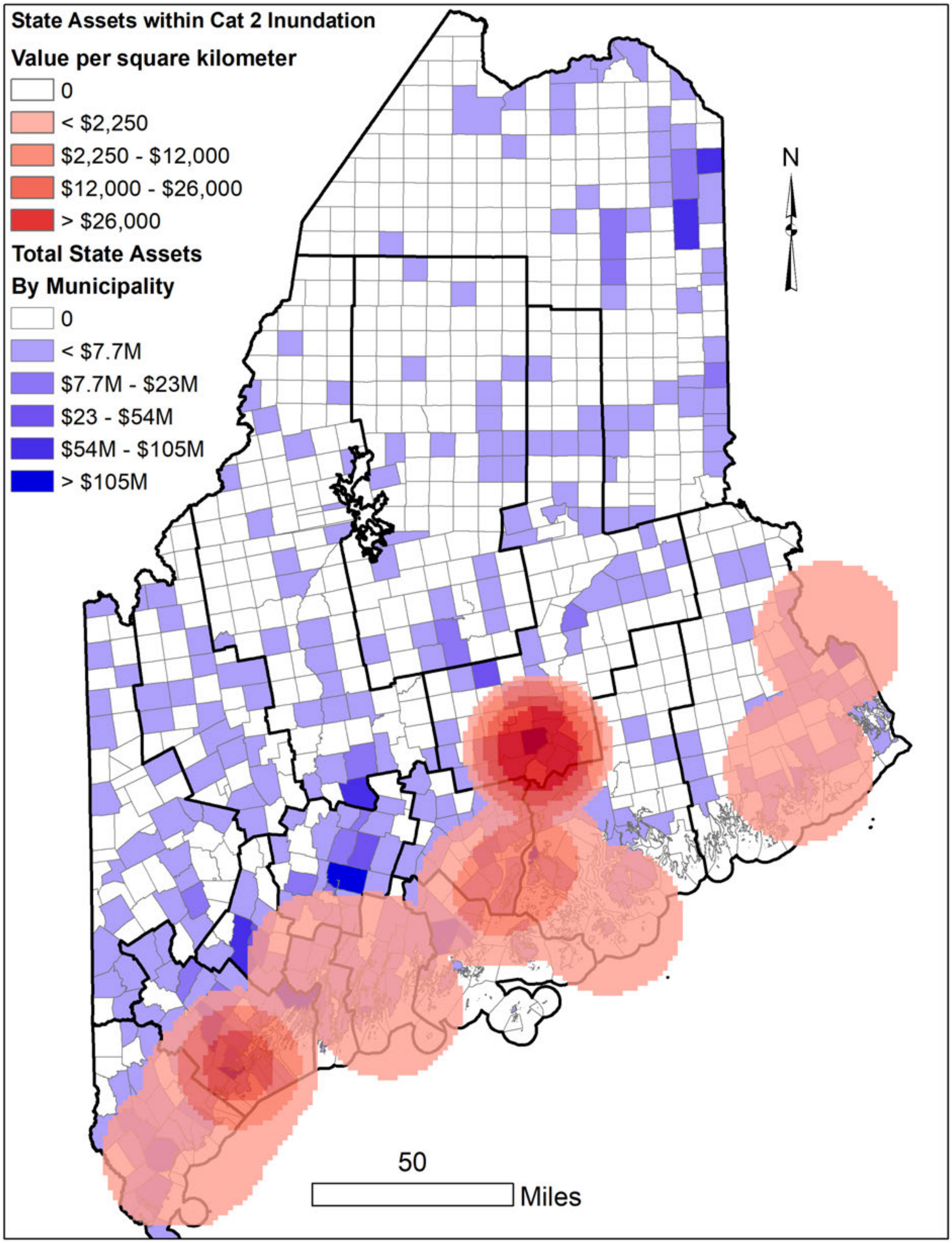

Figure 3.22: State Assets within Category 2 hurricane storm surge inundation areas and potential losses.

3.26 Tropical Cyclone – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

3.26.1 Identifying Jurisdictions with greatest vulnerability [S6.a.1.]

In 1954 Carol and Edna occurred within a two-week period, a highly unusual pairing caused deaths and extensive damage. Hurricane Donna in 1960 also caused damage in Maine. The experiences of Hurricane Gloria in September 1985 and Hurricane Bob in 1991 temporarily raised awareness of the state's vulnerability. Since these events, coastal populations have significantly increased, and valuations of many coastal communities have increased more than a hundred-fold. Consequentially, it is expected that damage today from equivalent storms would be many times greater. Awareness did become heightened in September of 2011, as Hurricane Irene tracked into New England resulting in record breaking damages and multi-state declarations. When it reached Maine as a tropical storm, Irene resulted in declaration DR-4032 because of the extensive flooding to roads from the heavy rains and the debris cleanup and power outages from the high winds. The four counties of Franklin, Lincoln, Oxford, and York were part of the declaration. In 2012, Hurricane Sandy devastated much of the northeast coast but spared Maine. Had Irene or Sandy affected more of the coastal counties, fishing, commercial and pleasure boating losses would have been significant if boats, gear, piers, and wharfs had been severely damaged.

To date, the State of Maine does not have any specific policies directing public facilities away from potential hurricane storm surge inundation areas. Maine's Uniform Building and Energy Code (MUBEC) requires cities and towns with a population greater than 4,000 to adopt the International Building Code's wind resistant standard.

Disadvantaged Communities

The objective of the disadvantaged communities' assessment is to identify potential disadvantages felt by communities who are disproportionately impacted by natural hazards both historically and under future projections. Tropical cyclones are an infrequent hazard in Maine, but this assessment suggests an increasing occurrence. Two major impacts of tropical cyclones are storm surge and winds. For impacts of inland flooding, refer to the Flooding – Vulnerability Assessment section. Locations susceptible to storm surge are coastal, low-lying areas. These areas are identified within Maine's Hurricane Evacuation Zones [127]. Wind damage can occur anywhere in the state; however, it is possible to review historical hurricane tracks to identify locations that may experience a greater general recurrence of larger tropical cyclones. Further, the Office of the State Fire Marshal enforces the Maine Uniform Building and Energy Code (MUBEC [128]), requiring communities with population greater than 4,000 to adopt recent International Building Codes and Standards. Unfortunately, rural communities are not held to this standard and may enforce their own, potentially less stringent building codes that may leave structures less resilient to high winds.

Use of SVI census tracts (Figure 3.23) indicate a wide distribution of overall SVI values located in hurricane evacuation zones, with approximately one third of all disadvantaged communities located in evacuation zones. Looking more closely there are two clusters of disadvantaged communities that may be relatively more vulnerable to tropical cyclones. The City of Portland is the most populated city in Maine and contains several vulnerable communities in urban areas susceptible to storm surge. Namely, the Bayside neighborhood is severely disadvantaged and would experience the greatest magnitude of flooding in the city. The impacts would be long term and would be tied to the ability of the region to receive recovery assistance, similar to the flooding impacts indicated above.

[127] Maine Hurricane Dashboard: https://storymaps.arcgis.com/stories/4fb502bf0ea6467693ff4191a1859e92
[128] MUBEC: https://www.maine.gov/dps/fmo/building-codes

Washington County includes many communities vulnerable to storm surge, but also this area has a greater overall occurrence of hurricanes than other counties in Maine. Overall, SVI values Portland are wide ranging, but looking closely at the inset map indicates two census tracts denoting disadvantaged communities that are primarily located in hurricane evacuation zones. Further, many households in these tracts speak limited English, ranging from 6.7-17% limited English, posing communication challenges for hazardous weather updates and evacuation instructions (Census data accessed using FEMA's RAPT tool [129]). In Washington County, overall, SVI is much greater than the state average, with the majority of the county by area defined as disadvantaged.

These results suggest a disproportionate exposure of disadvantaged communities to storm surge in urban settings and higher occurrence of damaging winds in areas with potentially less stringent building codes in rural settings. Suggested mitigation actions would be to ensure that communities adopt MUBEC or other building codes to encourage reduction in potential damages from flooding and winds. Further, it will be crucial for community members to understand evacuation plans if a hurricane were to impact the City of Portland, or any other populated locations in Maine.

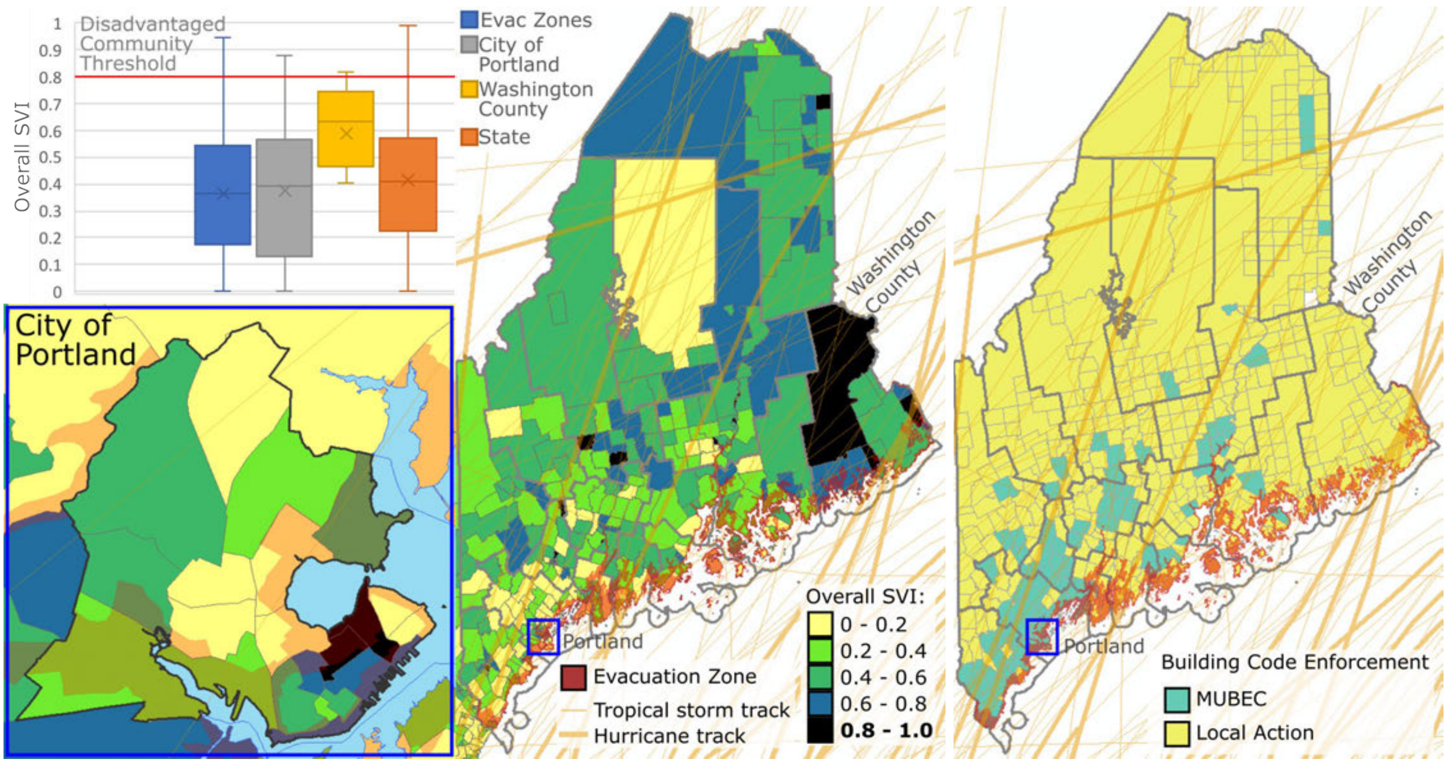

Figure 3.23: Overall SVI values for locations that may be more susceptible to tropical cyclone impacts. These include all hurricane evacuation zones, locations with a historic prevalence of storm tracks, and locations with local, rather than state, building code enforcement. Disadvantaged communities such as in in the City of Portland and Washington County may be more vulnerable to tropical cyclone impacts due to potentially greater exposure to storm surge, damaging winds, and uncertainty around building code standards.

[129] FEMA RAPT tool: https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6

3.26.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Hazard-Asset Footprint Overlay Analysis

It is not expected buildings will suffer 100% losses from a hurricane event in Maine. Damage estimates for storm surge flooding and high winds are expected to account only for only 75% and 5%, respectively, of the valuation for assets and their contents located in impacted areas.

The total valuation for all identified structure assets in Maine is $329 Billion (2022 USD). There are $46 billion in assets identified within hurricane evacuation zones, though not all of these assets are directly vulnerable to storm surge flooding. Assuming 75% of assets are damaged within a Category 2 storm surge, total losses equal $8.7 billion. Assuming statewide 5% losses due to Category 2 hurricane winds, total losses would be $16.5 billion. These estimates are further disseminated by county in Table 3.24.

For more information on potential dollar losses due to inland flooding and sea level rise, refer to the section Flooding – Vulnerability Assessment. For more specific information on debris damages caused by high winds, refer to the section Severe Summer Weather – Vulnerability Assessment.

Table 3.24: Potential dollar losses (millions 2022 USD) to all building assets by tropical cyclone hazards

Region	Totals		Assets in Evacuation Zone			Category 1 storm surge		Category 2 storm surge		Category 3 Storm Surge		Category 4 Storm Surge		Category 2 winds* (100 mph sustained)	
	Assets Count	Total Value	Assets Count	Full value	% of total value	Assets Count	75% Losses	Assets Count	75% Losses	Assets Count	75% Losses	Assets Count	75% Losses	Assets Count	5% Losses
State of Maine	758,999	$329,411	104,361	$45,967	14.0%	6,725	$3,712	16,768	$8,678	26,546	$13,434	36,947	$18,499	758,999	$16,471
Androscoggin	40,678	$20,282												40,678	$1,014
Aroostook	47,211	$21,437												47,211	$1,072
Cumberland	120,034	$60,316	20,828	$11,621	19.3%	1,203	$1,056	3,780	$2,597	6,281	$3,928	9,386	$5,751	120,034	$3,016
Franklin	21,643	$8,534												21,643	$427
Hancock	47,129	$17,737	18,081	$7,072	39.9%	794	$438	2,090	$965	3,641	$1,669	5,404	$2,351	47,129	$887
Kennebec	65,768	$29,533	313	$227	0.8%	2	$1	19	$14	39	$20	93	75.617	65,768	$1,477
Knox	28,812	$11,720	8,592	$3,111	26.5%	372	$194	1,075	$478	1,887	$810	2,664	$1,095	28,812	$586
Lincoln	27,821	$10,680	9,694	$3,916	36.7%	380	$212	1,097	$536	1,889	$864	2,949	$1,331	27,821	$534
Oxford	40,062	$16,050												40,062	$803
Penobscot	79,169	$35,301	2,366	$1,626	4.6%	143	$168	715	$535	1,141	$889	1,232	$1,022	79,169	$1,765
Piscataquis	16,376	$5,782												16,376	$289
Sagadahoc	20,394	$8,210	6,748	$2,735	33.3%	219	$156	599	$365	998	$548	1,430	$737	20,394	$411
Somerset	38,723	$15,823												38,723	$791
Waldo	26,926	$10,879	2,074	$1,012	9.3%	105	$92	366	$228	698	$395	1,029	$573	26,926	$544
Washington	24,214	$8,175	6,111	$2,128	26.0%	190	$89	673	$252	1,317	$441	2,064	$711	24,214	$409
York	107,149	$45,785	29,554	$12,518	27.3%	3,263	$1,272	6,212	$2,609	8,423	$3,719	10,366	$4,619	107,149	$2,289

*Wind damage assumed across entire region of study.

Severe Fall/Winter Weather – Hazard Profile

TIER 1 HAZARD

3.27 Severe Fall/Winter Weather - General Definition and Types of Events [S3.a., S3.b.]

Severe fall/winter weather conditions are distinguished by low temperatures, strong winds, ice, and often large quantities of snow that typically occur in the seasons of fall, winter, and occasionally early spring.

3.27.1 Heavy Snow

Heavy snow is generally defined as a snowfall of 6 to 8 inches or more within 24 hours which disrupts or slows transportation systems and public safety departments' response capability [130] (Figure 3.24).

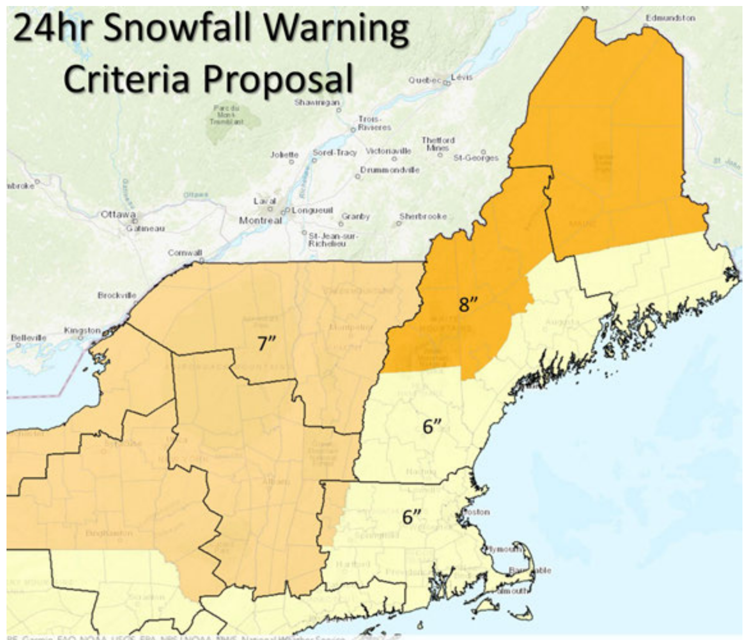

Figure 3.24: Regional heavy snowfall warning criteria

3.27.2 High Winds

High winds are common during the winter months, especially at higher elevations. In addition to potential damaging winds, high winds in winter often coincide with cold temperatures to cause wind chill [131]. High winds and blowing snow can lead to the development of dangerous snow drifts and white out conditions that pose roadway hazards.

3.27.3 Snow Squall

A snow squall is an intense, but limited duration, period of moderate to heavy snowfall, accompanied by strong, gusty surface winds and possibly lightning (generally moderate to heavy snow showers). Snow accumulation may be significant [132].

3.27.4 Sleet Storm

Sleet is defined as pellets of ice composed of frozen or mostly frozen raindrops or refrozen partially melted snowflakes. These pellets of ice usually bounce after hitting the ground or other hard surfaces. Heavy sleet is a relatively rare event defined as an accumulation of ice pellets covering the ground to a depth of one-half inch or more [133]. Sleet can be extremely slick and hazardous to drive on compared to snow, but it doesn’t drift or cause low visibility.

[130] NWS Heavy snow definition: https://forecast.weather.gov/glossary.php?word=heavy%20snow
[131] NWS Wind Chill Definition: https://www.weather.gov/ama/windchill
[132] NWS Snow squall definition: https://forecast.weather.gov/glossary.php?word=SQUALL
[133] NWS Sleet Definition: https://w1.weather.gov/glossary/index.php?word=SLEET

3.27.5 Freezing Rain and Ice Storms

Freezing rain is liquid water precipitation freezing upon impact with the sub-freezing surface. Any amount of freezing rain can be dangerous for travel conditions on untreated roads. An ice storm is used to describe occasions when damaging accumulations of ice are expected during freezing rain situations. Mean radial ice coating at least one-fourth inch in thickness is heavy enough to begin to damage tree branches, overhead wires, and similar objects. A mean radial ice coating of one half an inch is heavy enough to produce destructive widespread power outages [134].

3.27.6 Extreme Cold

Extreme cold is defined as temperatures much colder than local and seasonal average conditions. Health effects of extreme cold temperatures are often exacerbated by wind chill [135]. In Maine, these temperature definitions vary from –35F in the North to –25F across the Southwest.

3.27.7 Freezing Fog

Tiny, supercooled liquid water droplets in fog can freeze instantly on exposed surfaces when surface temperatures are at or below freezing. Some surfaces that these droplets may freeze on include tree branches, stairs and rails, sidewalks, roads, and vehicles. Extreme caution should be taken if travel is necessary. Freezing fog in Maine is a rare occurrence that is normally confined to valleys or along the coastline in the heart of winter.

3.27.8 Blizzard

Blizzards are a combination of heavy snow and high winds. Sustained winds or frequent gusts of 35 miles per hour (mph) or more with heavy falling or blowing snow limiting visibility to ¼ mile or less that persists for three or more hours. The combination of conditions along with subfreezing temperatures brings potentially life-threatening traveling conditions.

3.27.9 Extratropical Cyclones (Nor'easters and Southeasters)

A cyclone of any intensity for which the primary energy source is baroclinic, that is, results from the temperature contrast between warm and cold air masses [136]. Extratropical cyclones may bring high winds, expansive coastal flooding, and any combination of heavy winter precipitation and/or rainfall. These storms can occur any time of the year, but they are most frequent between September and April. In contrast with tropical cyclones, extratropical cyclones produce rapid changes in temperature and dew point along broad lines, called weather fronts, about the center of the cyclone. The warm conveyor belts associated with these cyclones produce approximately half of the wintertime precipitation in middle and high latitudes [137]. In fall, extratropical cyclones bring heavy rain and damaging winds. In winter, extratropical cyclones produce hazardous winter weather ranging from heavy snowstorms to blizzards [138].

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[134] NOAA Freezing Rain Definition: https://www.nssl.noaa.gov/education/svrwx101/winter/types/
[135] CDC Extreme Cold Guide: https://www.cdc.gov/disasters/winter/pdf/extreme-cold-guide.pdf
[136] NHC Extratropical Cyclone Definition: https://www.nhc.noaa.gov/aboutgloss.shtml
[137] Cotton, W. R., Bryan, G., & van den Heever, S. C. (2011). The mesoscale structure of extratropical cyclones and middle and high clouds. In *International Geophysics* (Vol. 99, pp. 527-672). Academic Press. https://doi.org/10.1016/S0074-6142(10)09916-X
[138] Extratropical Storms in Winter: https://atmos.illinois.edu/research/areas/extratropical-cyclones-and-winter-storms

3.28 Severe Fall/Winter Weather – Location of Hazard [S3.a.1]

The entire State is subject to severe storms *every* winter. Western and northern areas historically receive more snowfall (Figure 3.25) while coastal areas are more likely to have freezing rain, sleet, tide surges and flood damage (Table 3.25, Figure 3.26). Although average snowfall amounts are lower on the coast, coastal areas are more prone to blizzard conditions and very heavy snowfall of 2 feet or more during Nor'easter storms.

Average seasonal snowfall amounts generally increase north and northwestward from the coastal region. Total seasonal snowfall ranges between 50 and 80 inches in the Coastal Division, between 60 to 90 inches in the Southern Interior Division, and 90 to 110-plus inches in the Northern Division. The largest average seasonal snowfall totals on record are the 118 inches per winter season from Jackman and the 116 inches per winter season from Caribou. Higher snowfall totals may be found locally, particularly at higher elevations in the northwest mountains.

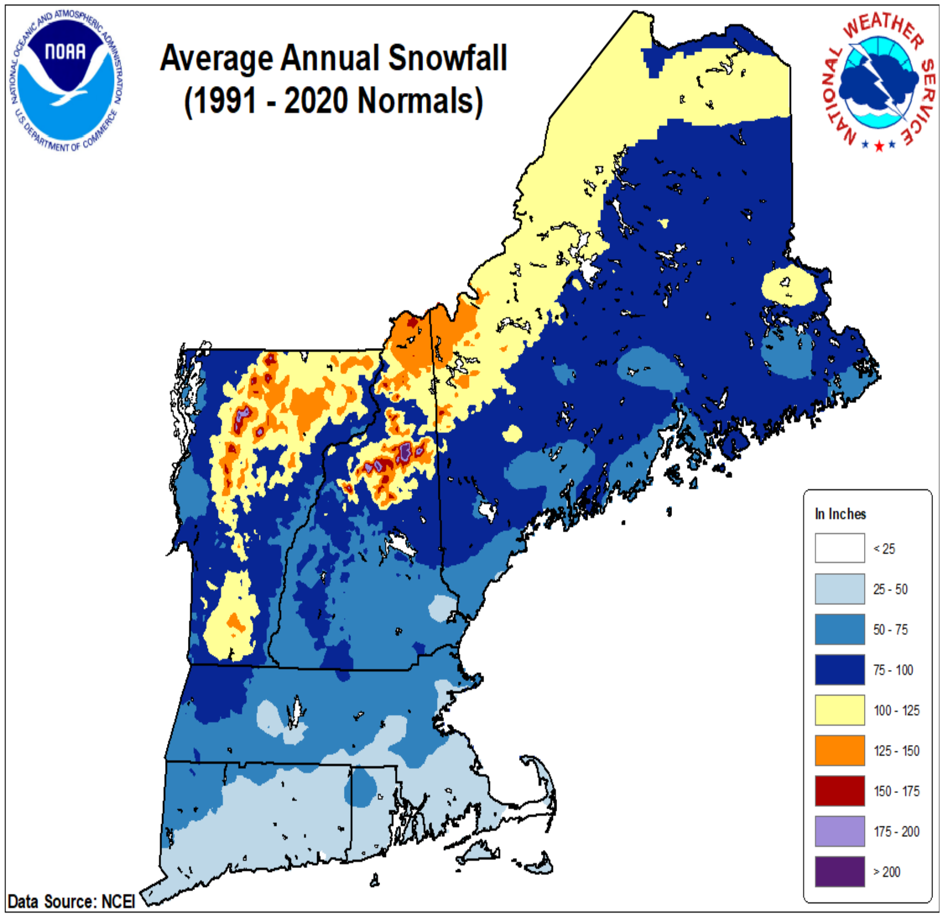

Figure 3.25: regional snowfall normals for New England.

Table 3.25: Severe Fall/Winter Weather Event Occurrence by County, 1996-2021 [139]

County	Blizzard	Extreme Cold	Heavy Snow	Ice Storm	Winter Storm	Sleet	Winter Flood*	Total
Androscoggin	4	22	118	4	53	0	6	207
Aroostook	24	125	220	3	271	6	9	658
Cumberland	10	41	237	6	95	0	33	422
Franklin	0	49	248	3	109	0	13	422
Hancock	28	37	82	7	144	1	15	314
Kennebec	6	24	103	4	55	0	24	216
Knox	6	21	101	4	37	0	7	176
Lincoln	6	20	100	4	40	0	9	179
Oxford	0	47	255	4	112	0	23	441
Penobscot	20	76	170	7	253	6	23	555
Piscataquis	14	113	168	3	227	8	22	555
Sagadahoc	5	20	107	4	39	0	9	184
Somerset	6	99	293	3	166	1	22	590
Waldo	10	46	201	8	80	0	14	359
Washington	41	47	142	9	208	3	13	463
York	10	39	224	6	87	0	25	392
Total	190	826	2,769	79	1,976	25	267	6,133

*Record of floods occurring in December, January, or February

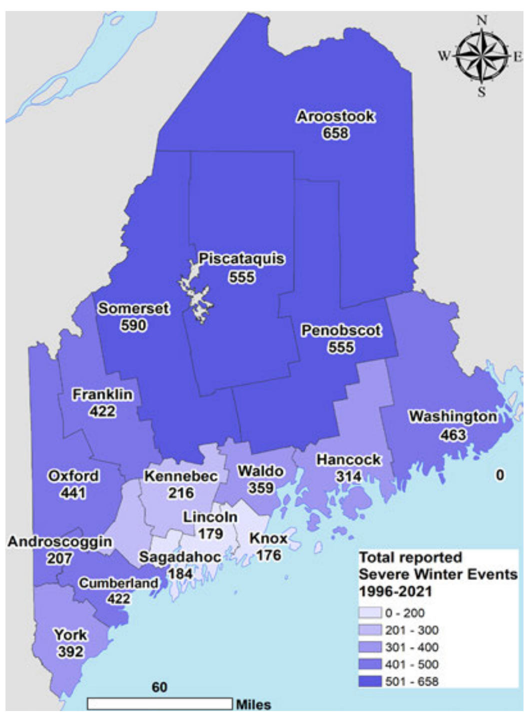

Figure 3.26: Total reported severe fall/winter

139 NOAA Storm Events Database: https://www.ncdc.noaa.gov/stormevents/

3.29 Severe Fall/Winter Weather – Intensity and Previous Occurrences [S3.a.2.]

The extent of severe fall/winter weather related hazards is dependent on factors such as temperature, snow fall, ice cover, sustained wind speed, wind gust speed, duration of event, and time between events. The extent of one winter weather event can be exacerbated if it occurs shortly after a previous weather event.

During the winter months Maine often has heavy snowfall, snow combined with high winds, freezing rain, or ice storms. Extratropical cyclones can impact the state in winter, spring, and fall. They rarely develop during the summer. These storms often bring an ensemble of wind, precipitation, and flooding hazards. Precipitation amounts may exceed several inches of water equivalent (20-30 inches of snow or more), while wind speeds can be equal to or greater than those for hurricanes that reach Maine. As an example, the Groundhog Day Nor'easter in 1976 produced 100-knot (115 mph) winds at Southwest Harbor, exceeding the wind speed threshold for a category 3 hurricane. A loss of electrical power and communication services can occur when utility lines yield under the weight of ice and snow. These conditions can impede the response time of ambulance, fire, police, and other emergency services, especially to remote or isolated residents.

The intensity of severe winter storms can be measured based on the magnitude and duration of wind and precipitation, and the combination of different precipitation types. However, there is no widely used standard scale to classify the intensity of snowstorms because the degree of associated damage cannot be determined solely by the amount of snowfall. Wind, temperature, ice accumulation, snow density, and other factors must be incorporated. One approach attempts to isolate the impacts of snowfall: The Northeast Snowfall Impact Scale (NESIS) developed by the National Weather Service [140] characterizes and ranks high-impact Northeast snowstorms. These storms have large areas impacting heavily populated areas with 10-inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable (Table 3.26). The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus, NESIS values incorporate a storm's societal impacts in addition to total snowfall and area. This scale was developed because of the impact Northeast snowstorms can have on the rest of the country in terms of transportation and economic impact.

Table 3.26: NESIS impact categories

Category	NESIS Value*	Description	Number of occurrences in Maine
1	1-2.499	Notable	18
2	2.5-3.99	Significant	19
3	4-5.99	Major	23
4	6-9.99	Crippling	8
5	10.0+	Extreme	1

*NESIS value calculated based on total snowfall area and total population impacted in the snowfall area.

The NOAA NESIS website [141] indicates that, from 1996 to 2021 Maine received greater than 10 inches of snow during 1 out of 2 total Extreme Events, 8 out of 10 total Crippling Events, 18 out of 23 Major Events, and many Significant and Notable Events.

[140] Kocin and Uccellini, 2004: https://www.ncdc.noaa.gov/monitoring-content/snow-and-ice/rsi/docs/kocin-and-uccellini-2004.pdf
[141] Northeast Snowfall Impact Scale: https://www.ncdc.noaa.gov/snow-and-ice/rsi/nesis

3.29.1 Previous Occurrences

The snowfall season usually runs from late October (in the north) or November (mid to lower portion of the state) through to April and sometimes into May. Occasionally an early season storm can bring snow in the first weeks of October even along the coast. January is usually the snowiest month throughout the state with many stations averaging over 20 inches of snow. December typically averages out to be the second snowiest month.

Table 3.27 is a summary of some of the most severe winter storms during the past 41 years.

Table 3.27: Severe Winter Storm and extreme cold record.

Month of Occurrence	Year	County/region	Damage (2022 USD [142])	Declaration
December	1929	***Statewide***	Ice storm extended from western New York into Maine; widespread power outages from tree and overhead line damage. Part of historical summary to the DR-1198 FEMA Interagency Report [143].	N/A
Feb. 19 Snowstorm	1972	Hancock, Knox, Washington		State Aid
March 7 Ice Storm	1972	Cumberland, Lincoln, Sagadahoc, York	$2,960,484 Severe storms, flooding	***Presidential*** **DR-326-ME**
Jan 10 Rain/Snow/Ice	1978	***Statewide***		
March 15 Ice jams & heavy rains	1978	Franklin, Kennebec, Somerset		State Aid
Mar 13-14 Blizzard	1993	***Statewide***	Maine blizzards, severe winds and snowfall, coastal storm	***Presidential*** **EM-3099-ME**
Jan 5-25 "Great Ice Storm of 98"	**1998**	***Statewide*** As in 1929, this storm extended from western New York into all of Maine.	$87,542,231 Power outages [Loss of heat, refrigeration, sanitation services] Forestry damage	***Presidential*** **DR-1198-ME**
Mar 5-31	2001	Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Washington, York	$7,539,599 Maine severe winter storm.	***Presidential*** **EM-3164-ME**
Dec 17 2002 - Jan 1, 2003	2003	Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Kennebec, Lincoln, Oxford, Penobscot, Piscataquis, Washington	$3,496,704 Maine Extreme winter weather; severe cold deep and frost; the "frozen pipes" disaster	***Presidential*** **DR-1468-ME**
Feb 2-4	2003	Aroostook	$2.61 million Maine snowstorms Winter storms and extreme cold	***Presidential*** **EM-3174-ME**
Dec 6-7	2003	Aroostook, Cumberland, Franklin, Hancock, Kennebec, Oxford, Penobscot, Piscataquis, Somerset	$2.77 million Maine snow, winter storms, and extreme cold	***Presidential*** **EM-3190-ME**

[142] CPI Inflation Calculator, U.S. Bureau of Labor Statistics: https://www.bls.gov/data/inflation_calculator.htm
[143] Cold Regions Research Engineering Laboratories (CRREL).

Table 3.27: Severe Winter Storm and extreme cold record.

Month of Occurrence	Year	County/region	Damage (2022 USD [142])	Declaration
Dec 14-15	2003	Aroostook, Franklin, Hancock, Penobscot, Piscataquis, Somerset, Washington	Maine snow, winter storms, and extreme cold	***Presidential*** **EM-3194-ME**
Jan 22-23	2005	Cumberland, York	$15.54 million Maine snow, winter storms and extreme cold	***Presidential*** **EM-3205-ME**
Feb 10-11	2005	Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Knox, Oxford, Penobscot, Piscataquis, Somerset, York	$15.54 million Maine snow, winter storms, and extreme cold	***Presidential*** **EM-3206-ME**
March 9	2005	Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Oxford, Penobscot, Piscataquis, Somerset, York	$15.54 million Maine snow, winter storms, and extreme cold	***Presidential*** **EM-3209-ME**
March 11-12	2005	Androscoggin, Cumberland, Oxford	$15.54 million Maine snow, winter storms, and extreme cold	***Presidential*** **EM-3210-ME**
Dec 25-27 “Christmas Storm”	2005	Aroostook	Maine snow, winter storms, and extreme cold	***Presidential*** **EM-3265-ME**
Dec 11	2008	Cumberland, Knox, Lincoln, Sagadahoc, Waldo, York	Maine severe winter storm, winter storms and, and extreme cold	***Presidential*** **EM-3298-ME**
Feb 8-9	2013	Androscoggin, Cumberland, Knox, Sagadahoc, Washington, York	$3,975,117 Severe winter storm (blizzard)	***Presidential*** **DR-4108-ME**
Dec 21-26 “Christmas Ice Storm”	2013	Androscoggin, Kennebec, Knox, Lincoln, Penobscot, Waldo, Washington	Severe ice storm caused extended power outages. Accompanied by the “Polar Vortex” it kept subfreezing conditions in place, also resulting in frozen pipes and water damage to homes; at least two deaths from CO poisoning.	***Disaster Declaration denied***
Nov 1-2 Nor’easter [144]	2014	Kennebec, Lincoln, Knox, Penobscot, Waldo	Nor’easter with 50 mph gusts cause 100k power outages. Heavy, wet snow, accompanied by winds caused severe power outages for several days.	***None requested***
Jan 26-28	2015	Androscoggin, Cumberland, Sagadahoc, York	$3,355,200 Blizzard that closed state and town offices. Highways were treacherous due to winds and drifting snow. Portland received 19.1 inches of snow.	***Presidential DR-4208-ME***
13 Feb	2017	Statewide	Blizzard closed state and town offices. Public was warned to avoid any unnecessary travel which made snow removal efforts timely.	***N/A***
14 Mar	2017	Statewide	Blizzard conditions along the coast and heavy snow fell throughout the state. School and meeting cancellations. State offices closed at 2PM.	***N/A***

[144] 2014 storm: https://www.usatoday.com/story/weather/2014/11/03/snow-storm-maine/18405771/

Table 3.27: Severe Winter Storm and extreme cold record.

Month of Occurrence	Year	County/region	Damage (2022 USD [142])	Declaration
30 October	2017	Statewide	$9,507,448 - A bomb cyclone with south/southeast winds with up to 70 mph gusts caused 500k power outages [145, 146] A bomb cyclone with south/southeast winds with up to 70 mph gusts caused 500k power outages [147, 148]	***DR-4354-ME***
1 Jan	2018	Aroostook, Piscataquis, Penobscot, Somerset	Wind chill temperatures ranging from 30 to 40 below zero.	***N/A***
4 Jan	2018	Statewide	Blizzard: high winds statewide, 10 to 15 inches of snow in western Maine, coastal flooding and erosion	***N/A***
6 Jan	2018	Aroostook, Piscataquis, Penobscot, Somerset	Wind chill temperatures ranging from 30 to 40 below zero.	***N/A***
13 Mar	2018	York, Knox, Lincoln, Sagadahoc, Cumberland, Penobscot, Hancock, Washington	Blizzard: 12 to 24 inches of snow across York County and western Maine, some reports of 30 inches in eastern Maine, several hours of blizzard conditions on the coast.	***N/A***
22 Jan	2019	Aroostook, Piscataquis, Penobscot, Somerset	Wind chill temperatures ranging from 35 to 40 below zero.	***N/A***
17 October	2019	Statewide	Bomb cyclone with gusts up to ~60 mph caused 219k power outages [149]	***N/A***
1 Nov	2019	Aroostook, Piscataquis	Wind storm with gusts up to ~53 mph caused 230k power outages [150]	***N/A***
10 Apr	2020	Aroostook, Piscataquis, Penobscot, Hancock, Washington	Damaging winds, heavy snow, coastal flooding	***N/A***
2 Mar	2021	Aroostook, Piscataquis, Penobscot, Somerset	Wind chill temperatures ranging from 35 to 40 below zero.	***N/A***

Storm of Record: The "Great Ice Storm of '98"

The residents of Northern New England will never forget the Ice Storm of 1998. In Maine, more than six hundred thousand customers were without power. Extending from Western New York to Maine, below-freezing temperatures combined with record rainfall contributed to the formation of a blanket of solid ice. In some places, more than three inches of ice coated the rural and urban landscape.

The storm began January 5th and continued through January 25, 1998. Advisories for freezing precipitation from The National Weather Service (NWS) in Gray, Maine, began during Sunday, January 4, 1998. On Monday morning, freezing drizzle and rain began in several areas and continued through Tuesday. On January 6th, the NWS advised Maine Emergency Management Agency (MEMA) to expect a major ice storm. From January 7th through January 9th, heavier freezing rain developed over Central and Southern Maine. To the north of the front, cold air remained entrenched near the ground as warm, moist air moved northward from the Mid-Atlantic states over the wedge of colder air. The combination of peak low-pressure areas, abundant moisture in the atmosphere, and cold temperatures near the ground caused significant rainfall and severe icing to occur in Central and Southern

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145 2017 storm: https://www.newscentermaine.com/article/news/local/historic-october-wind-storm-hit-maine-one-year-ago/97-609203380
146 DR-4354-ME: https://www.fema.gov/disaster/4354#funding-obligations
147 2017 storm: https://www.newscentermaine.com/article/news/local/historic-october-wind-storm-hit-maine-one-year-ago/97-609203380
148 DR-4354-ME: https://www.fema.gov/disaster/4354#funding-obligations
149 2019 storm: www.mainepublic.org/environment-and-outdoors/2019-10-17/strong-october-noreaster-knocks-out-power-to-more-than-200k-in-maine
150 November 2019 storm: https://www.pressherald.com/2019/11/01/heavy-winds-knock-out-power-to-thousands-in-maine/

Maine, with increased amounts of sleet in the central areas. In Northern Maine more than two feet of snow fell during this same period of time creating severe conditions and safety concerns.

Mixed precipitation developed on January 13th as the low-pressure system moved eastward. Gusts were reported up to 50 mph and brought much colder air into the state. Temperatures dropped into the single digits in Central Maine, and below zero temperatures in both the mountains and the northern part of the state. Wind chills were in the minus 20 to minus 40-degree range. The evening of January 15th brought a low-pressure system to the mid-Atlantic coast that deposited four to eight inches of snow in extreme Southwestern Maine, three to six inches across the central part of the state, and five to ten inches in the western mountains. On January 23rd, snow developed from south to north during the day, changing to sleet and then to freezing rain in Southern and Central Maine. The mixture of precipitation continued into the afternoon of January 25th, with significant icing along the southwestern coast of Maine.

On January 13th, President Clinton declared 15 of Maine's 16 counties as a federal disaster area eligible for infrastructure support assistance. The Disaster Declaration was amended to cover Individual Assistance on January 15th, and Aroostook, the final county, was added to the declaration. Hazard Mitigation funds to reduce future disaster risks were made available on January 13th.

At its peak, more than half of Maine's population was without power, caused by ice that coated lines and branches an inch thick. Many state and secondary roads were closed because of downed trees on power lines. State government offices were closed, and innumerable businesses were forced to close and remain closed because of blocked roadways and power outages. As a result, 130 emergency shelters were opened throughout the state. Heat, electricity, refrigeration, running water, and sanitary facilities were all interrupted by the power outage. Maine Public Television and Radio remained unavailable to most viewers for more than a week. Other commercial radio and television stations in South-Central Maine lost communication towers and/or electrical power and were unable to broadcast. Even the Emergency Alert System failed.

Across the Northeast states, 17 deaths were attributed to the storm. The fast response of voluntary organizations, local and state governments prevented many more casualties. Utility crews partnered with the Maine Department of Transportation (DOT) and the Maine Army National Guard (MENG) to restore power to the region. All worked through frigid temperatures and snow to clear debris and keep roads open so utility crews could reconnect downed lines.

Central Maine Power (CMP) estimated their cost to restore power to the more than 600,000 residents at 60 million dollars. Clean-up and repair costs of local and state government agencies increased the estimate to more than 87 million dollars.

Long-term impacts of the widespread devastation continue to be identified. More than 17,000,000 acres of urban and rural forest in the four-state area sustained some degree of damage, creating an immediate safety hazard and potentially threatening the long-term regional economy.

The Salvation Army and The American Red Cross (ARC) estimated their recovery costs at $600,000 on March 4, 1998, and the Maine State Bureau of Insurance (MSBI) issued a report indicating $28,353,000 in claims had been paid. The Maine Forest Service (MFS) reported as much as $28,000,000 in forest damage, along with devastating losses to blueberry farmers, maple syrup producers, and beekeepers. An agribusiness survey taken by the Farm Bureau in each county summarized a total damage estimate of $24,970,890.

3.30 Severe Fall/Winter Weather – Probability of Future Occurrence [S4.]

Records dating as far back as 1972 indicate that every year, between November and April, there is a high probability that severe fall/winter weather will occur. On average, the length of annual maximum snow cover ranges from about 50 days along the coast to over four months in the northern and particularly the northwestern part of the state.

3.30.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Maine winters have warmed about 4°F and the snow season length has decreased 1–2 weeks on average over the past century (Figure 3.27), with most of the latter associated with warmer temperatures in late fall/early winter. These trends are expected to continue over the next several decades. It is uncertain whether ice storms will become more or less common in a warmer climate, but there is a tendency toward more extreme weather events in relation to warmer temperatures driving an intensified hydrologic cycle. Warmer winter temperatures may lead to a greater occurrence of ice and heavy snow hazards. However, variability can and will continue to deliver impactful snowstorms and cold-air outbreaks. For a recent example, consider the record breaking "snow year" of 2014-2015 that blanked the northeast; this winter also produced the coldest February in Maine since 1934 due to an unusually persistent atmospheric ridge-trough pattern over North America that repeatedly brought Arctic flow into the region.

Local observations indicate that extratropical cyclones, specifically southeasters, are becoming more prevalent in late fall/early winter (October to January) which are causing high winds, lots of precipitation, waves, and as a result, high levels of erosion among south and east facing beaches, marshes, and bluffs. These events are also causing very large power outages from wind damage and downed trees. Simonson et al. (2020) [151] examined the historical incidence of mid-fall extratropical cyclones in New England in a climate context and found since 1979 there is not a statistically significant trend in storm frequency or intensity. However, the study does find a statistically significant trend toward increasing precipitation accompanying storms with maximum winds exceeding 58 mph. This increased rainfall associated with high-wind producing storms could potentially increase damage risk.

Figure 3.27: This map shows changes in the timing of annual high winter-spring flow carried by rivers and streams from 1940 to 2018. This analysis focuses on parts of the country where streamflow is strongly influenced by snowmelt. Trends are based on the winter-spring center of volume, which is the date when half of the total January 1–July 31 streamflow (in the West) or half of the total January 1–May 31 streamflow (in the East) has passed by each streamflow gauge, reflecting the timing of spring snowmelt.

[151] Simonson, J. M., Birkel, S. D., Maasch, K. A., Mayewski, P. A., Lyon, B., & Carleton, A. M. (2020). Historical incidence of mid-autumn wind storms in New England. *Meteorological Applications*, *27*(5), e1952. https://rmets.onlinelibrary.wiley.com/doi/10.1002/met.1952

Winter snowpack makes an irreplaceable contribution to spring surface and groundwater supplies. Years with a low snowpack can lead to water shortages and drought by late summer. Melting of the snowpack in April and May is often gradual enough to prevent serious flooding, although there have been times when a quick melt has led to disastrous conditions. Historic streamflow records indicate that the timing of annual high spring flows caused by snowmelt is occurring earlier than in previous decades by 5-10 days or more (Figure 3.27) [152]. Trends in lake ice out also indicate earlier transitions into spring weather and associated hydrologic conditions (Figure 3.28) [153], posing a potential hazard also for community members wishing to recreate or fish on late season ice [154].

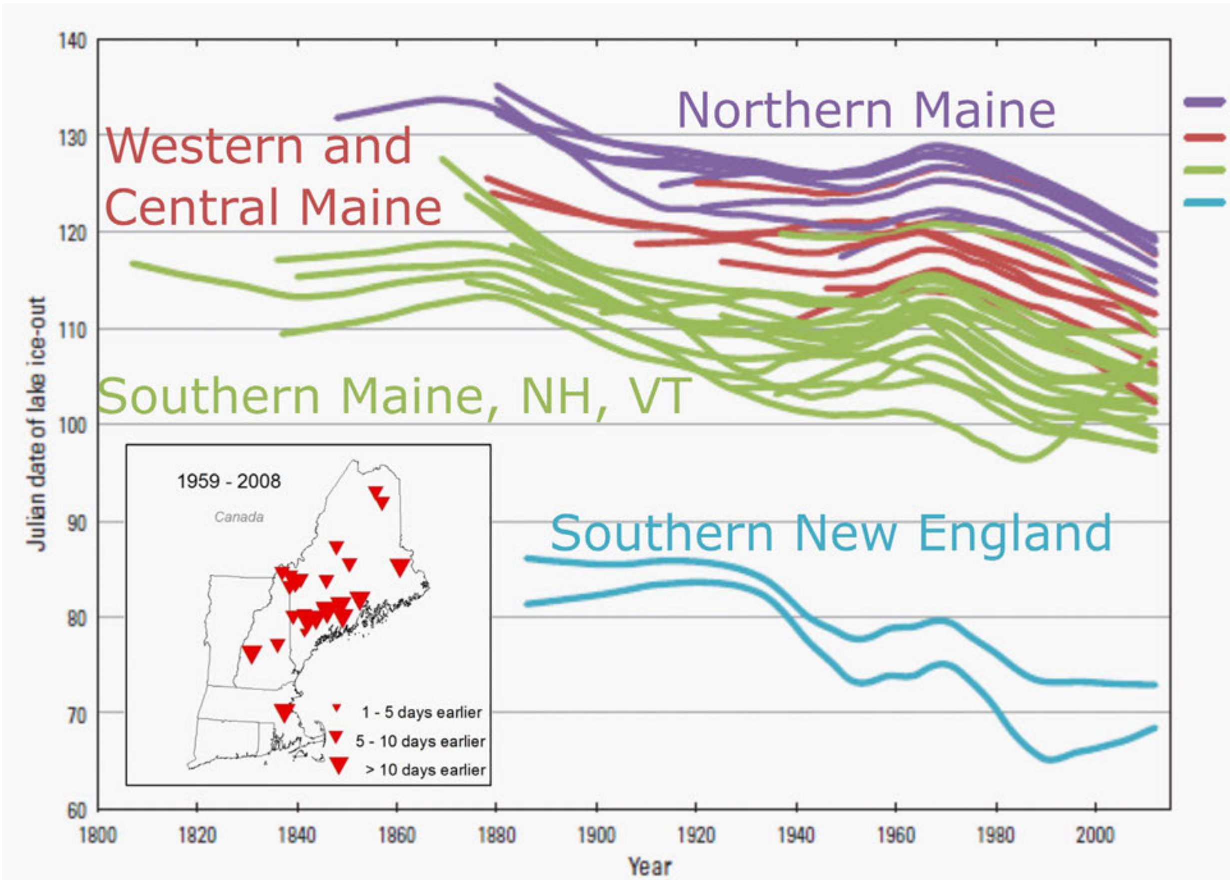


Figure 3.28: Ice-out dates over time for eight selected lakes in New England. Data smoothed by locally weighted regression.

[152] https://www.epa.gov/climate-indicators/climate-change-indicators-streamflow#ref4
[153] Hodgkins, G. A. (2013). The importance of record length in estimating the magnitude of climatic changes: an example using 175 years of lake ice-out dates in New England. *Climatic change*, *119*(3), 705-718. https://link.springer.com/article/10.1007/s10584-013-0766-8
[154] Learning to ice fish on Maine's changing lakes: spectrumlocalnews.com/me/maine/news/2022/02/28/learning-to-ice-fish-on-maine-s-changing-lakes

Severe Fall/Winter Weather – Vulnerability Assessment

TIER 1 HAZARD

3.31 Severe Fall/Winter Weather – Impacts

A severe fall/winter weather event can down power lines and cause widespread outages, shut down roads, and close businesses. Even in the absence of a major snowfall event, the accumulation of multiple snowfall events can come at high costs to local governments. Roof collapses can occur on residential and commercial properties when snow loads become extreme.

All of Maine is vulnerable to severe fall/winter weather events every year and on a larger scale/extent than severe summer storms. In general, the Southern Interior and Northern Climate Divisions receive more snowfall while the Coastal Climate Division experiences more ice storms. Severe fall/winter weather of all types can still happen anywhere in Maine. In the event of an extended power outage residents without an alternate heating source are vulnerable to cold temperatures, and remote populations could be without power for a upwards to several weeks.

3.32 Severe Fall/Winter Weather – Vulnerability of State Assets [S5.]

Winter storm damages to state-owned or operated buildings or infrastructure are no more likely than damages to other buildings or infrastructure. Costs typically come from the overtime use of Maine Department of Transportation and National Guard personnel and equipment to remove state-maintained roads of ice, snow, and debris. Although utilities can be damaged during winter storms, the utilities are owned and operated by private utility companies.

Primary impacts to state assets are power outages leading to a halt in state services that do not have backup generators, potential cold weather damages, frozen/broken pipes, and resultant flooding, roof/structure damage from heavy snow, and debris damages to Maine's transportation network and structures. Essential state workers are at greater risk of being injured as they serve critical roles that may involve travel and maintenance during severe winter weather.

3.32.1 Potential Dollar Losses to State owned buildings, infrastructure, critical facilities

Damages from an extratropical cyclone on state assets would be similar in scale to damages modeled for tropical cyclones in this Plan. Refer to Tropical Cyclones – Vulnerability Assessment for damage estimates. There is no guarantee that these assets will be damaged in a natural hazard event.

Damage Assessments from Disaster Declarations

As noted in the section Severe Summer Weather – Vulnerability Assessment, the windstorm of October 2017 caused substantial damage across 13 of 16 counties (185 municipalities) primarily in the form of vegetative debris cleanup on state and town roads, with cleanup costs equal to $361 per mile ($8.3 million 2022 USD for the total impacted area). This cost per mile estimate is spread across the entirety of impacted counties rather than the roads that were directly impacted and is therefore considered an underestimate.

3.32.2 Community lifeline Risks

Severe fall/winter weather impacts are anticipated to have a similar influence on community lifelines as tropical cyclones with the added threat of heavy snowfall and freezing temperatures. A primary impact of heavy snowfall is the transportation lifeline and freezing temperatures can impact shelter needs.

Transportation

Snow and ice control are crucial in Maine winters. The cost of snow and ice clearing is around $10,000-12,000 per centerline mile, for the season, for a state highway. This includes all material, labor, and equipment costs. Higher level-of-service corridors will be on the higher side of that range, lower will be on the lower side. State aid corridors should be somewhat less. Municipal road winter maintenance may be more or less than this rate depending on their contracts.

Shelter

Several programs exist to protect vulnerable communities from exposure to cold winter temperatures. Two examples are warming centers and home heat assistance programs. Refer to the disadvantaged communities section below for details on LIHEAP. A Warming Center is a facility that has been opened for short term operations due to a specific emergency or event. They are normally opened when temperatures or a combination of precipitation, wind chill, wind and temperatures have or may become dangerous. Their paramount purpose is the prevention of death and injury related to exposure to the elements. Warming centers can help stranded motorists, or residents that have lost critical services. Some warming centers may provide limited food, showers, charging stations and places to rest [155].

3.33 Severe Fall/Winter Weather – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

3.33.1 Identifying Jurisdictions with greatest vulnerability [S6.a.1.]

All jurisdictions are vulnerable to different forms of severe fall/winter weather. Figure 3.26 indicates varying degrees of risk and annual expected losses jurisdictions may have for typical fall/winter hazards including ice storms, winter weather, cold waves, and strong winds. For these maps, the calculation of risk is a function of expected annual losses determined from past events, social vulnerability metrics, and community resilience metrics. Under these assumptions, southern/coastal Maine holds the greatest risk for ice storms, while northern Maine holds the greatest risk of cold waves. Parts of central Maine hold the greatest risk for winter weather, while the risk of strong wind is fairly evenly distributed across the state.

Disadvantaged Communities

The objective of the disadvantaged communities' assessment is to identify potential disadvantages felt by community members who are disproportionately impacted by natural hazards both historically and under future projections. Exposure of disadvantaged communities for large storm events, such as nor'easters, would follow similar trends shared in the Tropical Cyclone – Vulnerability Assessment.

Exposure to cold temperatures leads to higher energy burdens on low-income residents who must spend more of their own budgets on electricity and heating fuels than higher income residents. In fact, the average home energy burden for low-income households is 19%, far exceeding most definitions of energy poverty [156]. In 2020, the Maine Low Income Home Energy Assistance Program (LIHEAP) allocated $40.34 million for utility payment and home weatherization programs across the state, with 158,381 households eligible for the program [157]. Further, 82.5% of LIHEAP recipients also have at least one vulnerable member (elderly over 60, disabled, or child under 6).

[155] MEMA Mass Care: https://www.maine.gov/mema/response-recovery/mass-care
[156] Maine Low-Income Home Energy Burden: https://www.maine.gov/meopa/sites/maine.gov.meopa/files/inline-files/Maine%20Low%20Income%20Energy%20Burden%20Study%20June%202019.pdf
[157] LIHEAP funding: https://neuac.org/wp-content/uploads/2021/02/Maine-State-Sheet-2022.pdf

3.33.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Severe fall/winter weather events have the potential to cause significant damage, cripple critical infrastructure, and impact community lifelines. Table 3.28 indicates total damages by winter weather category as reported by NOAA's Storm Events Database. Only storm categories with reported damages are listed, and not all events led to Presidential Disaster Declarations, as noted above.

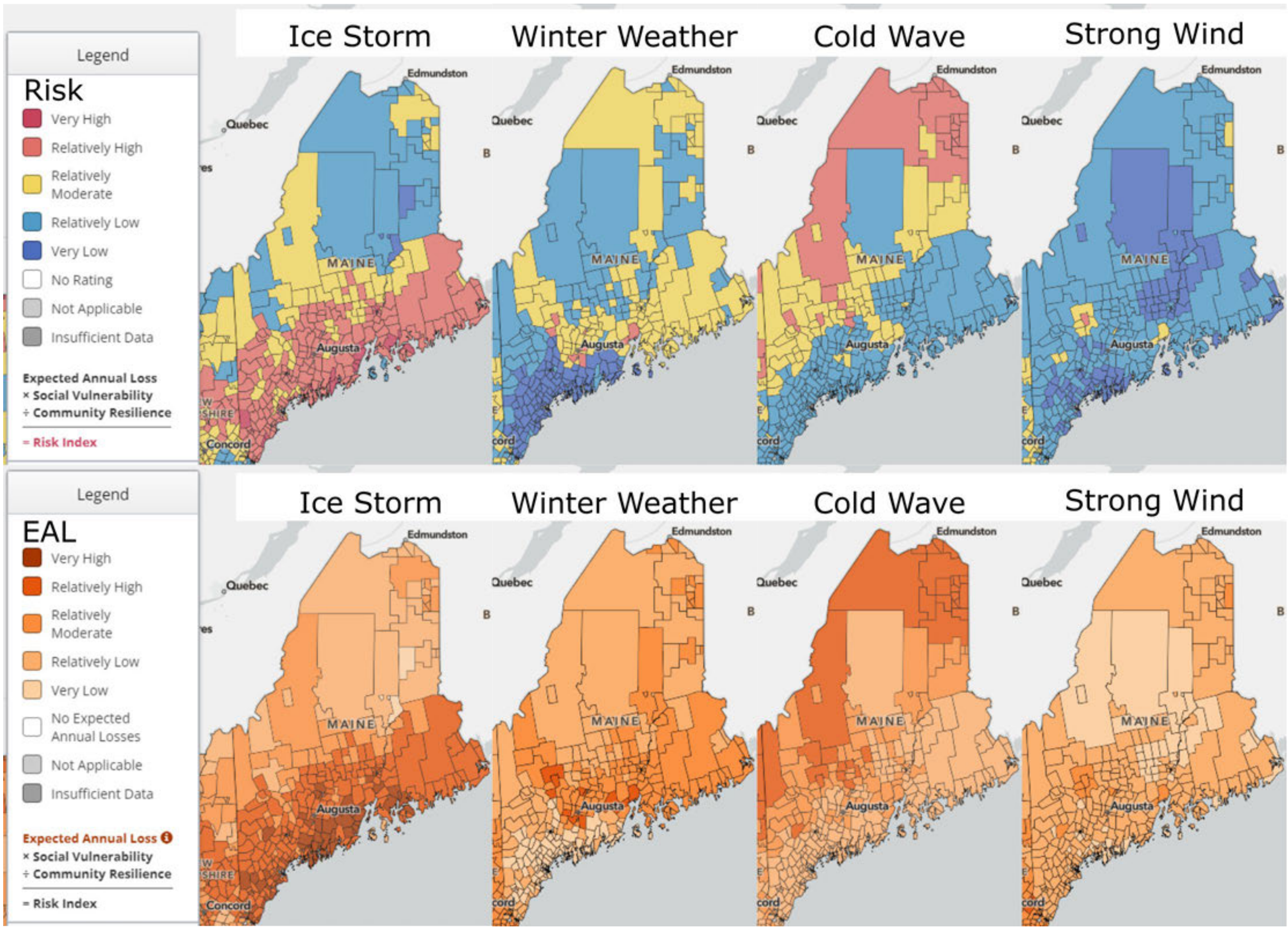


Figure 3.29: National Risk Index map calculations of risk (top row) and expected annual loss (EAL, bottom row) for ice storm, winter weather, cold wave, and strong wind. https://hazards.fema.gov/nri/map#

Table 3.28: winter storm events and collective damages.

Weather Event Category	Event Year(s) Reported	Total Sum of Damages (2022 $USD)	
		Storm Events Database	PA/IA programs
Winter Storm	2013, 2015	$864,928	$9,714,543
Heavy Snow	1996, 1998	$13,669,279	$4,126,123
Ice Storm	1998, 2008, 2013	$590,691,322	$107,492,368

Lack of resources continues to be the greatest issue for severe winter storms. For larger storms, snow removal resources are often maxed out leaving some of the more rural areas more vulnerable to isolation and loss of power.

Wildfire – Hazard Profile

TIER 1 HAZARD

3.34 Wildfire – General Definition and Types of Events [S3.a., S3.b.]

A wildfire or wildland fire is an unplanned fire burning in an area of combustible vegetation that occurs in forests, shrublands, grasslands, or prairies. Areas damaged by wildfires are particularly susceptible to flash floods and debris flows during rainstorms. Rainfall that is normally absorbed by soil and vegetation can run off almost instantly, causing creeks and drainage areas to flood much earlier and with higher magnitude than normal. Heavy rainfall on recently burned areas can also mobilize sediments and cause a much more destructive debris flow.

3.34.1 Wildland Fire

Any non-structure fire, other than prescribed fire, occurring in the wildland or wildland urban interface [1]. Wildfire is a natural phenomenon initially finding its origin in lightning. However, humans have become the greatest cause of fires in Maine. Today, about 95 percent of all forest fires are caused by human activity while lightning causes about ten percent. Though wildland fires originate in wildland areas, they can potentially spread into urban areas and become an even greater threat to lives and property [2].

3.35 Wildfire – Location of Hazard [S3.a.1]

Maine has 17.52 million acres of forest land that provide more than 500 different wood products and lumber. Maine continues to be the most heavily forested state in the nation at 89% [3]. The state's forest land base has remained essentially stable for the last several decades and is close to the estimated acreage of forest land present at the time of European settlement.

Well-distributed rainfall normally reduces wildfire risks, but seasonal variations, rapidly draining soils, and unusually dry periods can induce major blazes. In addition, insect damage (such as the hemlock woolly adelgid and spruce budworm) diseases, severe weather, and residential and commercial developments in wooded areas greatly increase the potential for catastrophic fires. Over time, a considerable fuel supply can accumulate from the ignitable slash of some logging operations and/or from dead trees left standing on the forest floor after insect infestations.

The Department of Agriculture, Conservation, and Forestry; Maine Forest Services; Forest Protection Division, tracks all reported fire occurrences in the state on an annual basis. These are coded by cause such as: campfire, children, debris burning – which can include backyard burning as well as the agricultural practice of "burning over" blueberry fields, incendiary (includes arson) lightning, machinery, miscellaneous, railroad, and smoking. Maine Forest Service uses a national system called InFORM that uses ArcGis, Survey 123 to capture wildfire incidents [4].

[1] US Forest Service wildfire definition: https://www.fs.fed.us/nwacfire/home/terminology.html
[2] Urban fire definition: https://www.eugene-or.gov/1175/Urban-Fire
[3] Maine Forest Health Highlights 2020: https://www.maine.gov/DACF/mfs/forest_health/documents/2020MaineForestHealthHighlightsForUSFS.pdf
[4] InFORM: https://in-form-nifc.hub.arcgis.com/

The Maine Forest Service's (MFS) Forest Protection Division provides wildfire protection services for all of Maine's forest lands. In the Unorganized Territory of Maine, which accounts for 44 percent of the state's total land area, MFS is the only fire suppression entity and is often requested to respond to structure and vehicle fires as well as wildland fires. Their goals are to keep the number of forest fire starts to less than 1,000 and annual acreage loss to less than 3,500. MFS has met those goals in recent years because of:

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

3.36 Wildfire – Intensity and Previous Occurrences [S3.a.2.]

With 17.52 million acres of forested land covering 90 percent of the State of Maine, the entire state remains at risk for wildfires. With an increase in drought and other extreme conditions driven by climate change and seen across the state, wildland fires could originate anywhere, potentially placing a large burden on the state's limited resources. Maine Forest Service uses several different scales to measure the intensity of wildfire events as noted in Table 3.29.

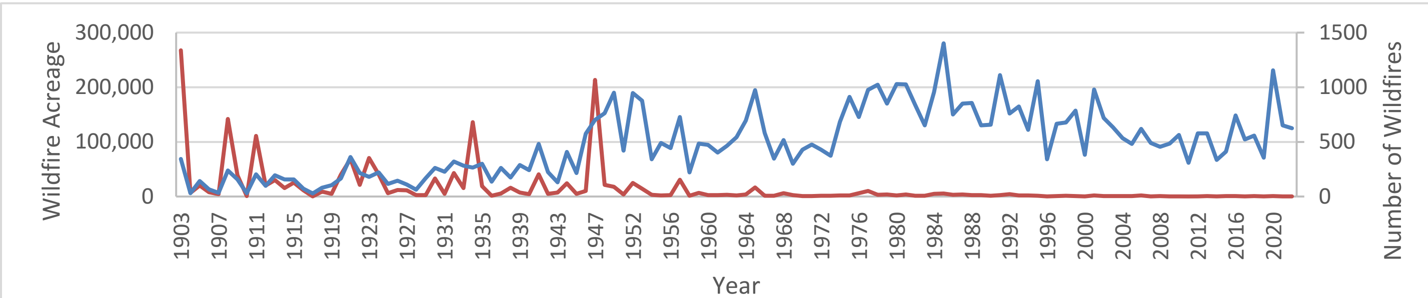
Table 3.29: Wildfire intensity scales

Wildfire intensity scale	Definition/use
Energy Release Component (ERC) [5]	Available energy in BTU per unit area within the flaming front at the head of a fire, incorporating all live and dead fuels available.
Initial Spread Index [6]	Integrates conditions of fuel moisture and surface windspeed to estimate the potential for wildfire spread.
Keetch-Byram Drought Index (KBDI) [7]	A drought index designed specifically for wildfire potential assessment, representing the net effect of evapotranspiration ad precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers.
Probability of Ignition [8]	Probability of wildfire ignition estimated from temperature, shading from forest canopy/cloud cover, and 1-hour fuel moisture content.

[5] Energy Release Component: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5339121.pdf
[6] Fire Weather Index System: https://www.nwcg.gov/publications/pms437/cffdrs/fire-weather-index-system
[7] KBDI: https://www.wfas.net/index.php/keetch-byram-index-moisture--drought-49
[8] Probability of Ignition: https://www.nwcg.gov/publications/pms437/fuel-moisture/probability-of-ignition

3.36.1 Previous Occurrences

Fire occurrences in 2016 increased with a record total of 747 events, increasing about 32 percent from a five-year average of 504 fires. Acreage burned also increased by 30 percent from the previous five-year average of 599 acres to a total of 907 acres. Traditional leading causes prevailed with debris burning and equipment use topping the list, with drought conditions exacerbating fire occurrence and intensity.



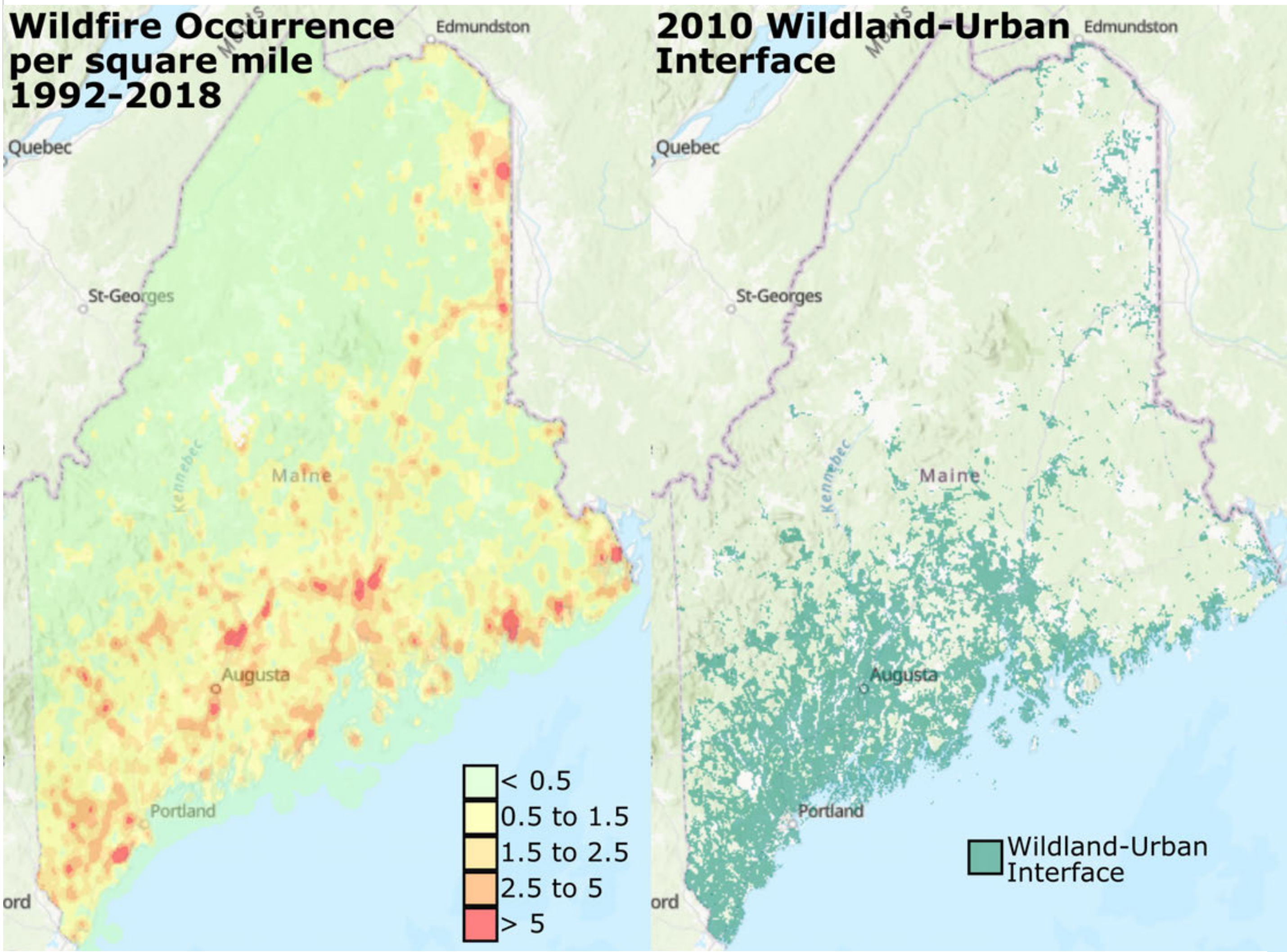


Figure 3.30: (top) wildfire occurrence over time in Maine by acreage (red) and total count (blue).

Figure 3.31 (bottom): distribution of wildfires in Maine from 1992 – 2018. (left) Wildfire occurrence in Maine, (right) Wildland Urban Interface delineated by US Forest Service based on 2010 US Census data.

The Maine Forest Service; Forest Service Division has identified a total of 1.85 million acres burned across 57,871 wildfires since 1903 (Figure 3.30). While historically major wildfires have correlated more with a higher number of acres burned, wildfire trends now reflect a higher number of smaller, more destructive fires due to an increase of people living in the wildland-urban interface. On average, the Maine Forest Service responds to 500 acres and fires annually. Figure 3.31 depicts the distribution of wildfires in Maine from 1992 to 2018. Moderate to severe drought conditions, as seen during the droughts of 2002, 2016, and 2020, inevitably help to exacerbate the likelihood of an event occurring.

Fire of Record: The "Great Fire of 1947"

The worst fires in Maine's history occurred in the fall of 1947. This event was actually a series of wildfires that flared all over Eastern and Southern Maine. Several fires that burned concurrently leveled nine towns in Southern Maine before the blazes were controlled. A similar situation occurred in Bar Harbor during the same period. Until 1947, Maine's record for a low incidence of fires was one of the best of the eastern states. Though that year had begun with excessive rainfall and cold temperatures, rapid onset of drought led to severe wildfire danger through the summer and into fall. Eventually, it would be apparent that the state was experiencing its severest drought in 30 years. A post-war boom in housing led to greater than normal amounts of slash and mill waste that contributed to a large amount of fuel near newly developed areas.

On Friday, October 3rd, a fire got out of hand when a crew was clearing brush for the new turnpike. With the help of local firefighters, they thought that it had been extinguished, but on Sunday, it flared up, burning underground along the roots of trees. By then, other fire reports were coming into the Office of the Forest Service in Augusta. As sunny, dry weather continued, more fires burst to life:

- **October 7** - fires were burning in the Topsham and Bowdoin areas, the Wells-Sanford Road in York County, and in Portland.
- **October 16** - there were 20 fires burning – double the number of 24 hours earlier.
- **October 17** - there were 50 fires burning; Gov. Hildreth closed the Maine woods to hunting, and a season of revenue.
- **October 18** - the Topsham-Bowdoin blaze was two weeks old, still out of control, and had consumed 1,000 acres of slash and timber.
- **October 23 –** "Red Thursday" the day of the big wind that spread the fire through Newfield, Shapleigh, Alfred, and Lyman.
- **October 24 –** rumors were rampant; Central Maine Power, the state's largest utility, had to issue a statement to stop further erosion of its stock value.
- **October 29 –** there were 40 fires still burning; there was a second attempt to "make rain" by combined efforts of "Project Cirrus."

In just a week, nine communities had been practically wiped out, four more had suffered severe damage, and scores of others had lost buildings. Property damage was estimated at $30,000,000. Fifteen had died. Many thousands of acres of trees had burned, and 3,000,000 feet of cut lumber had been destroyed.

Other notable wildfires

- October 1825, the Great Miramichi Fire burned 3.84 million acres in New Brunswick and spread into parts of eastern Maine, ranking within the top three largest wildfires recorded in North America.
- In July 1977, a forest fire, started by lightning in Baxter Park, burned nearly 4,000 acres and seriously threatened the entire park and surrounding developed areas.

- May 1992, a wildfire burned 1,200 acres near the towns of Allagash and St. Francis, requiring evacuation of 400 people and construction of a fire line in an effort to protect the communities [9]. Wildfire suppression costs totaled $1,106,114 (2022 USD) [10] and required federal support through the FMAG program [11].
- 1997, the Moxie fire burned 2,000 acres [12]

3.37 Wildfire – Probability of Future Occurrence [S4.]

Based on historical records of fires, the Department of Agriculture, Conservation and Forestry, Maine Forest Service Forest Protection Division anticipates there will be an average of 550 low acreage fires (from all causes) each year (a low acreage fire is less than 1,000 acres). Ironically, even though Maine has seen record drought conditions since the publication of the 2018 Plan, anticipated wildfires are still down from the 600-700 predicted five years ago. While the probability of a major wildfire, based on the last 115 years of wildfire data, is once a decade, it is currently unclear as to how changing climate conditions may either contribute to or inhibit future wildfire events. Most wildfires, however, are likely to occur between the months of April and October.

One aspect of risk analysis for wildfires in Maine which deserves attention is that of a "complex" of wildfires at the same time. Recent lightning events have resulted in this type of scenario, with multiple fires being reported simultaneously. While these fires are generally not large, challenges for managing multiple incidents exist. Recently, a single lightning storm caused over a dozen fires across the Unorganized Territory of Maine, resulting in fires ranging in size from one to twelve acres.

MFS has launched a community assessment program aimed at focusing its fire prevention efforts on geographical areas of the state with relatively high occurrences of wildfires. The assessment involves working with local officials and the public to identify vulnerable homes in the urban/wildland interface. MFS then prepares a community wildfire protection plan that contains guidelines that homeowners can use to protect their homes. The emphasis is on maintaining a 30-foot defensible space around homes.

[9] Allagash Fire: https://www.upi.com/Archives/1992/05/19/Forest-fire-threatens-two-northern-Maine-towns/9446706248000/
[10] Wildland-Urban Interface Communities at Risk, Community Wildfire Protection Program, Tacoma Lakes Improvement Society: https://static1.squarespace.com/static/6171b2817275ae7fb6410428/t/618aa37e6e426d31e3543736/1636475776566/Wildfire-Protection-Plan.pdf
[11] FEMA Fire Management Assistance Grants: https://www.fema.gov/assistance/public/fire-management-assistance
[12] Maine Forest Products Council: https://maineforest.org/maines-forests-dont-have-major-wildfires-every-year-in-fact-the-average-wildfire-in-maine-is-less-than-one-acre/

3.37.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

The landscape of wildfire control in Maine is rapidly changing on several fronts. These changes are presenting very significant challenges to the Forest Protection Division of the Maine Forest Service, as well as to Maine's rural municipal fire service. Changes in the ownership and timber management practices of Maine's commercial timber land base are presenting new challenges for the state's wildfire control program. Additionally, climate change, reductions in the forest ranger force and a reduced number of available firefighters are all concerning when considering the wildfire hazards for Maine. The following outlines several of these present and continually growing challenges to assess the hazards presented by wildfire to the State of Maine.

Climate Change

Maine's wildfire season usually begins in late March/early April with the Spring snow melt. This start time varies across the state, with the southern and Downeast coastal areas usually being the first to have reported wildfires. As temperatures increase, the wildfire threat spreads northward. The wildfire season generally only stops when snowfall begins. It is not uncommon for wildfires to occur in the months of November and December. The wildfire season in Maine is generally split, with a large number of wildfires occurring in April and May due to dry, cured grass brush. With a green-up period that occurs in late May and early June, wildfires generally subside a bit. The summer fire season, resulting from long-term drying of heavier forest fuels, coupled with lightning and unextinguished campfires, can produce some intense fire incidents.

Recent changes in Maine's weather patterns have resulted in "extremes" to become more of the norm. Long term drought, as cataloged by the US Drought Monitor, shows that Maine is not immune to longer periods of time without sustained precipitation. Additionally, we have increasingly experienced longer periods of time with uncharacteristically low relative humidity. In fact, in 2022 Maine experienced a continuous 5-day period with relative humidity of less than 20 percent. National Weather Service records show that this had not happened since 1948. Conversely, As our climate changes, federal agencies like the National Oceanic and Atmospheric Administration and the Environmental Protection Agency believe storms are becoming more frequent and more volatile.

The Maine Forest Service operates a network of remote automated weather stations, strategically located across Maine, to collect hourly weather data to understand current wildfire danger. We work cooperatively with the National Weather Service and our state and federal partners to share this information so that we can make sound decisions and inform the public of the wildfire danger.

Land Management Changes

In Maine, several industrial landowners and the Maine Bureau of Parks and Lands are now employing "Outcome Based Forestry", utilizing enhanced land management techniques for timber harvesting which give them the chance to develop more broad-based harvesting prescriptions. Outcome Based Forestry operations are timber harvesting techniques that are conducted in a manner that are touted as ecologically sustainable, economically viable and socially responsible. These science-based techniques allow participating parcels to have fewer compartmentalized sections of forest, resulting in fewer abrupt changes in forest stand types. As such, many contiguous harvest stands are larger in size and less fragmented in composition. Land managers who utilize Outcome Based Forestry state that an economic advantage of the program is that they now must establish and maintain fewer roads and larger road systems. They also state that because of these enhanced practices they can effectively, "put older road systems to bed," and not have to contend with them for 20-30 years post-harvest.

These byproducts, resulting from Outcome Based Forestry practices, will have a profound impact on present and future wildfire control efforts in our state. With forested areas having fewer stand type changes, fewer mandated clear-cut (surrounding) buffer zones and with forest stands which are often more intensely managed for spruce and fir timber products, the likelihood of larger and certainly more intense wildfires has and will continue to increase. Additionally, if road systems are not established, or existing systems are not maintained or are even made dormant, access for forest rangers and wildfire suppression resources become significantly limited. This is both good and bad – the good being less wildfire risk from reduced public access to remote forested areas – the bad is that it may become more difficult to quickly access areas for successful initial attack on wildfire incidents. And, as we certainly all know, lightning can happen anywhere, and its risks are nearly impossible to mitigate. Many land management companies and forest landowners are also deferring existing logging road maintenance simply to keep costs down and profitability up. Roads once passable with most passenger cars are now highly deteriorated and, in many cases, are grown in. Bridges and culverts are often temporarily pulled and/or permanently removed, limiting access to foot traffic and helicopter. In essence, Maine is now what one renowned national fire historian characterized as, "rewilding." This descriptor makes reference to what Maine was like in the 1950s relative to forest road access and to its reverting toward a more contiguous and wildfire susceptible forest.

Declines in Rural Fire Service

Maine's volunteer fire service is experiencing the widely publicized problem of a downward trend in firefighters willing to serve their communities, as seen in all areas of the United States. In recent years, Maine has not been immune to repeated cases in which existing volunteer fire departments are unable to respond with full crews to fires and other emergencies, requiring a much greater reliance on mutual aid, and resulting in the shuttering of several volunteer fire departments altogether. In recent years, there have been no fewer than 10 departments across Maine which have closed due to lack of members. Also, the Maine Legislature has allowed several organized municipalities to "deorganize" to become part of Maine's Unorganized Territories. In these townships, the State of Maine has replaced municipal government functions, including the full responsibility for wildfire control. As a result, since 2006 there has been a noteworthy shift in the responsibility for wildfire control to the Maine Forest Service in the amount of an additional 355,000 acres of forestland, including the associated protection of 2,775 structures situated on those acres with no additional personnel for this purpose either allocated or appropriated.

A recent survey of the Maine Forest Service's three Forest Protection Division regions paints a concerning picture of the growing threat of increased difficulty in ensuring quick and effective initial attack of wildfires. In our Central Region, comprised of 7.42 million acres, the Maine Forest Service is solely responsible for protecting 3.87 million acres (52.2%) of this total area from wildfires. This area of the region is referred to as Maine's unorganized territories and is home to over 10,000 structures. Remaining areas of the region consist of organized towns with no fire department of their own – 886,220 acres (11.7%) – and they rely heavily on the Maine Forest Service for wildfire protection. Still more concerning are those towns in the region whose fire departments have been classified as, "Limited Resource Fire Departments." This designation is applied to any town fire department which has documented and chronic low firefighter enrollment, and which the department is likely unable to successfully conduct initial attack operations on a 1-acre wildfire in their town without the help of mutual aid. This area totals 606,722 acres, or 8.2% or the Central Region's total acreage. In short, the Central Region's 16 field forest rangers are the de facto wildfire control officers responsible for the protection of 72 percent, or 5,349,813 of the region's 7.4 million acres7. There are towns and cities within the region which have no less than daytime staffing of their fire departments. Many of these provide 24 hour/7 day per week staffing, and this area accounts for 466,697 acres, or 6.3% percent of the Central Region's land area.

Wildfire – Vulnerability Assessment

TIER 1 HAZARD

3.38 Wildfire - Impacts

Though wildfires are a common occurrence in Maine, the state has a low risk for large, damaging wildfires due to a temperate climate; strong preparedness and response capabilities at local, county, and state levels; and a growing interest in wildfire mitigation actions. However, several demographic factors make Maine's rural areas less resistant to the threat of fires. First, the shrinking tax base is putting a strain on local funding for volunteer fire departments. Second, as in all of New England, Maine's housing stock is also aging. When old farm homes and wood frame buildings are located in remote areas, it can be very challenging for volunteer firefighters to respond before the structures are destroyed, especially since 90% of all firefighters in Maine are volunteers. In many areas of the state, fulltime fire departments are scarce. These departments often contract their services with adjoining towns which stretches them even further. They are not available for out-of-area fire response.

The Division utilizes fixed and rotary wing aircraft [helicopters] in its wildfire prevention, detection, and suppression missions. Currently, the inventory includes three Bell UH-1H "Huey" helicopters, three Bell 407s, and 1 Jet Ranger acquired from the Department of Defense through a loan agreement brokered by the U.S. Forest Service. These aircraft are the backbone of the state's suppression fleet.

Though rare in Maine's history, the impacts of large, statewide wildfires have been tremendous. Wildfires can destroy entire communities, causing major loss of life and property, severe injuries and mental health challenges, dramatic economic downturns, challenging local and state resources to manage the situation, and pose long-term recovery issues with lack of housing and resources for the recently unhoused. The environmental impacts of the Great Fire of 1947 are still visible on Mount Desert Island. The logistical challenges of wildfire impacts are discussed in the community lifelines considerations below.

3.39 Wildfire – Vulnerability of State Assets [S5.]

3.39.1 Potential Dollar Losses to State owned buildings, infrastructure, critical facilities

State Wildfire Suppression Costs

As a rural state, the biggest issues Maine continues to face in terms of mitigating wildfire revolves around limited resources. With a significant portion of the population living in wooded areas and limited capabilities to both monitor conditions and suppress fire hazards, a higher risk does exist. In recent years, Maine has also experienced exceedingly dry conditions posing the extra challenge of educating the public on prevention of fires and basic fire suppression techniques. Recent years have shown an increase in total fire suppression costs above the average listed in Table 3.30. For example, 2016 suppression costs reached $1.3 million, and damages reached $3.6 million.

State Building/Structure Assets

Wildfire damage to state structure assets is extremely unlikely given the successful history of fire suppression programs in the State of Maine. The US Forest service designates Maine wildfire hazard potential [13] as "Low" to "Very Low." However, the potential exposure of assets to wildfire is substantial under the assumption that wildfires are more likely to occur within the Wildland Urban Interface, as delineated by the US Forest Service [14].

[13] US Forest Service Wildfire Hazard Potential 2022 Map - https://usfs.maps.arcgis.com/apps/mapviewer/index.html?layers=55226e8547f84aae8965210a9801c357

[14] Radeloff, V.C., Helmers, D.P., Kramer, H.A., Mockrin, M.H., Alexandre, P.M., Bar-Massada, A., Butsic, V., Hawbaker, T.J., Martinuzzi, S., Syphard, A.D. and Stewart, S.I. (2018). Rapid growth of the US wildland-urban interface raises wildfire risk. *Proceedings of the National Academy of Sciences*, *115*(13), 3314-3319. http://silvis.forest.wisc.edu/wp-content/uploads/2018/10/Radeloff_2018_PNAS_SI.pdf

MEMA identified 1,733 state structure assets located in the Wildland Urban Interface. The top 10 structure assets rated by building and contents replacement cost are listed in Table 3.31.

Table 3.30: Average annual wildfire suppression costs by cause (values in 2022 USD).

Cause	Average Annual Suppression Cost
CAMPFIRE	$128,972
CHILDREN	$18,946
DEBRIS	$195,771
ARSON	$64,789
LIGHTNING	$101,136
EQUIPMENT USE	$139,038
MISCELLANEOUS	$80,689
RAILROAD	$32,177
SMOKING	$42,570
FIREWORKS	$4,311
POWERLINE	$48,174
PRESCRIBED FIRE	$16,272
STRUCTURE	$63,660
Totals	**$841,276**

Table 3.31: Wildfire potential exposure - State assets in Wildland Urban Interface

Address	County	Occupancy	Property Type	Year Built	Last Inspected	Total	Agency
250 Arsenal St, Augusta	Kennebec	MEDICAL FACILITY	Class 4 building*	2004	7/1/2016	$52,875,000	DHS, RIVERVIEW PSYCHIATRIC CENTER
54 Pleasant St, Castine	Hancock	DORMITORY	Steel/masonry[a]	1970	7/1/2017	$42,744,000	MMA, MAINE MARITIME ACADEMY
23 Blue Star Ave, Augusta	Kennebec	OFFICE	Class 4 building	2017	8/3/2017	$31,861,558	DVS, MILITARY BUREAU
807 Cushing Rd, Warren	Knox	OFFICE	Steel/masonry	2002	7/1/2015	$28,479,770	COR, MAINE STATE PRISON
112 College Dr, Wells	York	CLASSROOM	Steel/masonry	1997	5/11/2022	$26,248,033	TC, YORK COUNTY COMMUNITY COLLEGE
26 Edison Dr, Augusta	Kennebec	OFFICE	Steel/masonry	2020	8/14/2020	$22,250,000	MSH, MAINE STATE HOUSING AUTHORITY
45 Commerce Dr, Augusta	Kennebec	OFFICE				$21,613,000	ADF, OFFICE OF INFO TECH, COMPUTERS SERVERS
11 Market St, Belfast	Waldo	OFFICE	Class 4 building	2019	2/13/2019	$20,000,000	MMB, MAINE MUNICIPAL BOND BANK
66 Industrial Dr, Augusta	Kennebec	STORAGE	Class 4 building	2014	12/31/2014	$19,879,038	DOT, MID COAST REGION
185 Western Ave, Augusta	Kennebec	MILITARY	Steel/masonry	1954	7/1/2016	$19,293,248	DVS, MILITARY BUREAU

*A class 4 building with a fire resistive rating of at least one hour but less than two hours.

[a]Steel or masonry framed building. Masonry siding. Steel or masonry roof decking may be covered with any type of covering.

There is no guarantee that these assets will be damaged in a natural hazard event. The state assets identified in the WUI are all constructed with fire resistive materials, meaning that the exterior walls, floors, and roof consist of masonry, metal, or other non-combustive materials. However, under a severe wildfire, any building can be at risk of damage or destruction. The Riverview Psychiatric Center is a 92-bed inpatient psychiatric hospital treating patients with severe and persistent mental illness. Besides posing a risk to all patients and staff, evacuations of a psychiatric hospital under threat of a wildfire would be an immense challenge as there are few alternative options for inpatient care. Similar issues exist to evacuate state prisons. State-owned university buildings would face major logistical and financial challenges if wildfire damage were to occur. Finally, impacts to MaineHousing and the Maine Municipal Bond Bank would pose much larger challenges as communities would rely on these resources to acquire housing for survivors and rebuild communities.

Though state assets are distributed across Maine, most are in the Capital District in the City of Augusta. This area has a low to moderate wildfire risk and many of these assets are found in urban areas where wildfire risk is not calculated (Figure 3.32).

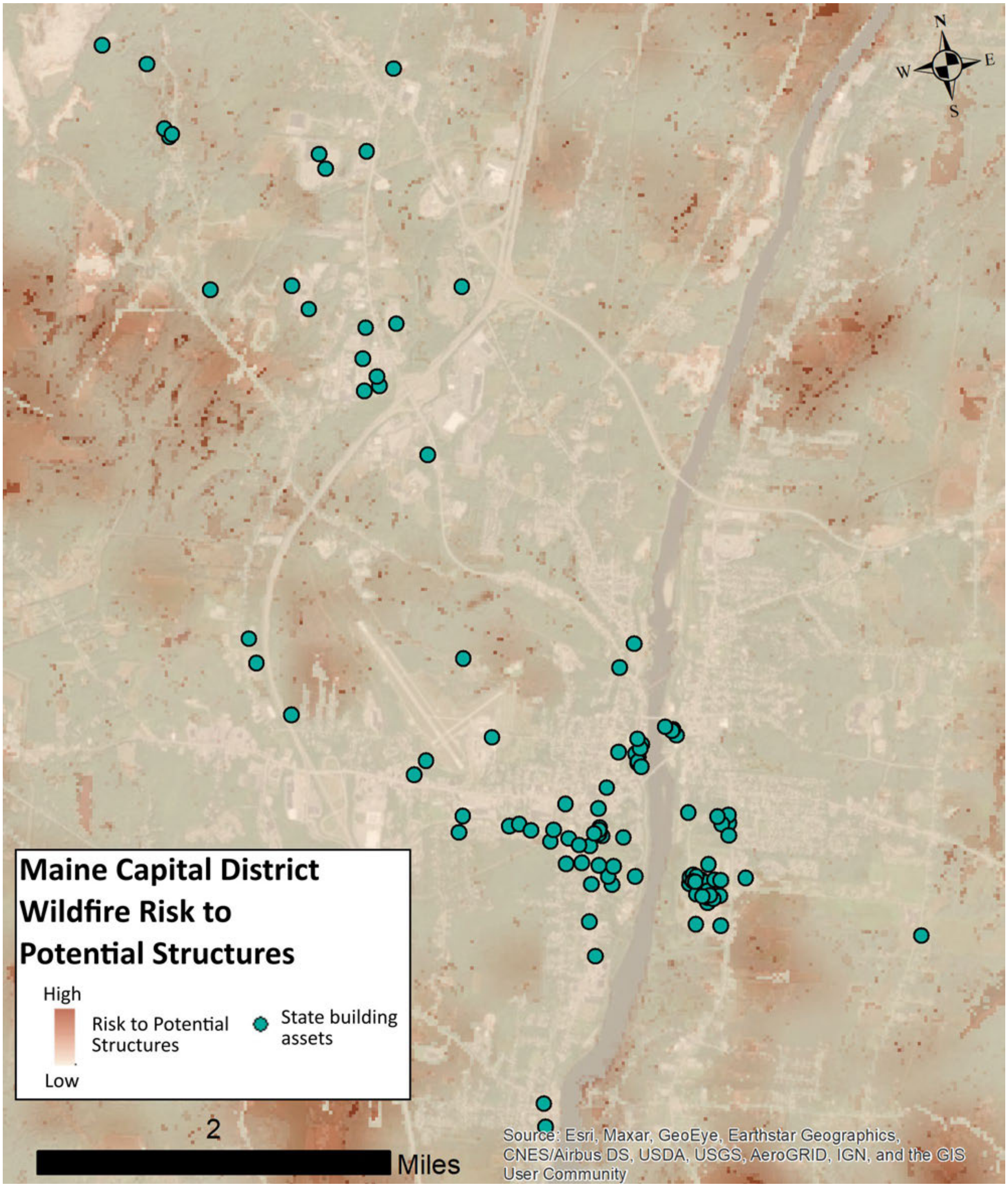


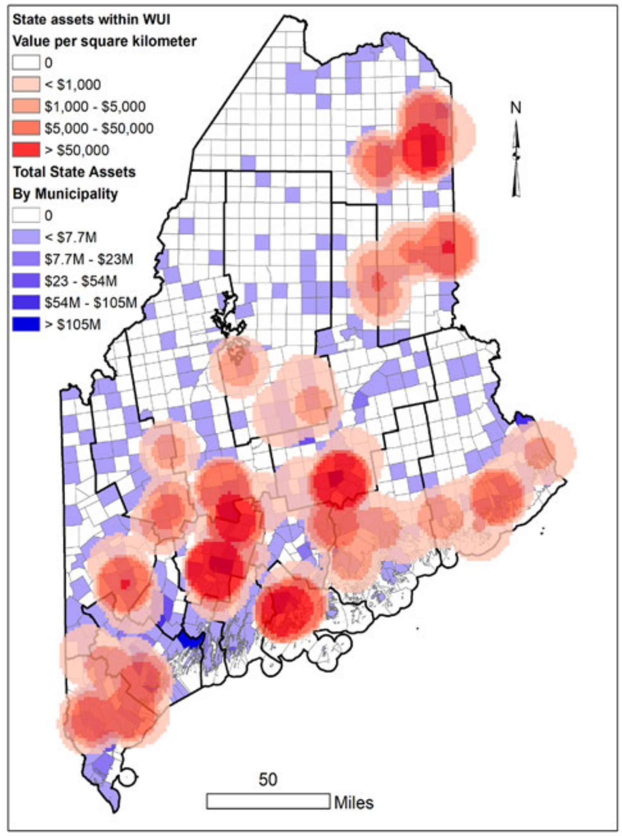
Figure 3.32: Wildfire risk to potential structures in the Capital District, Augusta, Maine.

Approximately 36% of all state structure assets are located in the Wildland Urban Interface (Table 3.32). Four counties, Hancock, Knox, Sagadahoc, and York County have more than 75% of state assets located in the Wildland Urban Interface. General locations are provided in Figure 3.33. Wildfire risk is low (Figure 3.34).

Table 3.32: Potential state asset exposure to wildfire - structures located in 2010 Wildland Urban Interface (Building and contents replacement values in millions 2022 USD)

Region	Totals		Potential exposure in WUI		
	Assets Count	Value	Assets Count	Value	% of total value
State of Maine	*3,769*	*$3,357.70*	*1,733*	*$1,206.71*	*35.9%*
Androscoggin	103	$131.86	41	$13.89	10.5%
Aroostook	421	$287.50	171	$76.58	26.6%
Cumberland	604	$628.20	246	$76.98	12.3%
Franklin	145	$21.04	63	$9.38	44.6%
Hancock	153	$202.13	110	$168.04	83.1%
Kennebec	518	$990.50	281	$399.99	40.4%
Knox	108	$163.41	80	$131.08	80.2%
Lincoln	80	$44.12	56	$11.89	27.0%
Oxford	109	$38.87	58	$15.70	40.4%
Penobscot	355	$383.40	105	$33.44	8.7%
Piscataquis	228	$32.19	38	$23.76	73.8%
Sagadahoc	87	$28.35	43	$22.09	77.9%
Somerset	191	$130.57	89	$63.95	49.0%
Waldo	179	$46.70	58	$32.64	69.9%
Washington	225	$122.94	92	$38.20	31.1%
York	263	$105.91	202	$89.07	84.1%

Figure 3.33: State assets potentially exposed to wildfire within the Wildland Urban Interface (WUI).



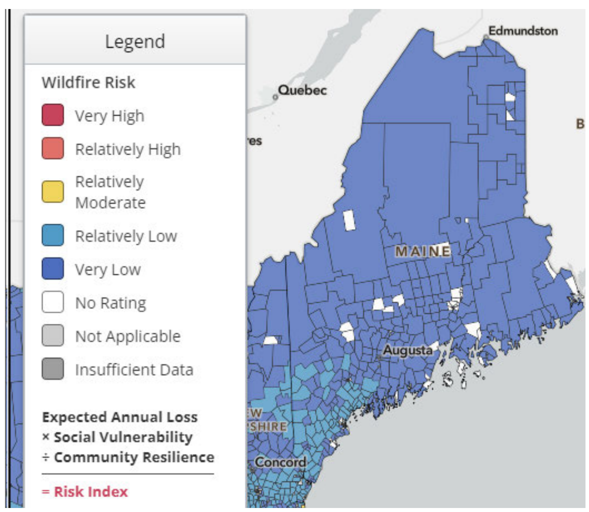


Figure 3.34: National Risk Index maps of wildfire risk in Maine census tracts.
https://hazards.fema.gov/nri/map#

Conserved Lands

Conserved lands may also be potentially exposed to wildfire based on their intersection with the Wildland Urban Interface (Table 3.33). Conserved lands, held by state, municipal, private, or federal agencies/organizations, may be more susceptible to wildfire because they tend to be forested with relatively more challenging wildfire suppression access versus structures. Conserved lands in southern, central, and coastal portions of Maine are more likely to be located in the Wildland Urban Interface.

Table 3.33: Conserved lands in Maine and portion of area within Wildland Urban Interface.

Interest type	Total acres (thousands)	WUI Intersect acres	Portion of area
State	1,349	29	2.2%
Municipal	42	28	66.8%
Private	2,670	144	5.4%
Federal	304	5	1.7%
Total	4,366	206	4.7%

3.39.2 Community lifeline Risks

Wildfire is anticipated to impact each lifeline to a potentially substantial degree. However, it is difficult to identify location-specific issues for each lifeline because wildfires can occur in any forested part of the state. Please refer to other sections of the Wildfire – Hazard Profile and Vulnerability Assessment for greater detail. Here we provide a count of certain facilities located within the WUI. As noted before, using the WUI to assume wildfire risk is an imperfect approach as it can only provide a relative comparison of wildfire occurrence in developed areas on the interface of forested areas.

Food, Water, Shelter

The vast majority of Maine shelters are in the WUI and are therefore at greater risk of wildfires. Municipal emergency managers would need to coordinate with the County EMA to activate shelters that are outside of the impacted area, and traffic would need to be diverted away from the burn path. Of the 270 identified shelter sites, 218 (81%) are located in the WUI.

Schools are commonly selected as shelter sites. Of the 784 public schools in Maine, 585 or nearly 75% are in the WUI, signifying the importance of mutual aid and multi-jurisdictional shelter coordination efforts. Outside of use as shelter sites, wildfire damages to schools would be a significant disruption to local education and childhood development.

Energy

A total of 35 power plants are located in the wildland urban interface in Maine, with 1,388 miles of transmission lines, or just over 50%, also located in the WUI. Damage to transmission lines could be very extensive depending on the size of the fire, leading to very long-term power outages and associated health, food, and service issues mentioned under other hazard profiles.

Medical

Most assisted living centers in Maine (83%) and 41% of hospitals are located in the WUI, including the Riverview Psychiatric Center and many other facilities that would be logistically challenging to evacuate and relocate patients to sites outside of the burn path.

Safety and Security

Local/regional fire stations are evenly distributed across the populated parts of the state, virtually all have mutual aid agreements with neighboring communities, and each is a crucial asset for fire suppression.

Communications

The majority (59%) of Maine cellphone towers are located in the WUI. As noted in other sections, damage to communications towers would drastically reduce the capacity for communication, increase load on remaining towers, and make communication in rural areas nearly impossible.

Hazardous Material

Maine's wildfire suppression and HAZMAT [15] capabilities would be a crucial component of preparedness and response to a wildfire event.

Historic and Cultural Resources

Using historic locations data overlain with the WUI layer, 841 historic sites of 1,266 total in Maine (66.4%) are located in the WUI, where the risk of wildfire occurrence is statistically higher due to the interface between human activity and forests.

Timber stands and state-protected lands are at a high risk of wildfire damage due to the abundance of fuels. Historic major wildfires have led to an estimated millions to hundreds of millions of dollars in lost timber stands for the lumber industry, a major economic driver for Maine. There are still some visible burn locations in Acadia National Park from the Great Fire of 1947, signifying the long-term impacts wildfires have on local ecology.

[15] MEMA HAZMAT: https://www.maine.gov/mema/hazards/human-caused-hazards/hazardous-materials

3.40 Wildfire – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

3.40.1 Identifying Jurisdictions with greatest vulnerability [S6.a.1.]

All jurisdictions are potentially vulnerable to damages from wildfire caused either by human activity or through natural conditions such as lightning strikes in fuel-rich and/or abnormally dry or drought-stricken areas. Geographic and slope factors and available fuel types also contribute to vulnerability. However, the WUI areas surrounding urban centers tend to experience a greater frequency of wildfires and can be considered to have greater vulnerability. These areas include jurisdictions surrounding the Cities of Bangor, Lewiston/Auburn, Portland, in addition to many communities in York and Cumberland Counties that are experiencing elevated development trends (refer to the Development Trends section of this plan). FEMA's National Risk Index indicates very low wildfire risk in most of Maine and relatively low risk in parts of southern and western Maine. Consequently, expected annual losses are very low to relatively low across the state.

Communities that have established plans that are implemented to mitigate against wildfire risks are considered to have lower vulnerability and fewer potential impacts. Ten communities have created Community Wildfire Protection Plans [16] in Maine: these include Thompson Lake in Oxford, Taylor Pond in Auburn, Brightwater-Windburg in Phippsburg, Raymond Neck, Southwest Harbor, Harford's Point near Greenville, Portage lake, Stoneham, Stow, and Albany/Mason Townships. Many other communities have also become involved in the state Firewise program [17]. These communities are Indian Point in Georgetown (2009), Cushing Island in Portland (2011), Sprucewold in Boothbay Harbor (2011), Pequawket Lake Preservation Association in Limington (2012), Little Diamond Island in Portland (2012), Great Diamond Island in Portland (2013), Bustins Island (2014), Wynburg-Brightwater-Wynburg East in Phippsburg (2017), and Harfords Point near Greenville (2021). Many Firewise and CWPP communities are located in remote areas where wildfire suppression resources are very limited, such as coastal islands and small communities surrounded by forest, suggesting the importance of wildfire mitigation.

Disadvantaged Communities

The objective of the disadvantaged communities' assessment is to identify potential disadvantages felt by communities who are disproportionately impacted by natural hazards both historically and under future projections. Wildfires are a frequent but typically low impact hazard in Maine thanks in large part to capable wildfire suppression efforts across jurisdictions.

Overlaying Maine's wildfire occurrence map onto the Overall SVI map (Figure 3.35) indicates a few coincident trends between disadvantaged communities and the frequency of wildfires, though wildfire trends are fairly well scattered across populated areas in the state. In some of these areas, the risk to potential structures is elevated relative to other populated parts of the state (calculated in part with data from the large wildfire simulation system FSim and presented by the Northeast-Midwest Wildfire Risk Explorer [18, 19]). This is particularly true for the eastern, southern, and northern portions of the state. One further disadvantage is the declining trend in rural fire service, which may have substantial consequences for rural disadvantaged communities.

Rural disadvantaged communities, such as those in Washington, Somerset, and Aroostook Counties, face major impacts from wildfire due to long evacuation routes and longer response times from wildfire suppression resources. At the same time, urban disadvantaged communities such as those in Kennebec, Androscoggin, and Cumberland counties, face the issue of evacuating and organizing shelters for much larger populations and

[16] CWPPs: https://www.usfa.fema.gov/downloads/pdf/publications/creating_a_cwpp.pdf
[17] Maine Firewise: https://www.maine.gov/dacf/mfs/forest_protection/firewise/index.html
[18] Northeast Region Cohesive Wildland Fire Management Strategy: https://www.northeasternwildfire.net/
[19] Northeast WRAP: https://northeastwrap.uat.timmonsdev.com/

recovering from higher anticipated losses in more heavily developed areas. Dry, forested areas with greater relief and abundant fuels have both a greater probability of wildfire occurrence and a much greater challenge for wildfire suppression efforts, And are therefore expected to see greater total impacts. These areas would benefit from wildfire mitigation efforts and reduce their reliance on wildfire suppression resources.

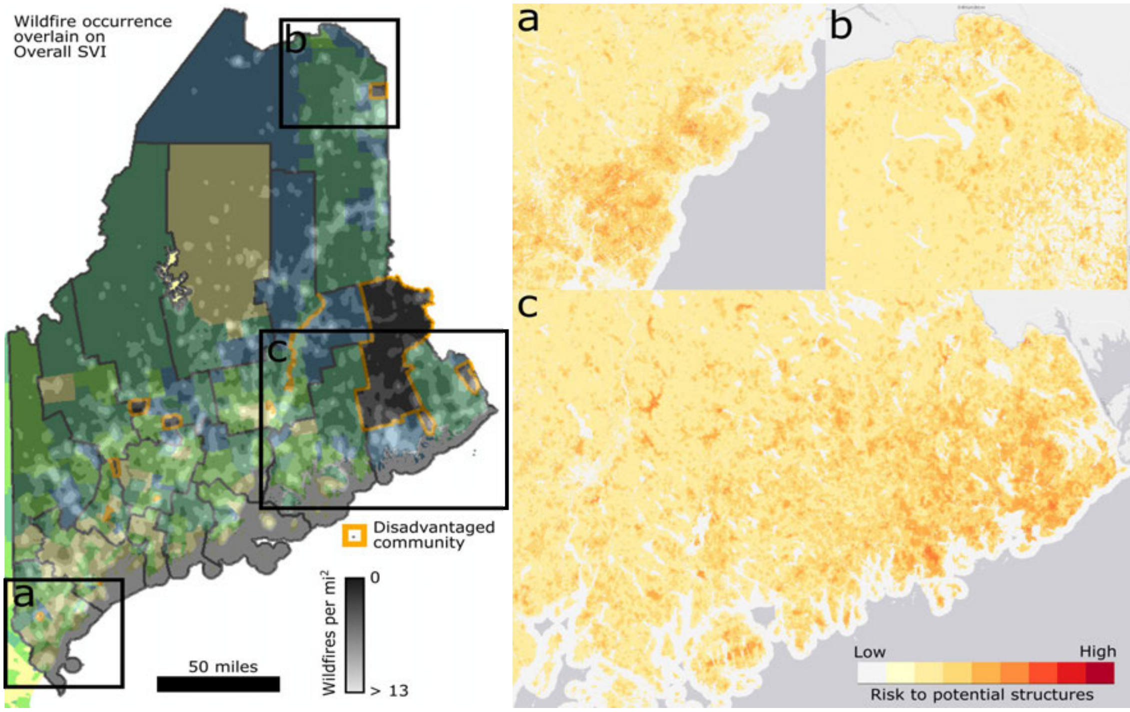


Figure 3.35: overlay map of wildfire occurrence and Overall SVI indicates some coincident trends between wildfires and disadvantaged communities. Southern, northern, and eastern portions of the state exhibit higher

The Justice40 initiative, which was created by the White House to confront and address decades of underinvestment in disadvantaged communities impacted by climate change, pollution, and environmental hazards, identifies these communities through use of the Climate and Economic Justice Screening Tool (CEJST) [20]. In addition to having a higher relative wildfire risk, many communities in Downeast Maine are identified as disadvantaged by CEJST. Many of these communities are rural as noted in Figure 3.36, and there is no substantial overlap for jurisdictions that have high wildfire risk, disadvantaged status, and a relatively large population. Some of the wildfire risk factors are somewhat unique in the Downeast region. For example, many parts of Mount Desert Island have a high wildfire suppression difficulty index which may lead wildfires to burn out of control if they were to occur. In this area, as in the western mountains of Maine, steep topography, difficult terrain, and fuel type are the primary causes of suppression difficulty. Steep terrain areas of Maine are sparsely populated but often include disadvantaged communities. However, wildfire risk is lower in the western mountain region than in the Downeast region.

Maine Forest Service notes that, though the Northeast-Midwest Wildfire Risk Explorer is a useful regional-level tool for assessing relative risk, it does not incorporate specific wildfire data reported by wildfire suppression efforts but is instead based on model data. An important future action will be to incorporate both types of data into a single viewer, combined with important vulnerability metrics such as SVI and Justice40, to verify risk and better prioritize disadvantaged communities.

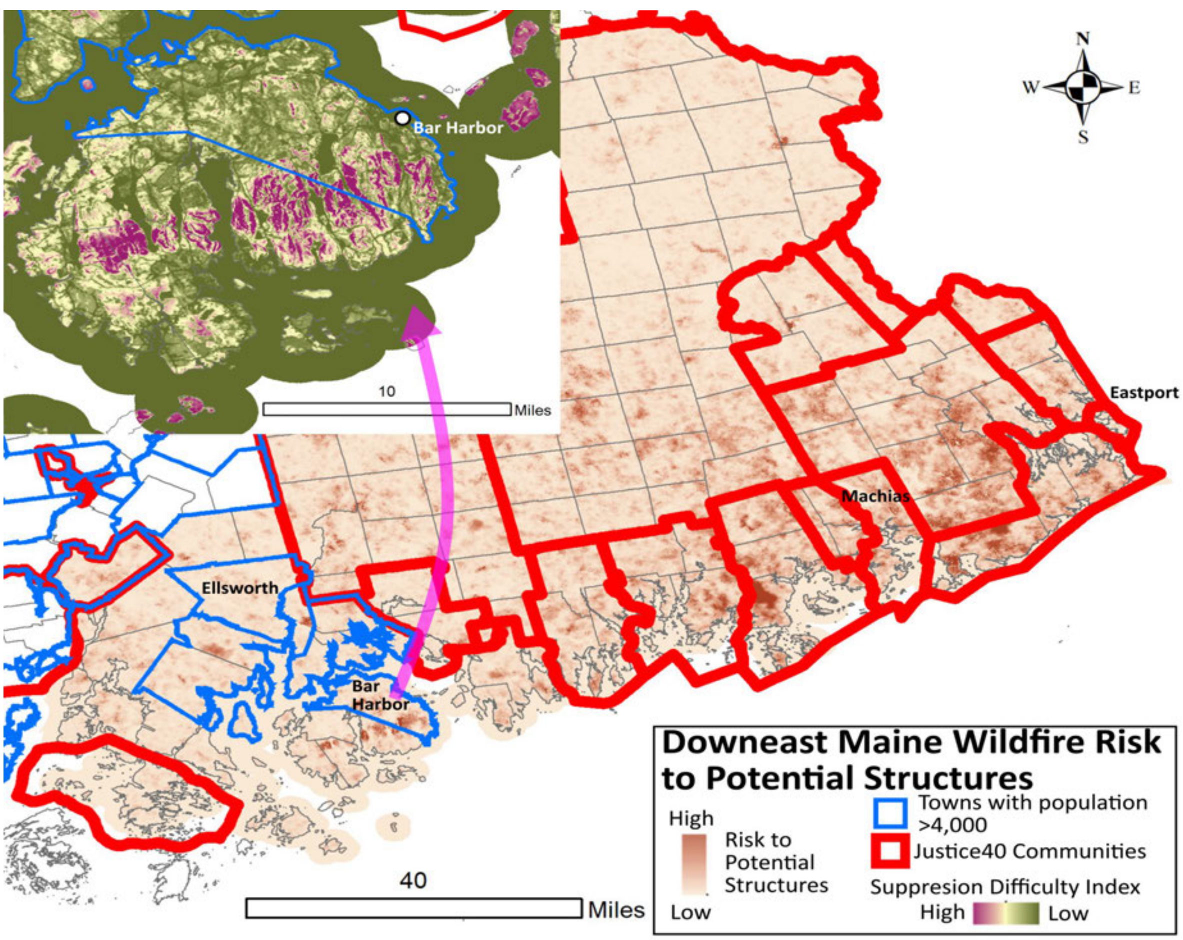


Figure 3.36: overlay of wildfire risk, town population, and disadvantaged communities in Downeast Maine.

[20] CEJST: https://screeningtool.geoplatform.gov/

3.40.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Hazard-Asset Footprint Overlay Analysis

Though wildfire risk is low in Maine, most populated portions of the state are located in the wildland urban interface and therefore may be potentially exposed to human caused wildfires. In some counties, as much as 92% of all structure assets are located in the wildland urban interface (Table 3.34). This does not mean that all of these structures are vulnerable to wildfire, though it does mean they are located in areas that statistically see a greater number of wildfire occurrences.

Table 3.34: Potential wildfire exposure for all structure assets in wildland urban interface (millions 2022 USD)

	Totals		**Assets in WUI**		
Region	Assets Count	Total Value	Assets Count	Replacement Cost	% of total value
State of Maine	758,999	$329,411	604,483	$248,573	75.46%
Androscoggin	40,678	$20,282	34,724	$15,690	77.36%
Aroostook	47,211	$21,437	25,391	$10,562	49.27%
Cumberland	120,034	$60,316	93,745	$41,919	69.50%
Franklin	21,643	$8,534	16,718	$6,634	77.74%
Hancock	47,129	$17,737	42,429	$15,919	89.75%
Kennebec	65,768	$29,533	56,404	$23,648	80.07%
Knox	28,812	$11,720	26,991	$10,691	91.22%
Lincoln	27,821	$10,680	25,460	$9,733	91.13%
Oxford	40,062	$16,050	30,361	$12,166	75.80%
Penobscot	79,169	$35,301	57,976	$24,011	68.02%
Piscataquis	16,376	$5,782	10,931	$4,032	69.73%
Sagadahoc	20,394	$8,210	19,436	$7,530	91.72%
Somerset	38,723	$15,823	28,242	$11,189	70.71%
Waldo	26,926	$10,879	21,309	$8,606	79.11%
Washington	24,214	$8,175	16,222	$5,529	67.64%
York	107,149	$45,785	98,144	$40,713	88.92%

Drought – Hazard Profile

TIER 1 HAZARD

3.41 Drought – General Definition and Types of Events [S3.a., S3.b.]

Drought is a period of unusually persistent dry weather resulting in prolonged shortages in water supply with many associated impacts. Drought is defined by its spatial extent, intensity, magnitude and duration, the components of the hydrological cycle that it affects and the systems that it impacts. These multiple factors that define drought make it difficult to predict, quantify or put into historical context.

Drought is a normal recurring feature in *all* climatic regions. While all droughts originate with a deficiency of precipitation, drought is a unique hazard due to the usually slow progression of the phenomenon [21]. Drought impacts respond to precipitation anomalies on varied timescales (see "Impacts" on following pages). This makes it difficult to determine a clear beginning or end to any drought event, particularly ones that are prolonged. The duration of drought can vary from several weeks to several years.

There are four different ways in which drought can be defined.

3.41.1 Meteorological Drought

Meteorological Drought is based on the degree of dryness or precipitation deficit and the length of the dry period [22]. Due to climatic differences, what might be considered a drought in one location of the country may not be a drought in another location.

Snow drought is a form of meteorological drought occasionally occurring in Maine and other regions accumulating the snowpack in winter. Snow drought is a period of abnormally low snowpack for the time of year occurring under two separate conditions. First, a "dry" snow drought is caused when a lack of winter precipitation leads to a reduced snowpack. Second, a "warm" snow drought is caused when there are unseasonably warm temperatures combined with winter precipitation that occurs as rainfall that does not contribute, and may even reduce, the total snowpack [23]. A reduced snowpack will eventually contribute less snowmelt in spring, potentially contributing to early season drought.

3.41.2 Hydrologic Drought

Hydrological Drought is based on the impact of precipitation deficits on the water supply such as stream flow, reservoir and lake levels, and ground water table decline. Hydrologic drought indicators lag significantly behind meteorological drought indicators.

Agricultural Drought

Agricultural Drought refers to soil moisture deficits, and subsequent impact to plants and agriculture, resulting from precipitation deficits and/or above-normal temperatures and wind that cause evaporative losses [24]. Agricultural drought can increase the need for crop irrigation.

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[21] US Drought Monitor: http://drought.unl.edu/Education/DroughtBasics.aspx
[22] NWS drought types: https://www.weather.gov/safety/drought-types
[23] American Geophysical Union Definition of Snow Drought: https://eos.org/opinions/defining-snow-drought-and-why-it-matters
[24] https://www.drought.gov/topics/agriculture

3.41.3 Socioeconomic Drought

Socioeconomic Drought considers the impact of drought conditions (meteorological, agricultural, or hydrological drought) on supply and demand of some economic goods such as fruits, vegetables, grains and meat. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related deficit in water supply.

3.42 Drought – Location of Hazard [S3.a.1]

Drought classification is relative to longer term (weekly, monthly, seasonal) and often broadscale precipitation trends, surface and groundwater levels, soil moisture content, and other dryness indicators, the entire State of Maine is evenly susceptible to drought.

3.43 Drought – Intensity and Previous Occurrences [S3.a.2.]

The extent of drought can vary significantly from localized events in a specific watershed to a statewide occurrence; from short term (one summer) to long term duration (several years); or from an abnormally dry spell to a drought of exceptional intensity.

Maine uses the U.S. Drought Monitor's (USDM) classification method (Table 3.35) to measure the extent of drought events as they occur.

Table 3.35: U.S. Drought Monitor Drought Classification.

Category & Description	Historically observed impacts	Palmer Drought Severity Index	CPC Soil Moisture Model*	USGS Weekly Streamflow*	Standard Precip. Index (SPI)	Objective Drought Indicator Blends*
D0 Abnormally Dry	-Crop growth is stunted; planting is delayed -Fire danger is elevated; spring fire season starts early -Lawns brown early; gardens begin to wilt -Surface water levels decline	-1 to -1.9	21 to 30	21 to 30	-.5 to -.7	21 to 30
D1 Moderate Drought	-Irrigation use increases; hay and grain yields are lower than normal -Honey production declines -Wildfires and ground fires increase -Trees/landscaping stressed; fish stressed -Voluntary water conservation is requested; reservoir and lake levels below normal capacity	-2 to -2.9	11 to 20	11 to 20	-.8 to -1.2	11 to 20
D2 Severe Drought	-Specialty crops (yield/fruit size) impacted -Producers begin feeding cattle; hay prices are high -Warnings are issued on outdoor burns; air quality is poor -Golf courses conserve water -Trees are brittle and susceptible to insects -Fish kills occur; wildlife move to farms for food -Poor water quality; declining groundwater; dry irrigation ponds; outdoor water restrictions implemented	-3 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3 Extreme Drought	-Widespread crop loss; Christmas tree farms are stressed; dairy farmers are struggling financially -Well drillers, bulk water haulers see business rise -Water recreation and hunting are modified; wildlife disease outbreak is observed -Extremely reduced/ceased surface flow; warm river temperatures; wells run dry; people digging more/deeper wells	-4 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4 Exceptional Drought	- Unprecedented drought - Exceptional and widespread crop/pasture losses - Shortages of water creating emergencies	-5 or less	0 to 2	0 to 2	-2 or less	0 to 2

* Percentile values

3.43.1 Previous Occurrences

Maine's 1999-2002 drought period was the most damaging to date (Figure 3.37, Table 3.36). There were an estimated 17,000 private wells that ran dry in the nine months prior to April 2002, and farmers lost more than 32 million dollars in crop yield between 2001 and 2002 [25].

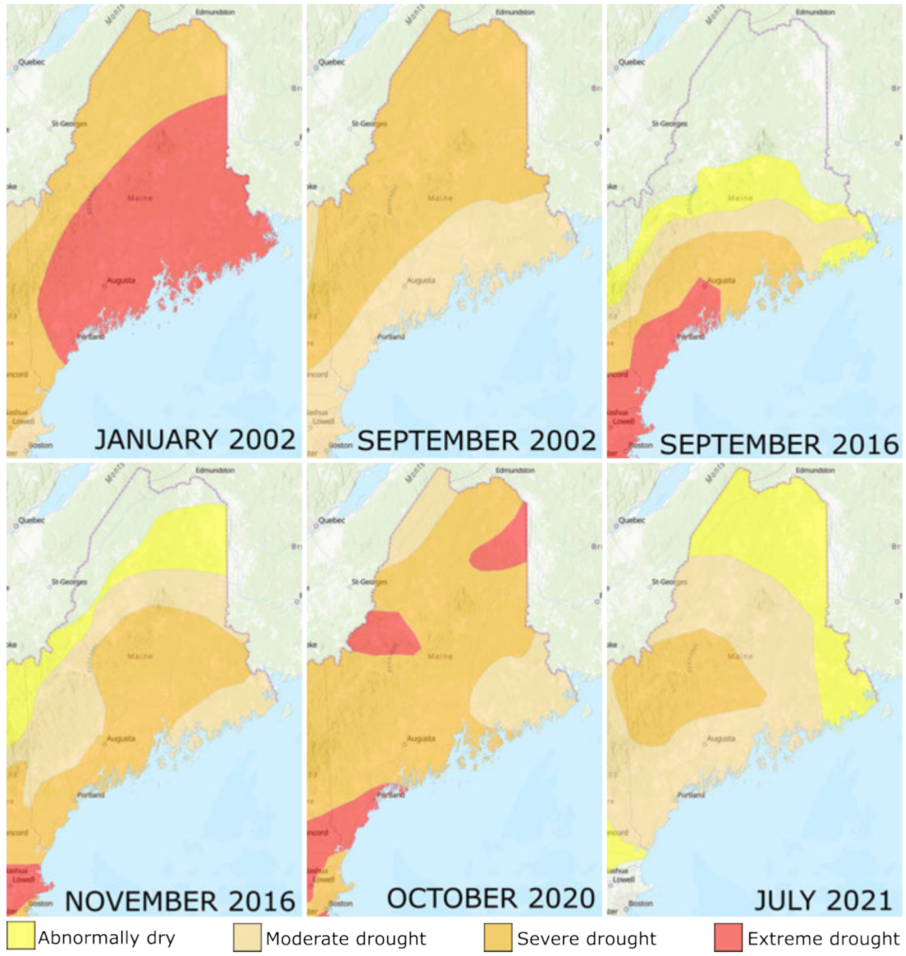


Figure 3.37: Peak drought conditions in Maine over the past 20 years based on analysis of U.S. Drought Monitor map records.

Maine's Drought Task Force convened in August 2016 for the first time in 14 years and continued to meet monthly through December. The 2016 drought was a result of three years of below average precipitation which led to low groundwater levels statewide, but particularly in the southern portion of Maine. As of this writing, the final impacts of the drought are undetermined, but it is reasonable to assume that the significant investments water utilities have made after the 2001 drought mitigated the impacts of the 2016 drought. Hundreds of millions of dollars have been spent replacing antiquated water mains. That has resulted in reduced loss of water through leakage. Additionally, many of those projects upgraded interconnections which have improved the ability of water utilities to purchase water from neighboring systems when the need has arisen.

[25] Lombard, P. J. (2004). Drought conditions in Maine, 1999-2002: a historical perspective. *US Geological Survey*, 03-4310. https://pubs.usgs.gov/wri/wrir034310/pdf/wrir03-4310.pdf

Table 3.36: Chronology of Major Droughts in Maine

Date	**Affected Areas**	**Average Recurrence Range**	**Remarks**
1938-1943	Western Areas	15 to > 30	Severe in Androscoggin and Kennebec River Basins
1947-1950	Statewide	25	Severe in central coastal region
1955-1957	Nearly entire state	20	Severe in northern and eastern parts of state
1963-1969	Statewide	70	Longest endured drought, stream flows in southern portions of Maine reached 100-year lows
1984-1988 [26]	Statewide	20	Severe in northern Maine
1999-2002[120]	Statewide	60	2001 was driest year on record (to date), August 2002 was driest month on record
2015-2016	Statewide	40 to 50	Most severe in York and parts of Cumberland Counties
2020-2022 [27]	Statewide	25	2020 flash drought Moderate to extreme drought across entire state, 2020 had the highest wildfire occurrence in 35 years. Severe drought re-emerged in 2021, 2022 triggering USDA Secretarial Disaster Designations in 2021

A 2020 drought impacted the entirety of New England and set records in Northern Maine [28]. Northeastern and central parts of the state went from normal conditions on June 9 to moderate drought (D1) on June 23, and then to severe drought (D2) by July 7 (this fast onset generally meets the criterion of a flash drought). Mean streamflows in July were below the 10th percentile, with three of eight sites recording a 30-year low in mean streamflow in July. D2 persisted for 12 weeks. Parts of northeastern Maine then saw conditions deteriorate to extreme drought (D3) by September. Extreme drought includes widespread crop loss, modified recreation and hunting, extremely reduced flow to no flow in streams, and increased well drilling and bulk water hauling. Indeed, in mid-September – a month in which some places saw no rain for 30 days – the U.S. Department of Agriculture declared crop disaster areas in Aroostook and adjacent counties. By fall 2020, substantial rainfall reduced the scope of drought in Maine, but this was soon followed by a warm winter and snow drought (Figure 3.38) [29]. In 2021, a dry spring and early summer saw moderate to severe drought conditions persisting across central and western portions of Maine until July when beneficial rainfall brought relief. Conditions improved for all but westernmost portions of the state. In 2022, a dry summer led to renewed drought in southern, coastal, and central Maine. As of this writing, counties along the southwest coast remain afflicted by severe (D2) drought.

[26] Water Supply Paper 2375; National Water Summary 1988-89 – Hydrologic Events and Floods and Droughts. https://doi.org/10.3133/wsp2375
[27] Lombard, P. J., Barclay, J. R., & McCarthy, D. A. E. (2020). *2020 drought in New England* (No. 2020-1148). US Geological Survey. https://pubs.usgs.gov/of/2020/1148/ofr20201148.pdf
[28] Lombard, P.J., Barclay, J.R., and McCarthy, D.E. (2020), 2020 drought in New England (ver. 1.1, February 2021): U.S. Geological Survey Open-File Report 2020–1148, 12 p., https://doi.org/10.3133/ofr20201148.
[29] Maine Cooperative Snow Survey, March 31, 2021 Water Content Comparison map: https://www.maine.gov/dacf/mgs/hazards/snow_survey/

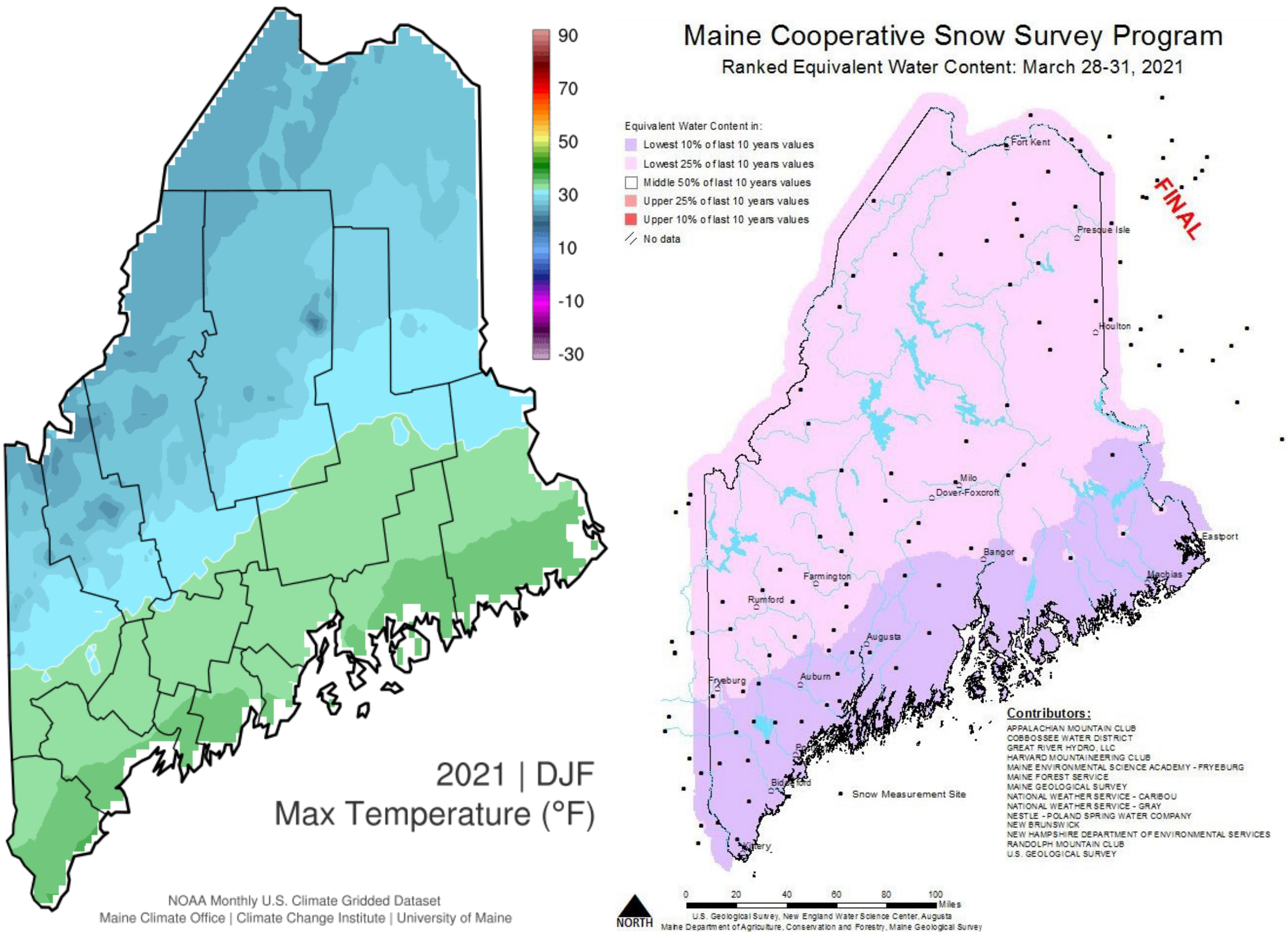


Figure 3.38: Mean maximum winter 2021 temperatures (left) denote substantial southern and coastal areas above melting temperature (green). Warm winter conditions led to warm snow drought (right): lower to much lower equivalent water content in snowpack remaining in late March across the entire state.

3.44 Drought – Probability of Future Occurrence [S4.]

Similar to floods, which are primarily driven by precipitation, meteorologists and hydrologists define the extent of drought by the probability of occurrence. Drought is defined by its spatial extent, intensity, magnitude and duration, the components of the hydrological cycle that it affects and the systems that it impacts. These multiple factors that define drought make it difficult to predict, quantify or put into historical context.

Extreme droughts are relatively uncommon and are expected to happen on average once every 20 to 50 years in our region, while moderate droughts are common and may occur every 5 to 10 years (Svoboda and others, 2002 [30]). Drought occurrence is difficult to determine in Maine due to the varied nature of drought conditions and their tendency to occur at different magnitudes and over multiple consecutive years. During the 1999-2002 drought, USGS reported recurrence of 7-day surface water low flow intervals for historic droughts in Maine for individual year occurrences (Table 3.37).

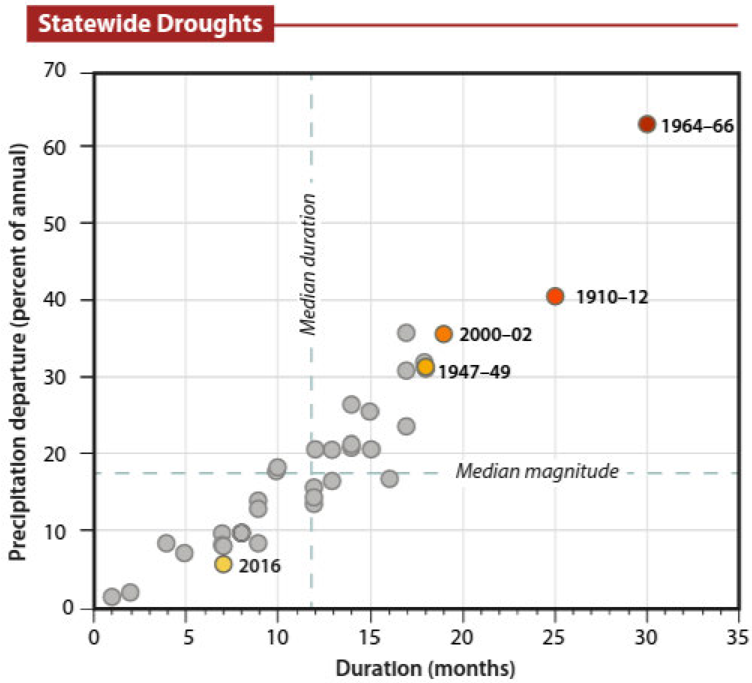
Table 3.37: Approximate recurrence intervals for historical droughts in Maine, 1947-2002 (Recurrence interval, the average interval of time within which streamflow will be less than a particular value; <, less than; >, greater than)

Drought period	Individual years of surface-water drought*	Region Affected	Average Recurrence Interval (years)	Range of Recurrence Intervals (years)
1947-50	1947, 1948, 1949	Statewide	45	<10 to >100
1952-53	1952, 1953	West & north	25	<10 to 90
1955-59	1957, 1959	South	20	<10 to 85
1963-69	1965, 1966, 1968	Statewide	25	<10 to >100
1978	1978	Statewide	15	<10 to 35
1984-88	1985, 1987	Central	20	<10 to 65
1995	1995	Statewide	40	<10 to >100
1999-2002	1999, 2001, 2002	Statewide	60	<10 to >100

* Includes any year with a 7-day surface-water low flow with a recurrence interval of at least 20 years at two stations or a recurrence interval greater than 40 years at any one station.

[30] Svoboda, M., LeComte, D., Hayes, M., Heim, R., Gleason, K., Angel, J., Rippey, B., Tinker, R., Palecki, M., Stooksbury, D., Miskus, D., and Stephens, S., 2002, The drought monitor: Bulletin of the American Meteorological Society, v. 83 no. 8, p. 1181–1190, accessed December 22, 2020, at https://doi.org/10.1175/1520-0477-83.8.1181.

An alternative approach was used for the 2020 drought report by focusing on occurrence of 30-year low flows at more than 10 percent of streamgages. The analysis also indicates the typical time of year for these low flow occurrences is through late spring to late summer (Table 3.39).



Statewide droughts based on the six-month Standardized Precipitation Index (SPI6), computed from monthly precipitation values averaged across Maine using climate division data, 1900–2018 (NOAA CAAG 2019). An index value of zero indicates average conditions, while negative values indicate drier than average conditions. Drought severity is measured by both drought duration (here, the number of months with SPI6 below 0) and associated cumulative precipitation deficit (the sum of monthly departures of precipitation from average over the course of the drought, displayed here as a percentage of annual average statewide precipitation).

Year	Month (States severely affected)[1]
30-year lows at more than 10 percent of sites	
1991	June and July
1995	June to September
1998	May (Maine, New Hampshire, Vermont)
1999	June to August
2001	August to September
2002	August to September
2016	June to August (Massachusetts, Rhode Island, Connecticut)
2020	June and September
Period of record lows at more than 10 percent of sites	
1961–69	June 1964 and July 1965

[1]Where no States are indicated, all States in New England were affected.

Table 3.39: Left: monthly duration of historic droughts versus their magnitude in terms of annual precipitation departure. Source: University of Maine (https://climatechange.umaine.edu/wp-content/uploads/sites/439/2020/02/Maines-Climate-Future-2020-Update-3.pdf). Right: Droughts in New England for individual annual occurrence and months impacted in the last 30 years. Source: USGS (https://pubs.usgs.gov/of/2020/1148/ofr20201148.pdf).

For prediction purposes, this plan will compare the Standard Precipitation Index (SPI) value associated with each drought intensity classification level used in the USDM to estimate the recurrence interval for each drought level (Table 3.38). The World Meteorological Association endorsed the SPI as the standard for determining the existence of meteorological drought.

Table 3.38: Recurrence Intervals for U.S. Drought Monitor Classifications

Intensity	SPI Trigger	SPI Recurrence Range[1]	USDM Recurrence Interval[2]
D0 (Abnormally Dry)	-0.5	3.25	3 – 5
D1 (Moderate Drought)	-0.8	4.75	5 – 10
D2 (Severe Drought)	-1.3	10.5	10 - 20
D3 (Extreme Drought)	-1.6	18.25	40 - 50
D4 (Exceptional Drought)	-2.0	44	50 - 100

NOTE: [1] The USDM uses a variety of indicators and indices to determine drought intensity in addition to the SPI. See table in Extent. The above recurrence intervals use the 30-day SPI timescale. [2] The authors of the USDM use objective and subjective input to develop their finished product. They design the USDM to have the recurrence intervals stated in USDM column (Rippey, Brad. Northeast Drought Outlook Forum. Boston, MA, 11 October 2016).

3.44.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Much like events of any type it is difficult to determine probability of occurrence for future drought events because "the global hydrological cycle is exhibiting significant variability, especially in the geographic distribution and intensity of precipitation, the availability of water resources, [and] prolongation of periods of drought" [31]. There is considerable uncertainty whether drought will become more frequent in the future, presenting challenges for mitigation strategies, however, there is an anticipation for greater occurrence of extreme events of all kinds in Maine, suggesting that droughts may become a more prominent event in a future climate. Increasing atmospheric temperatures may be able to hold greater moisture and provide greater total rainfall, but warmer temperatures will also encourage increased drying between rainfall events.

[31] Williams Jr, R. S., Williams Jr, R. S., & Ferrigno, J. (2012). Changes in the Earth's Cryosphere and global environmental change. *State of the Earth's cryosphere at the beginning of the 21st century: Glaciers, global snow cover, floating ice, and permafrost and periglacial environments. http://pubs.usgs.gov/pp/p1386a/pdf/pp1386a-1-web.pdf*

3.45 Drought – Impacts

A drought impact is defined by the World Meteorological Organization (WMO) as an observable loss or change at a specific time because of drought. [32] It is uncommon for drought to significantly impact Maine because of typical precipitation levels, the state's ground water hydrology, and a relatively low statewide demand for water compared to available resources. Still, all Maine communities can be vulnerable to impacts of drought. Droughts can impact stakeholders, who include homeowners (on private and public water supply), hydroelectric generators, the agricultural community, commercial businesses, foresters, and natural ecosystems.

All Maine residents are vulnerable to drought if it impacts water supply and food production. However, households on private wells are more vulnerable to water shortages because they are dependent on local ground water levels, which may already be in short supply, and are thus more susceptible to water scarcities. Private well owners do not benefit from the redundant measures that are set to protect public water supply. There are limited resources available to private homeowners with dry wells. With 42 percent of the state on private water supply, or 561,000 residents, Maine has the highest proportion of residents not served by a public water supplier. [33] Recent estimates indicate that closer to half of Maine's population may depend on private wells. Because many of these private wells are dug or shallow, any prolonged drought period can have significant impacts and reduce access to potable water.

The agricultural community is also vulnerable to drought, as drought is historically the most significant risk factor to the sector. Maine agriculture is the basis of over 1.2 billion dollars of food and fiber products annually. It employs 22,000 workers statewide and there are an estimated 8,000 family farms in Maine. [34]

Forest health is also vulnerable to drought events, as drought conditions can lead to high threat of forest fires. Forest and brush fire hazards are also common in early spring prior to leaf-out. Forest litter from the previous year may be especially dry if insufficient spring rains follow an early melting of the snowpack. Both of these situations occurred in 1947 as detailed in the Wildfire section. Residents in rural parts of Maine are the most susceptible to forest fires due to possible urban wildfire interface. The vulnerability of rural residents to drought events is compounded because rural residents make up most of the population on private wells.

Ineligibility for Hazard Mitigation Assistance – Since droughts do not receive presidential declarations, common drought mitigation activities, which include measures to increase efficiency and/or drilling wells deeper into the water table, are not eligible for funding through FEMA's Individual Assistance Program.

Residents on Private Wells – With nearly half of the state's population relying on private wells for water supply, the state has limited capacity for managing individual water supply.

[32] http://www.droughtmanagement.info/literature/GWP_Handbook_of_Drought_Indicators_and_Indices_2016.pdf
[33] https://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf
[34] https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=MAINE

3.46 Drought – Vulnerability of State Assets [S5.]

Damages to state-owned or operated buildings or infrastructure are not likely from drought events. Costs typically come from the overtime use of Maine Department of Agriculture, Conservation and Forestry personnel to assist farmers and private well owners. The State of Maine does not own or operate any public water utilities but the Public Utilities Commission does regulate water supplier rates, and Maine's Drinking Water Program regulates water quality and facilitates needs for bulk water hauling in the event of water quantity issues.

3.46.1 Potential Dollar Losses to State owned buildings, infrastructure, critical facilities

Historically, the largest impacts of drought in Maine have been on agriculture, public water suppliers, and private wells. Drought has also had an indirect impact on resources needed for wildfire suppression (see Wildfire – Vulnerability Assessment). There have not been any documented damages to state owned buildings, infrastructure, or critical facilities at the time of this Plan update. There is no guarantee that these assets will be damaged in a natural hazard event.

3.46.2 Community lifeline Risks

In addition to the risks already described, the greatest impacts of drought relate to food and water. By definition, drought is a prolonged period of water shortage. State agencies have little authority over municipal water suppliers when it comes to taking emergency drought measures, but the state Drinking Water Program will help facilitate temporary solutions such as bulk water hauling to avoid a complete loss of local potable water. Local food production is a primary concern with drought as noted below. Currently the state is exploring funding programs that would support installation of irrigation infrastructure.

Drought has had major impacts on crop production in the past, posing potential issues for food supply at least on a local level. From an economic perspective, drought can put farms out of business if they are unable to produce. The pulp industry, a historically major contributor to Maine's economy, has been the largest industrial user of surface and groundwater in the State. Lack of abundant water could even influence pulp and paper production.

3.47 Drought – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

3.47.1 Identifying Jurisdictions with greatest vulnerability [S6.a.1.]

Jurisdictions that rely on small public water suppliers are expected to be at greater risk of running out of water and relying on expensive bulk water hauling arrangements to accommodate potable water needs. Private well owners may be impacted if they have shallow wells, or wells that are more susceptible to contamination from sea water intrusion or other natural (e.g., arsenic [35]) or human-caused (e.g., nitrates [36]) groundwater contaminants. A total of 394 wells ran dry during the drought years of 2020, 2021, and 2022. Jurisdictions may also see direct impacts if agriculture is a large contributor to the local economy and workforce.

Disadvantaged Communities

Like all other hazards profiled in the Plan, disadvantaged communities are expected to be hit hardest by drought given a lack of resources to mitigate, prepare, or recover against natural disasters. Some of the most significant impacts in Maine are felt by rural farming communities whose livelihoods depend on a consistent supply of water that is threatened by drought. Systems to mitigate against the impacts of drought, such as drilling additional wells and installing irrigation systems, are expensive and often not within the typical budget of

[35] Maine CDC arsenic webpage: https://www.maine.gov/dhhs/mecdc/public-health-systems/health-and-environmental-testing/arsenic.htm
[36] Maine CDC nitrates webpage: https://www.maine.gov/dhhs/mecdc/environmental-health/dwp/sitemap/nitrateNitrite.shtml

smaller farming operations. The quality and yield of agricultural commodities will suffer under drought conditions without proper irrigation [37], with longer term economic impacts for rural disadvantaged communities as a whole. Many other impacts can be felt by urban communities who depend on public water suppliers who may also face challenges meeting demand without using expensive alternatives.

Drought also heightens the potential occurrence of wildfires, with further amplified impacts for disadvantaged communities as described in the section Wildfire – Vulnerability Assessment.

3.47.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Though there may be several contributing factors to losses during a drought, some primary impacts include agricultural costs, bulk water hauling costs for dry public water suppliers, and costs associated with improving or redrilling private wells.

Agricultural losses could be significant under different drought scenarios (Table 3.39 [38]). Drought may lead to crop failures or greater use of irrigation that can increase operating costs for farmers, which may lead to increased prices for consumers.

Table 3.39: Impacts to agricultural commodities under different drought levels. Colors denote relative high (green) and low (red) values.

Location	Commodity Totals	Commodity totals under drought scenarios: Moderate drought: 25% losses	Severe drought: 50% losses	Extreme drought: 75% losses
State	$666,962,000	$500,221,500	$333,481,000	$166,740,500
Androscoggin	$40,536,000	$30,402,000	$20,268,000	$10,134,000
Aroostook	$201,974,000	$151,480,500	$100,987,000	$50,493,500
Cumberland	$25,644,000	$19,233,000	$12,822,000	$6,411,000
Franklin	$12,853,000	$9,639,750	$6,426,500	$3,213,250
Hancock	$18,372,000	$13,779,000	$9,186,000	$4,593,000
Kennebec	$49,007,000	$36,755,250	$24,503,500	$12,251,750
Knox	$9,116,000	$6,837,000	$4,558,000	$2,279,000
Lincoln	$12,882,000	$9,661,500	$6,441,000	$3,220,500
Oxford	$12,882,000	$9,661,500	$6,441,000	$3,220,500
Penobscot	$50,915,000	$38,186,250	$25,457,500	$12,728,750
Piscataquis	$9,108,000	$6,831,000	$4,554,000	$2,277,000
Sagadahoc	$7,749,000	$5,811,750	$3,874,500	$1,937,250
Somerset	$83,931,000	$62,948,250	$41,965,500	$20,982,750
Waldo	$22,954,000	$17,215,500	$11,477,000	$5,738,500
Washington	$69,253,000	$51,939,750	$34,626,500	$17,313,250
York	$28,551,000	$21,413,250	$14,275,500	$7,137,750

2017 USDA Agricultural Census

[37] Maine Drought Task Force 4 August 2022 Report: https://www.maine.gov/mema/sites/maine.gov.mema/files/inline-files/Drought%20Task%20Force%20Report%2008-04-2022.pdf
[38] USDA 2017 Agricultural Census: https://www.nass.usda.gov/Quick_Stats/CDQT/chapter/2/table/1/state/ME/county/031/year/2017

A total of 394 wells were reported to have run dry for the years 2020-2022, with some counties impacted more than others (Table 3.40). Southern counties are generally more populated and typically experience a greater total number of wells running dry under drought conditions versus other locations in the state, assuming uniform levels of drought.

Table 3.40: total number of wells reported to have run dry by county and state.

County	2020	2021	2022	TOTAL
Androscoggin	6	0	4	10
Aroostook	96	1	0	97
Cumberland	17	4	18	39
Franklin	21	2	4	27
Hancock	5	0	4	9
Kennebec	10	1	10	21
Knox	5	1	7	13
Lincoln	4	2	12	18
Oxford	13	4	2	19
Penobscot	9	2	3	14
Piscataquis	2	1	0	3
Sagadahoc	6	0	6	12
Somerset	20	1	3	24
Waldo	9	0	5	14
Washington	9	0	3	12
York	45	2	15	62
TOTAL	277	21	96	394

MEMA Dry Well Survey (maine-dry-well-survey-maine.hub.arcgis.com/)

The cost of drilling a new well can be highly variable depending on materials and labor cost. Installing a complete well water system costs $25-65 per foot, with the national average costing $3,750-15,300 per well [39]. Costs for building municipal water storage facilities can exceed $1 million [40]. Assuming the 394 wells would need to be redrilled from the 2020-2022 drought, the total average cost may equal $1.5 to $6 million dollars.

[39] State of California Central Valley Flood Protection Board Well Drilling Costs Report: http://cvfpb.ca.gov/wp-content/uploads/2020/11/8b.-EIS-Attachment-Well-Drilling-Costs.pdf
[40] https://www.mainepublic.org/environment-and-outdoors/2022-07-28/stonington-is-trucking-in-drinking-water-because-of-drought-and-summer-crowds

Erosion – Hazard Profile

TIER 1 HAZARD

3.48 Erosion – General Definition and Types of Events [S3.a., S3.b.]

Erosion is the process of the gradual wearing away of land masses. The focus of erosion as a hazard in Maine is widespread soil erosion, including the detachment, transport, and deposition of sediment. There are generally four recognized agents of sediment erosion: water, wind, ice/glaciers, and mass wasting/gravity. The focus of this hazard profile is on erosion caused by water movement, with a primary focus on coastal processes. Hazards associated with mass wasting are discussed in a separate profile. Rates of erosion can be rapid, such as within the timeframe of a single coastal storm event, or more prolonged, such as the gradual erosion of coastal land features through sea level rise. Beach and bluff coastal land features exhibit the greatest rates of erosion in Maine and are therefore the primary focus of this hazard profile.

3.48.1 Coastal Beach and Dune Erosion

Coastal beaches are narrow, gently sloping strips of land that lie along ocean shores. Beaches may consist of any combination of grain sizes though sand, gravel, and cobble beaches are more well recognized types in Maine. The sediments may consist of several different rock types and/or shell fragments. Sandy beaches are typically associated with passive margins, a wide continental shelf, and a geologic framework conducive to abundant sediment supply [41]. These regions may host coastal dunes (Figure 3.40) that consist of a series of ridges of sediment that form landward of a beach. Dunes differ from most other coastal landforms in that they are formed by winds in addition to wave overtopping [42]. Dunes provide natural protection to inland areas from wind, waves, and coastal flooding. Dunes are typically naturally stabilized by vegetation, including American beachgrass, which helps to decrease erosion. Gravel (cobbles, boulders, and pebbles) beaches and dunes are typically found in high-energy coastal environments and are a common occurrence in Maine, especially in mid-coast and downeast areas of the State.

Maine's coastal beaches and dunes are constantly changing. Erosion or accretion can reshape the beach and dunes over time, so remapping is needed for resource protection and coastal development. Beaches and dunes comprise about 2% of Maine's overall shoreline. Beach and dune erosion occurs in widely scattered locations, primarily on the state's larger beaches and sand dune systems located in York, Cumberland, and Sagadahoc Counties, though beaches and dunes are located throughout the State's coastal municipalities. The Maine Geological Survey has mapped the extent of dunes that comprise the State's coastal sand dune systems [43] and also keeps track of dune and beach shoreline changes at Maine's larger beach systems through its [Maine Beach Mapping Program]

Figure 3.40: dune grassland.

[41] National Park Service, Coastal sediments: https://www.nps.gov/articles/coastal-sediments-material-size.htm
[42] Coastal dunes: https://www.nature.com/scitable/knowledge/library/coastal-dunes-aeolian-transport-88264671/
[43] Maine Geological Survey Coastal Sand Dune Geology: https://www.maine.gov/dacf/mgs/pubs/digital/dunes.htm

3.48.2 Coastal Bluff Erosion

Bluffs are defined as a steep shoreline slope formed in sediment (loose material such as clay, sand, and gravel) that has three feet or more of vertical elevation just above the high tide line (The slope, shape, and amount of vegetation covering a coastal bluff and the adjacent shoreline are directly related to the susceptibility of the bluff face to ongoing erosion. As might be expected, less vegetated bluffs are more likely to be eroding than completely vegetated bluffs. Another important factor related to stability is the material that makes up the bluff. Clay, gravel, and sand react differently to erosion and, when combined with variations of vegetation and slope, affect the rate of erosion. Cliffs or slopes in bedrock (ledge) surfaces are not bluffs and are not subject to significant erosion in a century or more. Beaches and dunes do not form bluffs, except along the seaward dune edge as a result of erosion [44]. Bluffs in Maine have been classified as stable, unstable, or highly unstable (Figure 3.41).

About 48% of the Maine coastline is comprised of unconsolidated, erodible coastal bluffs that are three feet or greater in relief. The Maine Geological Survey estimates that about one-third of these bluffs are currently eroding. Bluff stability maps are available through MGS. Note that these maps provide information on bluff stability based on the time of the survey; conditions may have changed since mapping was completed. The stability of coastal bluffs above the high tide line are classified by MGS as follows:

Highly Unstable

Near vertical or very steep bluffs with little vegetation and common exposure of bare sediment. Fallen trees and displaced blocks of sediment are common on the bluff face and at the base of the bluff.

Unstable

Steep to gently sloping bluffs, mostly covered by shrubs with a few bare spots. Bent and tilting trees may be present.

Stable

Gently sloping bluffs with continuous cover of grass, shrubs or mature trees. A relatively wide zone of ledge or sediment occurs at the base of the bluff.

No Bluff

Broad, gently sloping vegetated land or bare ledge with less than three feet of sediment cover.

Maine Geological Survey Coastal Bluffs Maps also describe the shoreline at or below the high tide line. The shoreline can consist of ledge, salt marsh, a beach or tidal flat, or it may be armored (protected by man-made interventions such as riprap, seawalls or other engineered structures).

Finer grained sediments are typically more responsive to the flow of water than larger grained gravels and therefore may exhibit more rapid erosion rates under the same magnitude of waves, currents, and other influential coastal processes [45]. Marine clays are common in Maine, but they typically occur in tidal flats along bays and inlets that are more protected from wave activity. Clays also exhibit particle interaction forces that make them more cohesive and therefore less responsive to detachment and transport mechanisms. However, the presence of glaciomarine clay layers tends to destabilize coastal bluffs under certain conditions that can lead to mass wasting. Refer to the mass wasting hazard profile for more details.

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[44] Maine Geological Survey, definition of bluffs: https://www.maine.gov/dacf/mgs/pubs/digital/bluffs.htm

[45] Nguyen, V. B., Nguyen, Q. B., Zhang, Y. W., Lim, C. Y. H., & Khoo, B. C. (2016). Effect of particle size on erosion characteristics. *Wear*, *348*, 126-137: doi.org/10.1016/j.wear.2015.12.003

Stable bluff with a vegetated bluff face and an armored shoreline. The bluff face is fully vegetated and supports a mature stand of trees with vertical trunks. The presence of a wooden bulkhead suggests that erosion has occurred in the past.

Stable bluff with a vegetated bluff face and a salt marsh shoreline. A low bluff face is covered by shrubs landward of a salt marsh terrace. In this location the mature marsh protects the base of the bluff from rapid erosion and slows bluff recession or retreat.

Highly unstable bluff with an unvegetated bluff face and a salt marsh shoreline. Sediments on the bluff face are exposed and fallen tree trunks lie at the base of the bluff. A salt marsh has recently formed on the tidal flat, partly on the top of an old landslide deposit.

Highly unstable bluff with an unvegetated bluff face and a beach/gravel flat shoreline. The bluff face is too unstable to support vegetation. This bluff, a glacial esker, is eroded by waves to create a mixed sand and gravel beach in front the bluff.

Figure 3.41: Examples of stable (top) and highly unstable (bottom) bluffs.

3.49 Erosion – Location of Hazard [S3.a.1]

3.49.1 Coastal Beach Erosion

Beaches, which are part of Maine's "soft coast," only account for about 2 percent of the state's tidal shoreline, with the larger beaches concentrated in York and Cumberland Counties. Beaches are dynamic systems subject to erosion and accretion changes associated with seasonality. However, because of rising sea levels, erosion is expected to continue to dominate over accretion in most beach locations. Chronic long-term erosion along many beaches is on the order of a foot or more per year and is classified by MGS Maine Beach Mapping Program and summarized every 2 years in the State of Maine's Beaches Report.

3.49.2 Coastal Bluff Erosion

Maine is famous for its rockbound coast, buttressed by rugged, unchanging cliffs of stone. Rocky points such as Portland Head, photographed a century ago, show little change after a hundred years of storms. This is because Maine's bedrock is very strong and consolidated, so that it resists erosion from waves and weather. About 50% of Maine's coastline is comprised of consolidated bluffs. However, about 48% of Maine's coastline is comprised of unconsolidated bluff, and 17.5% of the Maine coastline consists of unstable to highly unstable bluff consisting of loose or unconsolidated materials that are subject to erosion. Although a slow, steady rise in sea level is the underlying reason for erosion along the coast, the most noticeable erosion occurs quickly during individual storms or landslide events.

Roughly half the coast of Maine consists of coastal bluffs. Bluff erosion is part of a natural cycle with consequences for the land below and above the bluff. Fine-grained silt and clay eroded from bluffs may be deposited on mud flats or salt marshes which help reduce wave energy at the base of a bluff and slow the overall rate of bluff erosion. Coarse-grained sediments, such as sand and gravel, eroded from bluffs become part of a beach at the base of the bluff and help stabilize the shoreline position.

Bluff erosion can result in a landward shift of the top edge of the bluff. This shoreline change is a natural process that, by itself, is not a coastal hazard (Figure 3.42). It becomes a hazard when it threatens something of value, such as a building near the edge of the bluff.

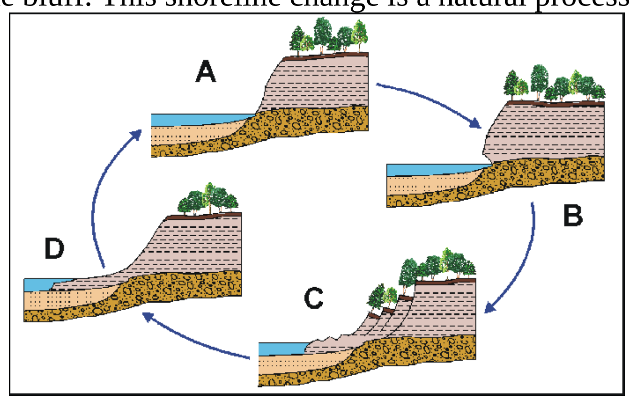

Figure 3.42: Side view of the coastal bluff erosion process. Maine Geological Survey.

Coastal bluffs erode episodically[46]. Some bluffs may not change much over many years, even though there are steep banks along the shore. Bluffs may not lose much ground in any one year but may slump a large amount of sediment every few years. Through this process, bluffs may become stable for a period of time before erosion of the toe continues and causes instability. Coastal bluffs that are classified as being either highly unstable or unstable are retreating at an average rate of about one (1) foot per year.

Unlike dunes, which may reappear in our lifetimes due to sediment deposition by waves and wind, bluff erosion is irreversible, and bluffs will not "reform" in a similar sense. Refer to the section Mass Wasting – Hazard Profile for more information on related bluff erosion mechanisms.

[46] MGS Coastal Property Owner Guide https://digitalmaine.com/cgi/viewcontent.cgi?article=1605&context=mgs_publications

3.50 Erosion – Intensity and Previous Occurrences [S3.a.2.]

Coastal Beach Erosion

Many Maine beaches are eroding 1 foot per year, while others are eroding up to 3 feet per year [47]. Along Maine's larger beach and dune systems (mostly in York, Cumberland, and Sagadahoc Counties), the Maine Geological Survey conducts monitoring of beach and dune erosion through the Maine Beach Mapping Program (MBMAP) [48]. MBMAP monitors annual shoreline change, along 36 beaches in 16 coastal municipalities and provides updated data in early fall of each year (Figure 3.43). In addition, MGS, the University of Maine, and Maine Sea Grant established the State of Maine Beach Profiling Program (SMBPP) in 1999. This program uses trained volunteers to monitor beach profiles on a monthly basis at select locations along the southern Maine coastline. As of 2022, 12 beaches in 10 communities are monitored as part of the program. Collected data is available for observation and download through MGS Collect (https://www.maine.gov/dacf/mgs/collect/). Every 2 years, MGS summarizes both MBMAP and SMBPP observations in a State of Maine's Beaches Report. The most recent report, from 2022, is located at: https://digitalmaine.com/mgs_publications/618/, and past reports are available from MGS.

Figure 3.43: 2021 beach dune monitoring map. www.maine.gov/dacf/mgs/hazards/beach_mapping/index.shtml

Coastal Bluff Erosion

Bluff stability along about 75% of Maine's shoreline is classified by the Coastal Bluff Map series. About one-third of unconsolidated bluffs along the Maine shoreline are eroding.

[47] Maine Coastal Erosion and Hazards: https://www.maine.gov/dacf/mgs/explore/marine/virtual/erosion/virtual_coastal_erosion.pdf
[48] MBMAP: https://www.maine.gov/dacf/mgs/hazards/beach_mapping/index.shtml

3.50.2 Previous Occurrences

According to the Maine Geological Survey, during the past century, 30-40 buildings have been destroyed by beach erosion in Maine:

- At Camp Ellis, Saco; 33 lots are now in the ocean (Figure 3.40).
- At least 10 buildings, including a hotel, were lost at Popham Beach in Phippsburg in 1976 (Figure 3.44). A number of others were undermined and threatened by erosion and have since been moved landward and elevated.
- A hotel at Higgins Beach in Scarborough was destroyed by erosion.

Some of the worst erosion, on the order of 2-3 feet/year, is occurring at Camp Ellis Beach in Saco. Over 30 lots have been lost to the sea since 1908. The erosion in the area is caused by a lack of natural sediment to adjacent beaches due to the presence of the northern jetty of the Saco River (placed in 1869), wave focusing on Camp Ellis Beach due to offshore bathymetry, and reflected wave energy that directs wave energy from the jetty onto

Figure 3.40: (Left) Aerial photograph of the Saco River jetties and Camp Ellis. Incoming waves during northeast storms reflect off the northern jetty and focus wave energy along Camp Ellis Beach. Tax map overlay from 1908 indicates the number of parcels that have been lost by erosion. Erosion rates immediately adjacent to the jetty are 2-4 feet per year. A deep trough adjacent to the jetty has formed. Map created by Maine Geological Survey.

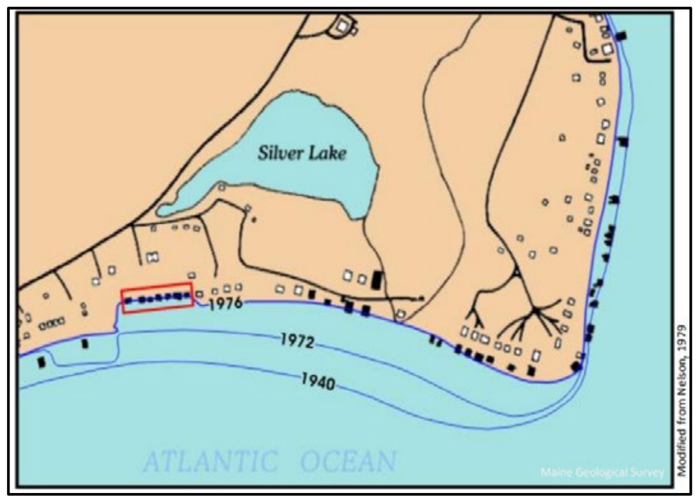

Figure 3.44: Historic shorelines along Popham Beach in Phippsburg. The blue lines show the location of the shoreline in 1940, 1973, and 1976. The small rectangles represent houses along the coast. The black rectangles represent houses that have been destroyed due to the coastal erosion. The red box outlines a row of

In the last 20 years, five houses in Saco were completely destroyed by erosion. Many others were damaged. Erosion of coastal beaches and bluffs occurs on a continuous basis along many parts of the Maine coast, resulting in an average annual loss of a foot or more on some beaches, and about a foot on highly unstable/unstable bluffs.

3.51 Erosion – Probability of Occurrence [S4.]

Maine's experience with erosion, coupled with the continual rise in the level of the sea, indicate that there is a high probability that erosion will continue to occur on an annual basis in various locations along the Maine coast. Rising sea levels are exacerbating coastal erosion by elevating water levels, which allows waves to erode higher areas of dunes and bluffs. In Maine, there is only a 1-foot difference between the water level associated with a 1% event and a 10% event. Thus, with just 1 foot of sea level rise, the storm that has a 10% chance of occurring in any given year will have the impact of a storm that has a 1% chance of occurring

3.51.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Shoreline erosion is driven in part by the elevation of the high tides. As sea level rises, the height of the high tide rises, and the height of the coastal flood plain rises. A higher floodplain will alter the frequency and inland extent of property damage from floods. Waves and currents can erode soil, bluffs, and beaches when they wash ashore at higher and higher levels. Salt water will reach farther inland and damage roots of trees, shrubs, and grasses. Underground salt water will flow farther inland and "intrude" on freshwater aquifers, perhaps turning some coastal wells salty. As the ocean rises, all coastal environments - salt marshes, mud flats, exposed ledge, and beaches - will attempt to migrate inland. If the transgression of marine environments over terrestrial ones is prevented, then some loss of coastal wetlands can be expected. Over decades, coastal infrastructure - docks, pipelines, roads, utilities, among others - will need to be rebuilt at higher levels or farther inland to provide an equal amount of protection or service.

Beaches undergo changes during storms and in response to sea-level rise. During storms, waves attack the berm and dunes, causing overtopping of the dunes and overwash. At the same time, the berm and dunes are eroded, and sediment is transported offshore and deposited in sandbars. This causes waves to break farther offshore, decreasing the wave energy that reaches the beach. As sea level rises, the same process occurs: waves can attack the upper part of the beach profile, pushing sand over the dune in a process called overwash. At the same time, sand is pulled offshore. The barrier beach migrates landward, rolling landward over itself. The initial beach migrates landward over its own marsh into its second position. This is why you can find peat deposits, tree stumps, and oyster shells in the surf zone. Think of the beach as a tread on a tank rolling over itself in a landward direction [49].

[49] Maine Geological Survey Coastal Erosion FAQ: https://www.maine.gov/dacf/mgs/hazards/erosion/faq.htm

Erosion – Vulnerability Assessment

TIER 1 HAZARD

3.52 Erosion – Impacts

The erosion of portions of Maine's coastline, notably along beaches, dunes, and bluffs, is driven largely by coastal storm events such as extratropical (nor'easters and southeasters) and tropical cyclones. The health of beaches and dunes is related to their available supply of sediment. Those beaches and dunes with a healthy sediment supply, often from a nearby river, can have an excess of sediment and accrete, or build seaward. Beaches and dunes with a limited sediment supply, such as small pocket beaches surrounded by headlands, depend on seasonal shifts in sand to maintain their overall shapes. Beaches and dunes undergo distinct seasonal changes – for example, during the winter months, dunes are eroded, and beaches are typically concave in shape, with sand from the beach and dune stored in offshore bars. During summer months, the sand typically returns to the beach and dune, and the beach becomes higher and more convex in shape, while dunes usually recover from the previous winter erosion.

In natural areas, beaches and dunes respond to coastal storms and sea level rise by migrating landward over time, rolling over the back-barrier similar to a tank tread. In highly developed areas, such as those with structures and/or seawalls, this process is impeded, and the beach or dune has limited room to migrate. Coastal bluffs, unlike coastal sand dunes, erode one-way in our lifetimes, and don't reform. Eroding bluffs can "heal" themselves through the bluff erosion cycle, in which a section of eroding bluff calves off through a small landslide process, which decreases the unstable slope and then stabilizes the toe of the bluff for a period of time. Beach, dune, and bluff erosion is a natural process that, by itself, is not a hazard. It becomes a hazard when erosion threatens man-made structures such as dwellings that are in a fixed location on the coastline.

The unconsolidated sections of Maine's coastline – beaches, dunes, and bluffs – are vulnerable to coastal erosion. However, as stated before, erosion by itself isn't necessarily a hazard, but becomes a hazard when it threatens man-made infrastructure. Highly developed areas of the southern Maine sandy coastline are particularly vulnerable to erosion impacts. Locations such as Camp Ellis, Wells Beach, and Popham Beach experience significant erosion rates in a year, threatening coastal properties and diminishing state-protected areas.

3.53 Erosion – Vulnerability of State Assets [S5.]

3.53.1 Potential Dollar Losses to State Owned Buildings, Infrastructure, Critical Facilities

State building/structure assets

It was determined that no state facilities that would be used during an emergency or disaster for response or recovery are located in erosion hazard zones. MEMA identified 4 structure assets located within 60 feet of unstable to highly unstable bluffs with a total building replacement cost of $3.3 million. These assets rated by valuation are listed in Table 3.41. No state assets were identified to be within beach dune erosion hazard areas.

Table 3.41: Identified state assets within 60 feet of unstable to highly unstable coastal bluffs. Note that one location may hold multiple assets.

Address	County	Occupancy Type	Property Type	Year Built	Last Inspected	Total Valuation	Agency
45 Granville Rd, Bass Harbor, Maine, 04653	Hancock	PIER	Steel framed and sided.	-	2/6/2006	$3,016,000	DOT, MAINTENANCE & OPERATIONS
45 Granville Rd, Bass Harbor, Maine, 04653	Hancock	OFFICE	Wood framed. Wood siding.	1997	7/1/2005	$244,400	DOT, MAINTENANCE & OPERATIONS
45 Granville Rd, Bass Harbor, Maine, 04653	Hancock	OFFICE	-	-	-	$18,720	ADF, OFFICE OF INFO TECH, COMPUTERS SERVERS ETC.
2255 US-1, Sullivan, Maine, 04664	Hancock	REST ROOM	Wood framed. Wood siding.	2002	6/3/2015	$15,600	DOT, EASTERN REGION

There is no guarantee that these assets will be damaged in a natural hazard event. The state operated ferry at Bass Harbor is in close proximity to an unstable to highly unstable bluff, making it potentially vulnerable to erosion impacts that could directly damage the infrastructure. A temporary or long-term closure of the Bass Harbor terminal would impact ferry services to Swans Island and the ability for its 324 residents to reach the mainland, or the many seasonal tourists to visit the island.

State Road Assets

A total of 55.75 miles of state and municipal roads were identified within 60 feet of unstable to highly unstable coastal bluffs (Table 3.42). The state roads host an average of 4,910 vehicles per day. Assuming that road replacement costs equal $1.5 to $2 million per mile, the value of potentially exposed state roads range from $18.5 to $24.2 million.

Table 3.42: Public roads intersected by unstable to highly unstable bluff locations, indicating potential exposure to future erosion events.

Jurisdiction	Road miles	AADT* average	Reconstruction cost (millions)
Total	55.75	1,697	$83.6-$112
State	12.1	4,910	$18.5-$24.2
Local	43.6	273	$65.4-$87.2

*AADT: annual average daily traffic per segment

Conserved Lands

Many of Maine's most visited state parks contain beach and bluff erosion hazards (Table 3.43). A total of 31 parks are potentially exposed to coastal erosion hazards, and in many cases these hazards involve beach and bluff erosion processes. These parks are distributed across all coastal counties.

Table 3.43: Maine State Parks exposed to beach and bluff erosion hazards. Parks in bold are high visitation sites.

State Park	Beach Erosion	Bluff Erosion	Municipality	County	Building replacement cost*
Andrews Beach	X		Long Island	Cumberland	
Barrett Park		X	Boothbay Harbor	Lincoln	
Birch Point State Park	X		Owls Head	Knox	
Camden Hills State Park		X	Camden	Knox	
Clark Cove		X	Harpswell	Cumberland	
Crescent Beach State Park	X	X	Cape Elizabeth	Cumberland	
Duck Trap	X	X	Lincolnville	Waldo	
Eastern Head	X		Trescott	Washington	
Ferry Beach State Park	X	X	Saco	York	
Fort Point State Park and Fort Pownal		X	Stockton Springs	Waldo	
Fort Popham	X		Phippsburg	Maine	
Fort Webber (Fort Island)		X	Boothbay	Lincoln	
Gleason Point	X		Perry	Washington	
Holbrook Island Sanctuary State Park	X	X	Castine	Hancock	
Jewell Island	X	X	Jewell Island	Cumberland	
Lamoine State Park	X	X	Lamoine	Hancock	$2,105,941
Laudholm Farms	X	X	Wells	York	
Little Chebeague Island	X	X	Little Chebeague	Cumberland	
Mackworth Island State Park		X	Falmouth	Cumberland	
Marblehead Boat Launch		X	Biddeford	York	
Moose Point State Park		X	Searsport	Waldo	
Owls Head Light State Park		X	Owls Head	Knox	
Penobscot River Boating Access		X	Verona Island	Hancock	
Piscataqua River Boat Access		X	Eliot	York	
Popham Beach State Park	X	X	Phippsburg	Sagadahoc	$2,130,973
Quoddy Head State Park	X		Lubec	Washington	
Reid State Park	X		Georgetown	Sagadahoc	
Roque Bluffs State Park	X		Roque Bluffs	Washington	
Scarborough Beach State Park	X	X	Scarborough	Cumberland	$124,706
Warren Island State Park	X	X	Islesboro	Waldo	
Wolfes Neck Woods State Park		X	Freeport	Cumberland	
Total Park Building Replacement Cost:					$4,361,620

*Building replacement costs are assumed to be an incomplete assessment for this analysis of State Parks.

Building replacement costs are available for 3 of the 31 parks, with a total valuation of $4.36 million. Please note that this is likely an underestimate of total structural state assets located within these and all other parks.

3.53.2 Community Lifeline Risks

As already noted, erosion can impact transportation needs, which may hinder the ability of emergency responders to access the impacted area and impact access to critical medical, food, and shelter services.

3.54 Erosion – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

3.54.1 Identifying Jurisdictions with Greatest Vulnerability [S6.a.1.]

All jurisdictions may be exposed to hazardous erosion processes. Coastal processes are the most well studied, though there are still many uncertainties related to potential future erosion events in coastal communities. Best available data provide a foundation for a vulnerability analysis that can, at a bare minimum, provide a summation of georeferenced assets that may potentially become exposed to bluff and beach erosion risks in the future.

Disadvantaged Communities

The objective of the disadvantaged communities' assessment is to identify potential disadvantages felt by communities who are disproportionately impacted by natural hazards both historically and under future projections. Erosion is a hazard of growing concern in coastal Maine with sporadic events occurring further inland as well (see Mass Wasting- Hazard Profile). Locations at risk of erosion are predictably located in areas of potentially unstable sediments adjacent to flowing water and/or wave activity. However, much like flood risks, such properties are often highly valued due to their viewsheds and proximity to water.

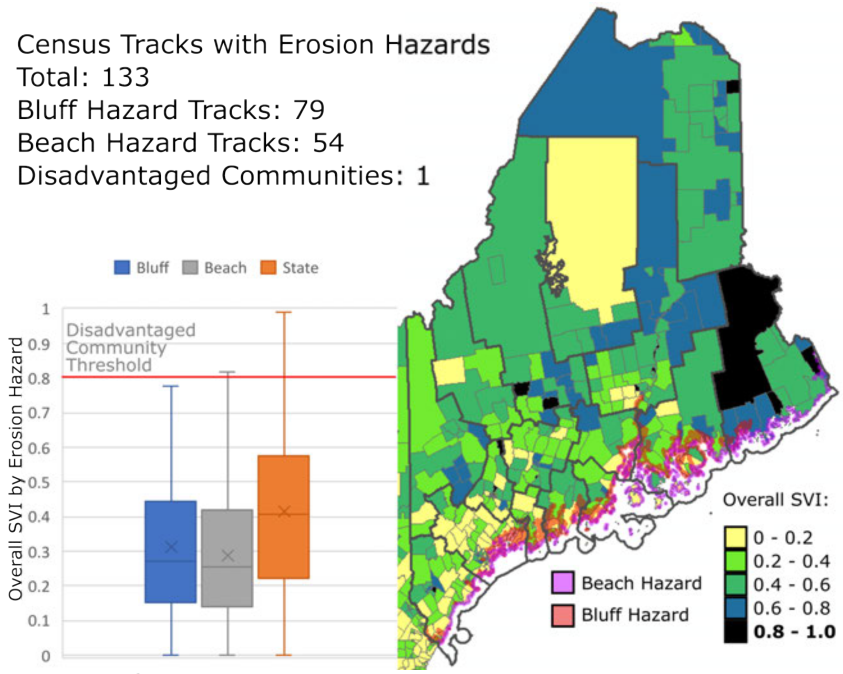

Figure 3.45

Use of SVI census tracts indicate a single disadvantaged community (5% of all disadvantaged communities in Maine) is potentially exposed to identified beach erosion hazards while none are exposed to identified bluff erosion hazards. Overall, SVI values for communities within these hazard areas are on average substantially less than the state SVI average. One limitation of this analysis is the coarse resolution of census tracts in Maine relative to the finer scale socioeconomic, ethnic, and cultural diversity that exists in Maine but is diluted by the averaging calculations made for census track SVI.

Further, many other disadvantaged community members may be unable to afford the cost of living along the coast but work in coastal areas prone to erosion hazards that could disrupt their livelihoods. Maine's large tourism industry is heavily concentrated on a fragile coast experiencing accelerated changes from sea level rise. Any reduction or loss in coastal tourism would be devastating for the economy and identity of local working communities.

Finally, sea level rise directly impacts working shorelines that support the seafood industry. Many working piers have been identified in this Risk Assessment as vulnerable to sea level rise and erosion, each of which is crucial for the fishing industry. Coincident with sea level rise, rising ocean temperatures are threatening the long-term sustainability of Maine's lobster industry, which supplies 90% of the national supply [50]. Shellfish harvesters and aquaculture businesses need to access clean mudflats. Changes in sea level will alter accessibility to these sites in the future, while increased coastal development will ultimately reduce the number of clean places to harvest.

3.54.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

MEMA performed a geospatial analysis to identify structures and parcels adjacent to beach and bluff erosion hazard locations (Table 3.43). Structure values were determined using the approach described in the Geospatial Analysis of Assets section above. Total structure values near bluff erosion hazards are estimated to be $311.4 million, the majority of which reside in Cumberland County, though Hancock County contains most exposed land parcels. Please note that the bluff hazards database does not include the full coastline of Washington County, and therefore potential exposure to bluff erosion may be greater than what is shown here. Total structure values near beach erosion hazards are estimated to be $753.1 million, the majority of which reside in York County.

Table 3.44: Parcels and structures exposed to unstable to highly unstable bluffs and sand dune erosion hazard areas. Structure values given in millions $USD 2022.

Region	Bluff			Beach		
	Parcels	Structures	Structure Value	Parcels	Structures	Structure Value
State	8,447	803	$311.4	4,774	2,040	$753.1
Cumberland	1,769	292	$102.9	499	155	$54.5
Hancock	2,561	176	$74.7	492	59	$21.5
Knox	892	91	$34.2	142	15	$2.8
Lincoln	1,206	81	$27.8	21	6	$2.6
Penobscot	127	4	$2.0	-	-	$0.0
Sagadahoc	403	42	$15.0	154	77	$25.7
Waldo	443	20	$10.5	115	14	$8.5
Washington*	416	23	$5.1	287	25	$6.6
York	630	74	$39.2	3,064	1,689	$630.9

* Bluff map does not cover entirety of Washington County.

Issues and Challenges

The following is a partial list of some of the erosion mitigation challenges in Maine.

Limited funding for Beach Profiling Program. The beach profiling program has been a cost-effective way to gather detailed information on changes in beach profiles every month and is dependent upon grant funding in conjunction with support fees from participating communities. The program continues to provide assistance to communities facing challenges related to coastal erosion and climate change as outlined in the Scientific Assessment of Climate Change and its Effects in Maine report by the Maine Climate Council [51].

Limited commitment to coastal geology hazard monitoring. Maine funds only one full-time, General Fund position in the Maine Geological Survey to deal with the complexity of issues surrounding the geology of Maine's coast. MGS relies heavily on grant funds for most of its data collection and mapping.

[50] Maine's key industries: https://www.maine.gov/decd/business-development/move/key-industries
[51] Scientific Assessment of Climate Change and its Effects in Maine: https://online.fliphtml5.com/gkqg/jqys/#p=102

Limited insurance for geological risks. It may be extremely difficult or prohibitively expensive for individuals to purchase erosion insurance for their properties. As such, many of the erosion hazards represent uninsurable risks.

Increasing mitigation need. As sea level continues to rise, erosion will continue along the waterfront. Mitigation, including relocation of infrastructure and environmentally sound coastal restoration and coastal engineering practices will be increasingly important in the coastal zone.

Mass Wasting – Hazard Profile

TIER 1 HAZARD

3.55 Mass Wasting – General Definition and Types of Events [S3.a., S3.b.]

Mass wasting is the downslope movement of earth materials under the force of gravity. There are many types of mass wasting, and the definition of their characteristics vary worldwide. The following sections describe the most common types of mass wasting in Maine and are generally aligned with the definitions set by the U.S. Geological Survey. [52]

Mass wasting is a hazard that has been occurring for thousands of years in the State of Maine, but new technology such as lidar topographic data has allowed greater understanding of its extent and characteristics [53]. Instability associated specifically with sediment known as the Presumpscot Formation has raised major concern within the highly populated coastal communities. The Presumpscot Formation is a glaciomarine mud that was deposited in areas of southern Maine that were covered by the ocean at the end of the last Ice Age [54]. The mud can be very soft and can liquefy and flow when disturbed (earthquakes, man-made vibrations) or exposed in a slope by excavation, stream cut bank or coastal bluff erosion).

3.55.1 Creep

Creep is the gradual downslope movement of soil or other unconsolidated earth materials due to freeze-thaw action (Figure 3.46). Creep does not pose a direct risk to human life, but it can impact infrastructure over time by tilting fences and utility poles that were not properly driven below the frost line. In some cases, creep *may* indicate an unstable slope prone to other types of mass wasting, but this is not always a reliable indicator. Creep may be identified on a slope by curved tree trunks, tilted fences and utility poles, cracks in pavement, or soil ripples.

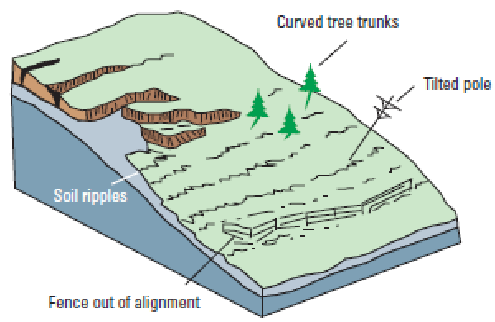

Figure 3.46: Illustration of features resulting from creep (Highland and Bobrowsky, 2008).

3.55.2 Rockfall

A rockfall is the sudden and rapid downslope movement of rocks (Figure 3.47). The rocks may bounce and break into smaller pieces as they move and tend to continue until they reach an obstruction or flatter topography. Rockfalls may occur in areas with steep slopes and exposed bedrock (natural or manmade). Freeze-thaw action tends to slowly loosen rock blocks from slopes along pre-existing fractures until they fall, but earthquakes may also trigger rockfalls.

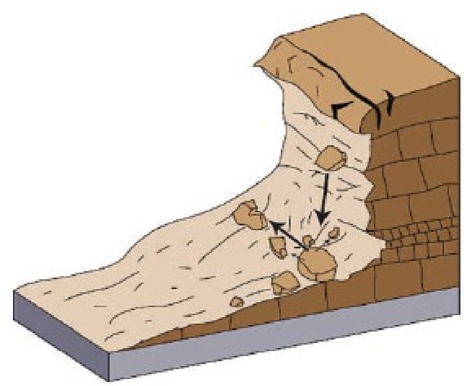

Figure 3.47: Illustration of a rockfall (from Highland and Bobrowsky, 2008).

52 Highland, L.M., and Bobrowsky, P., 2008, The landslide handbook—A guide to understanding landslides: Reston, Virginia, U.S. Geological Survey Circular 1325, 129 p. https://pubs.usgs.gov/circ/1325/pdf/Sections/Section1.pdf

53 Maine Geological Survey Inland Landslides Map: https://www.maine.gov/dacf/mgs/hazards/landslides/inland/index.shtml
54 Presumpscot Formation: https://digitalmaine.com/cgi/viewcontent.cgi?article=1334&context=mgs_publications

3.55.3 Landslides

A landslide is the downslope movement of earth materials (due to gravity) along a rupture surface (shear plane). The following factors or a combination of these factors may trigger a landslide:

- **Undermining Slope.** Removing the base or toe of a slope through natural or human processes, resulting in unstable areas upslope.
- **Adding weight to slope.** Overloading a slope due to human alteration (buildings, roads) or natural processes (growth of large trees, addition of water weight from snowmelt or rainfall).
- **Wet conditions.** High water content in the pore spaces of unconsolidated earth materials decreases friction between particles and reduces slope strength. Wet conditions also add water weight to a slope. Snowmelt and heavy rain are the most common causes of wet conditions, but other sources include septic leach fields and other manmade drainage outlets.
- **Earthquakes.** Shaking causes a slope to lose strength. Man-made vibrations (drilling, blasting, etc.) can also trigger landslides.

There are many different types of landslides, and sometimes an individual landslide can have the characteristics of multiple types. When assessing a landslide, it is best to categorize it as the type it most resembles since a perfect match is unlikely. Landslides may start with slow movement (inches to feet per day) that ends in very rapid movement (feet per second), or they may happen very rapidly without warning. The most common types of landslides in Maine are described in detail below.

3.55.4 Rotational landslide/slump

A rotational landslide (sometimes called a slump) is the down and outward movement of earth materials along a curved plane (Figure 3.48). This type of landslide may be triggered by undermining the base of a slope, adding weight to a slope, wet conditions, an earthquake, or a combination of these factors.

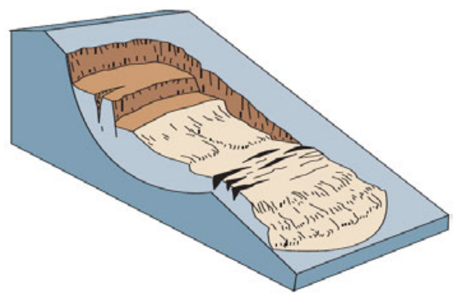

Figure 3.48: Illustration of a slump (from Highland and Bobrowsky, 2008).

3.55.5 Translational landslide

A translational landslide is the downslope movement of earth materials along a plane with little to no rotational movement (Figure 3.49). This type of landslide may be triggered by undermining the base of a slope, adding weight to a slope, wet conditions, an earthquake, or a combination of these factors.

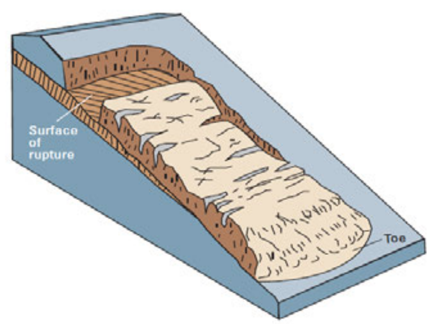

Figure 3.49: Illustration of a translational landslide (from Highland and Bobrowsky, 2008).

3.55.6 Flow

A flow is the downslope movement of water-saturated earth materials (Figure 3.50). There is little structure to a flow, with materials often moving as a slurry. This type of landslide requires wet conditions but may also be triggered by undermining the base of a slope, adding weight to a slope, an earthquake, or a combination of these factors. Flows are often confused with gullies and vice versa. In a gully, sediments are picked up and carried downslope by flowing water, not by gravity alone. Gullies often originate in areas of concentrated surface runoff, such as a culvert or drain outlet. It is important to recognize the difference, as flows tend to be one event, while gullies can remain active, resulting in long-term erosion problems.

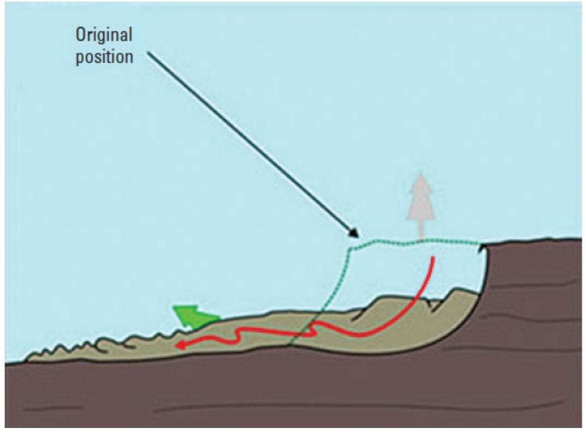

Figure 3.50: Illustration of flow (from Highland and Bobrowsky, 2008).

3.55.7 Spread

Spread landslides occur when a stronger earth material layer breaks apart and moves along and/or sinks into a weaker/softer underlying layer (Figure 3.51). This type of landslide requires unstable earth materials at depth and may be triggered by undermining the base of a slope, adding weight to a slope, wet conditions, an earthquake, or a combination of these factors.

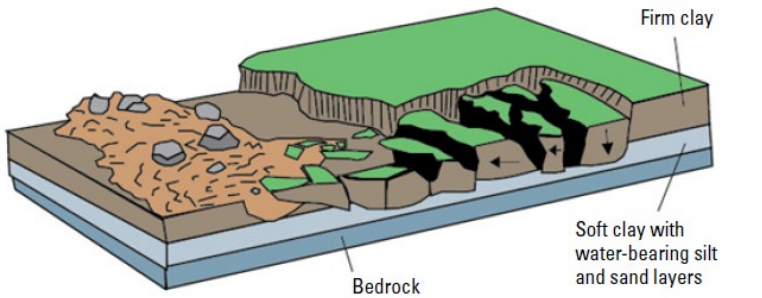

Figure 3.51: Illustration of a spread (from Highland and Bobrowsky, 2008). In Maine, “clay” layers would most likely be Presumpscot Formation.

3.56 Mass Wasting – Location of Hazard [S3.a.1]

Mass wasting may occur statewide (Figure 3.52), but specific types are more common in different areas of the state as described below.

3.56.1 Creep

Common statewide on slopes consisting of unconsolidated earth materials.

3.56.2 Rockfalls

Most common in areas with exposed bedrock on steep slopes, such as in the mountainous western and central regions of the state (Oxford, Franklin, Somerset, and Aroostook Counties). May also occur anywhere there are steep man-made exposures of bedrock, such as road cuts.

3.56.3 Rotational Landslides/Slumps

May occur statewide on slopes of unconsolidated earth materials, but most common in river cut bank and coastal bluff areas shortly after periods of high water, especially where the Presumpscot Formation is present. In river corridors, erosion tends to occur during high flows at the outside of a channel bend. The base of the riverbank is eroded/undermined leading to slumping or sliding as flood waters recede and expose the now unstable bank.

In coastal bluff areas consisting of unconsolidated earth materials, wave action may undermine the base of a bluff, particularly during strong storms (see Erosion – Hazard Profile). This process may lead to slumping and sliding, especially when combined with other triggers such as wet conditions.

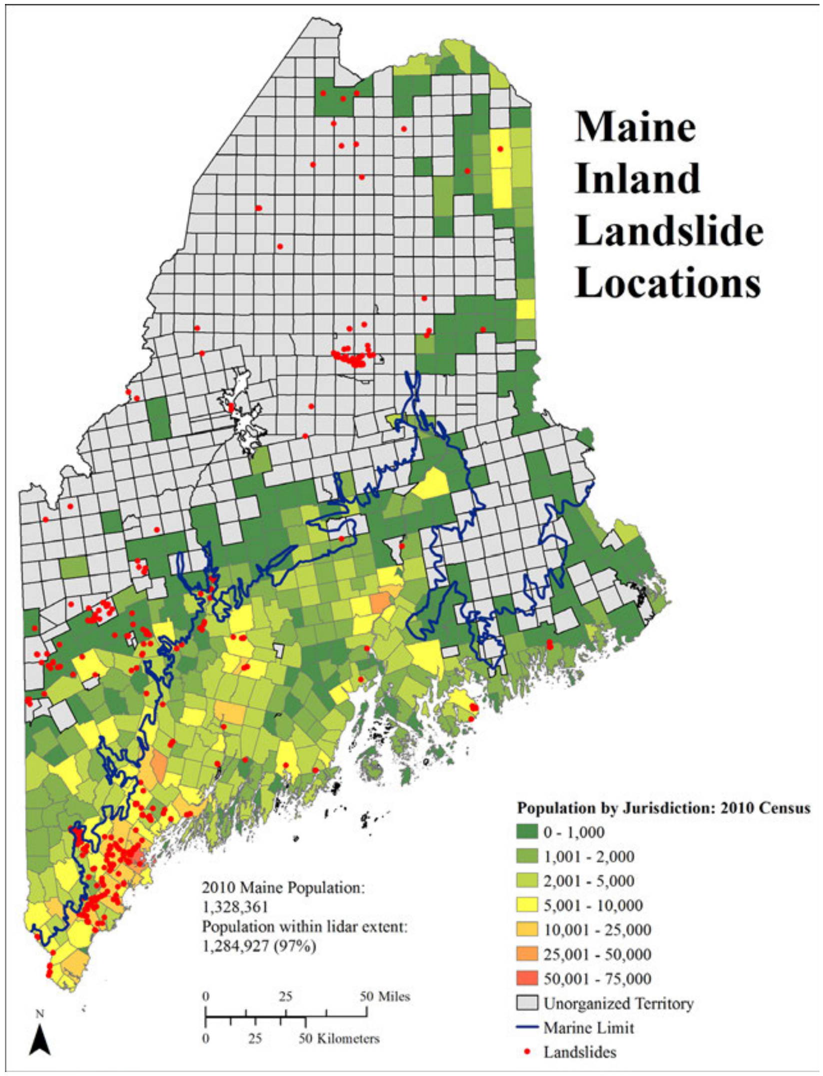

Figure 3.52: Map of landslide locations mapped from lidar as of September 2022. The highest density of landslides coincides with the most populated area of the state. The Presumpscot Formation may be present in areas south of the dark blue line (known as the "marine limit") and is likely related to the high number of landslides in southern Maine. Map: Maine Geological Survey.

3.56.4 Translational Landslides

Most common in mountainous areas with thin soils on steep slopes. Most likely to occur during or after prolonged wet periods when water adds weight to the slope and/or reduces the strength of the earth materials.

3.56.5 Flows

May occur on slopes of unconsolidated earth materials statewide but require water-saturated earth materials, making flows more likely after prolonged wet conditions. Flows may also result from disturbance and liquefaction of the Presumpscot Formation.

3.56.6 Spread Landslides

May occur in areas of southern Maine where the Presumpscot Formation glaciomarine deposit is present, usually at lower elevations in valleys. Lidar topographic data recently revealed many prehistoric spread landslides associated with the Presumpscot Formation.

3.57 Mass Wasting – Intensity and Previous Occurrence [S3.a.2.]

An accepted standardized scale to classify mass wasting event magnitudes does not currently exist, but landslides can be assessed in terms of the land area disturbed by the events. An analysis of existing lidar hillshade imagery was conducted to assess the sizes of Maine landslides that could be recognized and measured in a GIS program (Figures 3.53). There are 405 landslides recorded in this inventory, but this analysis probably does not include every landslide in Maine due to the lack of ability to field check all suspected landslide localities, and natural or human processes that may have altered a landslide beyond recognition, but it is a large enough sample size to portray the magnitude of these events in Maine. The average disturbed area for the 365 inland landslides for which extents could be mapped in GIS is about 19 acres, although there are situations that could increase or decrease this value. When a landslide occurs along a river channel or coastal area, the lower margin of the landslide (known as the "toe") can be washed downstream or eroded over time making it difficult to determine the full landslide extent. This is a common scenario in Maine, although this underestimation may be offset by very small slumps and slides that are difficult to map in GIS (<0.1 acre). If a landslide occurs along a river channel, the affected area may be increased substantially if the landslide toe blocks the river causing flooding upstream and potential flash flooding downstream once the river breaches the landslide toe.

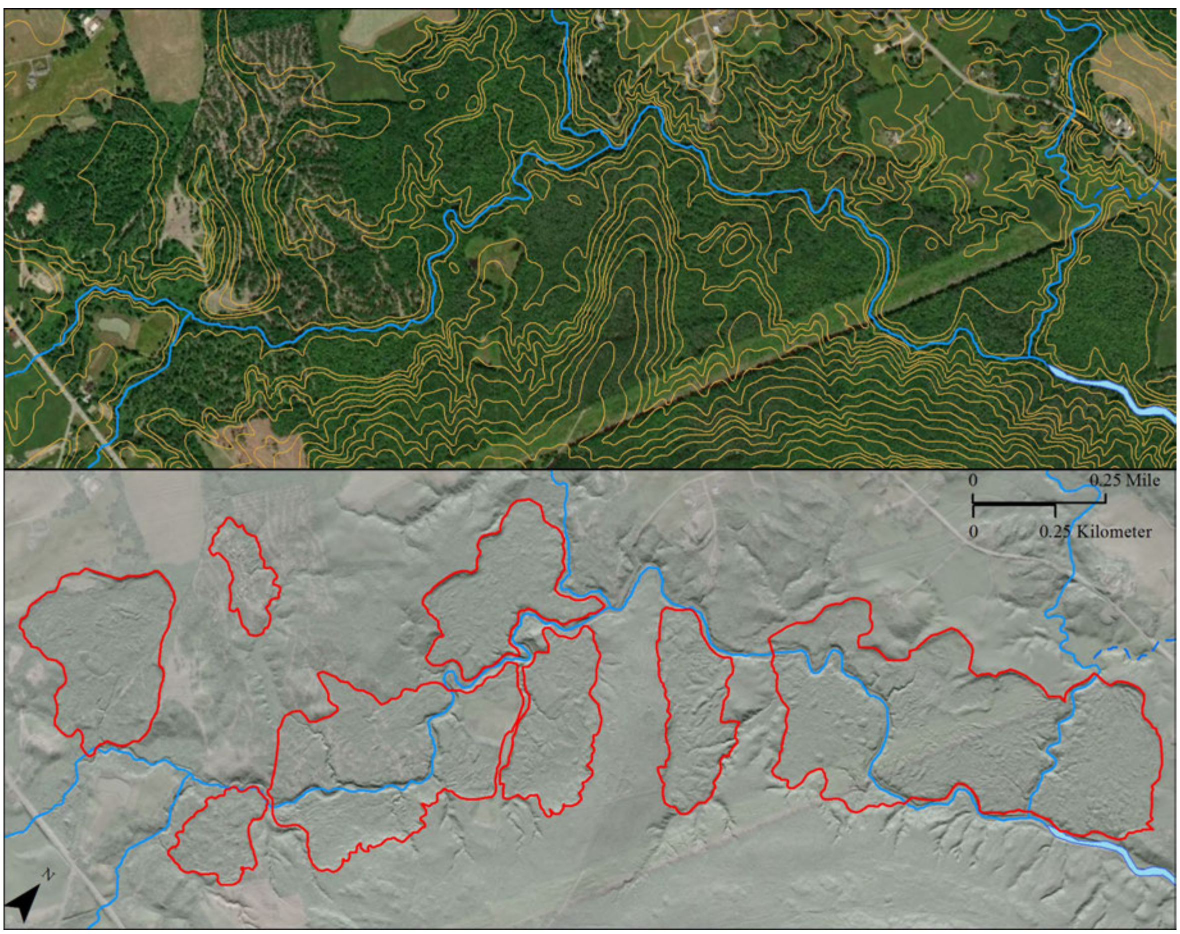

Figure 3.53: Lidar hillshade imagery revealed many landslides in this river valley (bottom image, outlined in red) that were not recognizable with traditional topographic maps and aerial imagery (top image).

3.57.1 Previous Occurrence

A complete list of mass wasting events in Maine does not exist in part because these events tend to affect individual properties and not entire communities. The following list is a sub-sample of known events for the modern, historic, and pre-historic eras.

Modern Landslides (1950-present)

Figure 3.54: 2021 Rockport landslide. Photo courtesy of Knox County EMA.

- **2021, Rockport, Maine:** a small spread landslide occurred along Glen Cove, displacing several cubic yards of soil on a private property (Figure 3.54).
- **2020, Westbrook, Maine**: A spread landslide occurred along the Presumpscot River directly opposite of the 1868 landslide (see description below).
- **2016, Brunswick, Maine:** A rotational landslide occurred in the Bugnanuc coastal bluff area with a history of similar events.
- **2010, Sandy River, Chesterville, Maine:** A rotational landslide along the river forced the town to relocate a road.
- **2007, Brunswick and Gilead, Maine:** The “Patriot’s Day Storm” triggered a coastal bluff landslide in Brunswick and gullying/possible flows along the Wild River in Gilead. A house was condemned due to the Brunswick landslide. A similar event was noted along the Wild River in 1998.
- **2006, Greenbush, Maine:** A rotational landslide along the Penobscot River threated U.S. Route 2.
- **2006, Mount Desert Island, Maine:** Earthquakes trigger roadcut and mountainside rockfalls in Acadia National Park, blocking roads and hiking trails.
- **2005, Wells, Maine:** A rotational landslide along the Merriland River resulted in removal of at least one nearby home. In March 2019, another small rotational landslide occurred in this area.
- **1996, Rockland, Maine:** A coastal bluff rotational landslide destroyed two homes that had been evacuated. A similar event occurred in the same harbor in 1973.
- **1990, Grafton, Maine:** A translational landslide occurred on Mount Hittie.
- **1983, Gorham, Maine:** A spread landslide along the Stroudwater River destroyed a home that was under construction.
- **1966, Waterville, Maine:** A rotational landslide occurred along the Kennebec River, threatening a local park known as Couture Field.

Historic Landslides (1600s-1950)

- **1927: Grafton, Maine:** A landslide occurred on the northeast flank of Old Speck Mountain due to heavy rainfall..
- **1917, Jackman, Maine:** A landslide on Mount Sally was noted in historical records.
- **1868, Westbrook, Maine:** The largest landslide witnessed in recorded Maine history occurred on the Presumpscot River. This flow landslide affected about 40 acres and blocked the river, flooding the paper mill upstream until workers dug out a path for the river by hand.
- **1849, Westbrook, Maine: A** spread landslide occurred along the Stroudwater River.
- **1826, Gilead, Maine:** A landslide on Peaked Hill was noted in historical records.
- **1670, Kennebunk, Maine:** A landslide along the Kennebunk River was noted in historical records.

Prehistoric Landslides

Lidar topographic data recently revealed over 200 landslides of unknown age that are concentrated in the most populated area of the state. Working in cooperation with MEMA, the Maine Geological Survey determined the ages of 28 prehistoric landslides in southern Maine through radiocarbon dating of vegetation buried by, caught up in, or deposited on top of the landslides (Figures 3.55-3.57). Prior to this study, only one prehistoric landslide (about 13,500 years old) had been studied when a large construction project in Portland revealed trees that were buried by the event. The oldest landslide in the current study is about 12,000 years old and occurred just south of Sebago Lake. Clusters of landslides occurred about 600, 3, 300, and 4,000 years ago. This clustering of activity suggests a more regional trigger, such as earthquakes or wet conditions. Other landslides occurring somewhat randomly over time may have more complex causes, such as the convergence of multiple factors like river cut bank erosion and wet conditions at that location. The youngest landslide in the study was determined to be the 1849 Stroudwater River landslide – the exact location was previously unknown. This research indicates that the previously unknown landslides are not as ancient as the Bramhall landslide – some are quite young, indicating that large landslides may be possible into the future.

Figure 3.55: A soil core revealing soils buried by a landslide in Lyman, Maine. The darkest layer in the middle of the core was the topsoil and the grey layer on the right was the bottom of the landslide (in this case, consisting of Presumpscot Formation). Plant fragments from the buried soil layer were sent for radiocarbon analysis to estimate the landslide age. Photo: Maine Geological Survey.

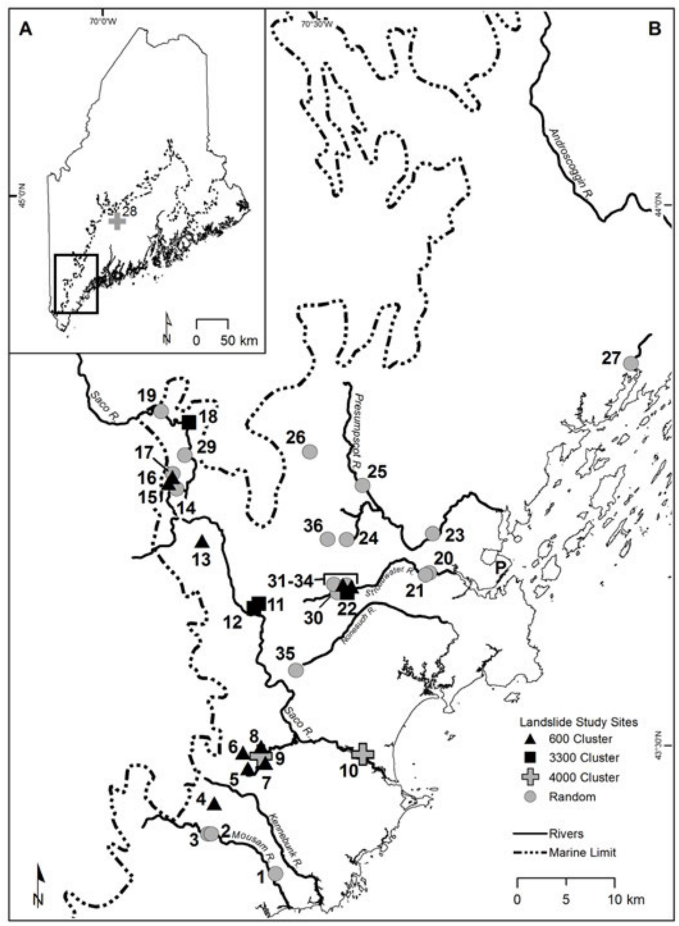

Figure 3.56: Locations of 36 prehistoric landslide sites with estimated ages (more than 36 were studied but some did not yield samples for radiocarbon dating). Site symbols are grouped by observed timing clusters, which may indicate a regional trigger such as a large earthquake or very wet conditions.

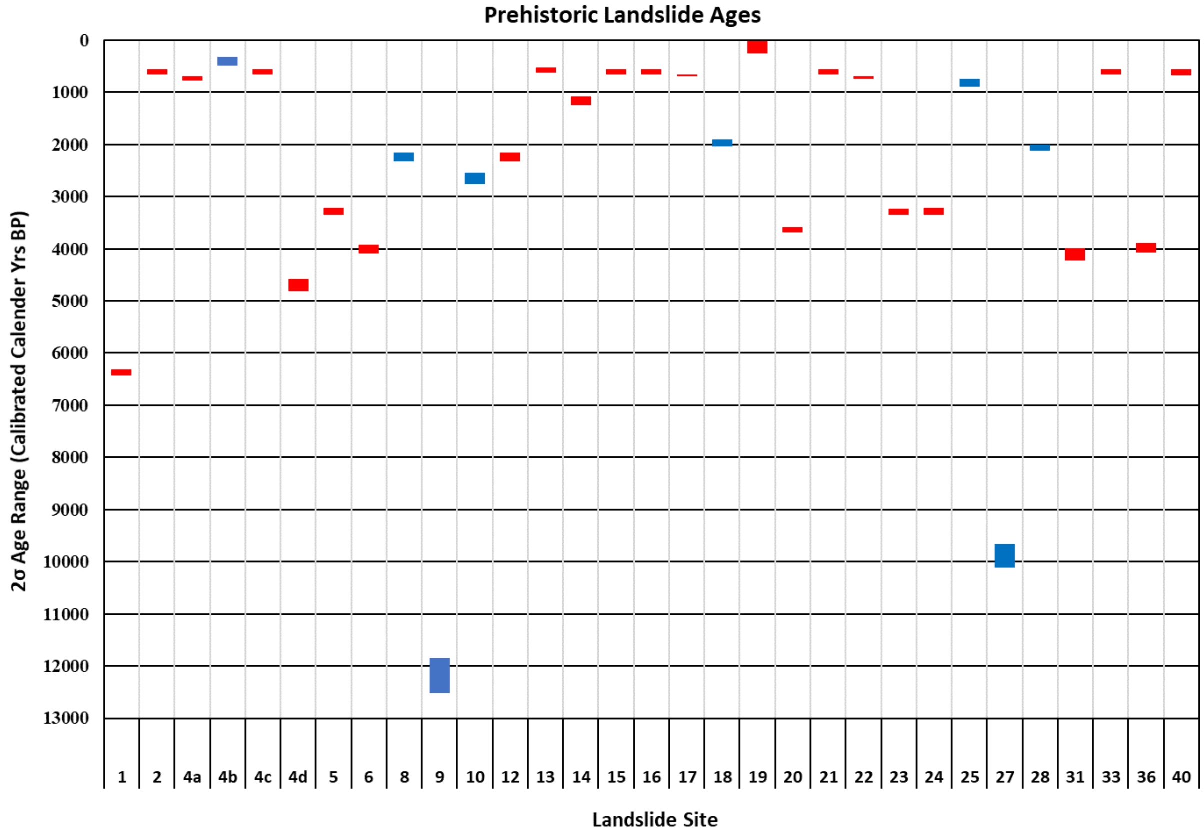

Figure 3.57: Graph of estimated landslide ages (2σ ranges are reported to account for error in radiocarbon analysis and conversion to calendar years before present). Blue ranges are from samples deposited on top of the landslide after it occurred, which provide a minimum age estimate. Red ranges are from samples that were buried by or caught up in the landslide, which provide a maximum age estimate. Ages shown are the best estimate from each site, which may have been selected from multiple samples at a site. Site 4 is a very large landslide complex (about 1 square mile) that was active at different times (shown as 4a-d).

3.58 Mass Wasting – Probability of Future Occurrence [S4.]

There are no specific statistical studies of mass wasting probability in Maine due to the small sample size of events with a known age and/or location. Geologic research can increase the sample size of dated prehistoric landslides, but the locations of landslides included in this sample is heavily dependent on permission to access features on private property. Many historic landslides have been documented, but their exact locations are often unknown or have been altered beyond recognition. Modern landslides are increasingly difficult to document, as landowners become hesitant to report any issues that may affect their property values, especially in coastal areas. Landslide susceptibility maps exist for portions of southern Maine, but new lidar topographic data and advances in GIS could greatly improve these maps. Despite the limitations described above, history indicates that mass wasting is more likely in areas of Maine with:

- Steep slopes (natural or manmade) that have been undermined or overloaded.
- River cut banks and coastal bluffs that have been undermined and/or overloaded, especially where the Presumpscot Formation is present.

As population increases in southern Maine, these communities should be encouraged to avoid development in river corridors and coastal bluff areas, especially where the Presumpscot Formation is present. Mountain recreation towns should consider the potential for mass wasting when developing these areas as well.

3.58.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Many historic and modern landslides have occurred in spring during prolonged wet periods fed in part by seasonal snowmelt [55]. Current climate projection models indicate trends that may indirectly impact the occurrence and seasonal timing of mass wasting in Maine, but such events continue to be very difficult and often impossible to predict. Climate projections suggest warming winter temperatures may reduce total snowpack available during spring snowmelt and this may reduce the potential for spring mass wasting events in the future. However, models also project an overall increase in precipitation in the northeast, particularly for large rainfall events exceeding 2 inches of rain (see section Flooding – Hazard Profile). These events may become more prevalent in summer and fall months under scenarios of prolonged heavy rainfall [56]. Severe summer and fall storms may increase the likelihood of mass wasting outside of the normal spring season, especially in steeper terrain. Further, greater fluctuations in freeze-thaw cycles through milder winters increase rockfall hazards through frequent expansion of ice forming within near surface rock fractures, causing them to weaken and fail. Further, the impacts of climate change, and their timing, will vary across the state of Maine, where there is a noticeable difference in how annual average snowpack is changing in northern versus southern locations.

[55] Landslides in the Presumpscot Formation: NEGSA Field Trip Guide

[56] Gauthier, D., & Hutchinson, D. J. (2012). Evaluation of potential meteorological triggers of large landslides in sensitive glaciomarine clay, eastern Canada. *Natural Hazards and Earth System Sciences*, *12*(11), 3359-3375. https://nhess.copernicus.org/articles/12/3359/2012/nhess-12-3359-2012.pdf

Mass Wasting – Vulnerability Assessment

TIER 1 HAZARD

3.59 Mass Wasting – Impacts

The impact of a mass wasting event varies substantially based on its size and location within the state. A rockfall in a rural mountainous area may go completely unnoticed, while a landslide in more populated southern Maine may take lives, destroy homes and infrastructure.

The entire state is vulnerable to some type of mass wasting, but events are much more likely to occur due to the following conditions:

- Steep slopes with thick deposits of unconsolidated earth materials, especially in areas where the Presumpscot Formation is present.
- River cut banks and coastal bluff areas that have been undermined by high flow/tides or storm events, especially where the Presumpscot Formation is present.
- Prolonged wet periods that add water weight and reduce slope strength, usually in spring when snowmelt is followed by persistent rain. Persistent rain is also frequently associated with high river flow or storm surges, which can undermine river cut banks and coastal bluffs.
- Earthquakes, which can occur throughout the state but are usually low magnitude (2 or less). The earthquake magnitude threshold trigger for mass wasting in Maine is unknown, but a 2006 swarm of earthquakes in the Mount Desert Island area (magnitude 2.3-4.2) was enough to cause several rockfalls.

The impacts of mass wasting in Maine have mostly been major damage to structures built along the top of steep slopes rather than damage and burial of structures at the base of a slope. Typically, rivers and other shorelines compose the base of these unstable slopes, and in some cases the mass wasting event can form a natural dam that may cause flooding of assets upstream. There are no known state assets that are vulnerable to these issues other than road infrastructure. The impacts of road infrastructure damage are noted below.

3.60 Mass Wasting – Vulnerability of State Assets [S5.]

Mass wasting is not expected to pose a substantial risk to state owned buildings. A geospatial analysis indicated no substantial state building assets are located adjacent to historically active inland landslide locations. However, the potential still exists given the historic difficulty in predicting locations and extents for mass wasting events. State roadways are likely to have the greatest potential exposure to mass wasting, either from erosion or debris coverage of roads.

3.60.1 Potential Dollar Losses to State Owned Buildings, Infrastructure, Critical Facilities

State Road Assets

MEMA conducted a geospatial analysis to identify public road sections located adjacent to known landside locations. This analysis was held under the assumption that these locations may be prone to future mass wasting events with the potential to damage roads. All public road sections within 20 meters of landslide disturbance sites were selected and are indicated in Figure 3.58 and detailed in Table 3.45. These road segments consist of 55.8 miles in total length and host an average 4,107 vehicles per day based on annual average daily traffic calculations provided by Maine DOT. Municipalities are responsible for the majority of maintenance for these road segments (but minimum road traffic) with 34.62 total miles. Of all exposed road segments, the most actively used is State Route 25 which connects Portland to towns in western Cumberland County and northern York County, with a maximum daily traffic estimate of 16,833. There is no guarantee that these assets will be damaged in a natural hazard event.

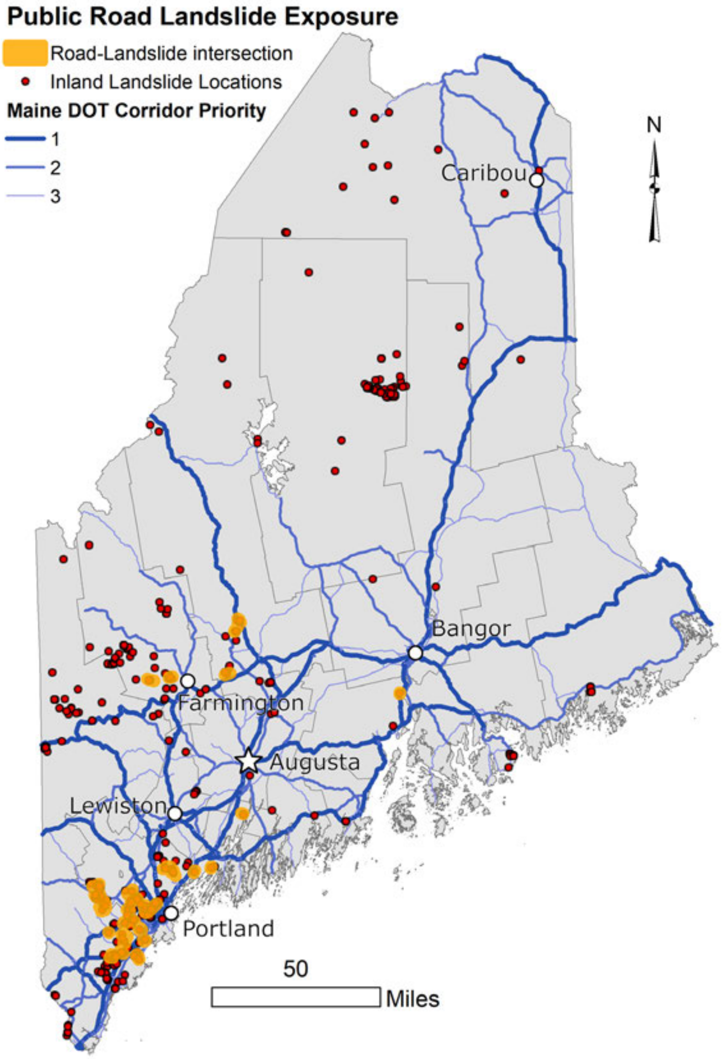

Figure 3.58: Exposure of public roads to historic landslide sites.

Table 3.45: Public roads intersected by historic landslide locations indicating potential exposure to future mass wasting events.

Jurisdiction	Road miles	AADT* average	Reconstruction cost (millions)
Total	55.8	4,107	$83.7 - $111.6
State	21.18	7,109	$31.8 - $42.4
Local	34.62	624	$51.9 - $69.2

*AADT: annual average daily traffic per segment

Maine DOT estimates that the cost of paved road reconstruction is $1.5 to $2 million per mile. Under these cost assumptions, the total cost of reconstructing all road-landslide exposure sites would cost approximately $83.7 to $111.6 million at a minimum. This would not include costs associated with debris removal or fill to reconstruct the land surface after a mass wasting event.

3.61 Mass Wasting – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

3.61.1 Identifying Jurisdictions with Greatest Vulnerability [S6.a.1.]

No critical facilities were located near historic landslide locations. However, as indicated above, there are several miles of local roads that may be exposed to future landslides based on their proximity to historic landslide sites. Further, community members with properties adjacent to steep terrain, cliff faces, or coastal/riverine bluffs may be susceptible to mass wasting events.

Disadvantaged Communities

Based on the analysis shown in Figure 3.55 and overlaying the Overall SVI census track dataset, there is one disadvantaged community in Somerset County hosting a public road-landslide intersection, suggesting that this community may face a higher likelihood of exposure to mass wasting. However, all rural communities are likely at greater risk given the potential impacts of mass wasting on public road infrastructure and transportation systems. Rural communities typically need to travel further to access critical services and depend heavily on safe and dependable roads. Road closures caused by mass wasting would lead to establishment of long-term detours until debris is removed and the road is repaired. In some cases, these detours can add a significant travel time to commuters, leading to potential economic and job security issues.

3.61.2 Community Lifeline Risks

Similar to erosion, mass wasting can impact transportation needs, which may hinder the ability of emergency responders to access the impacted area and impact access to critical medical, food, and shelter services.

3.61.3 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Potential dollar losses to jurisdictions based on road exposure may exceed $51 million dollars in total. However, a single mass wasting event will generally be localized to within a mile of road length or less. In this case losses may be closer to $1.5 to $2 million. Refer to the section Erosion – Vulnerability of Jurisdictions for guidance on bluff mass wasting.

Earthquake – Hazard Profile

TIER 1 HAZARD

3.62 Earthquake – General Definition and Types of Events [S3.a., S3.b.]

A sudden motion or trembling caused by a release of strain accumulated within or along the edge of earth's tectonic plates. This complex motion is caused by a sudden shifting or breaking of subsurface rock to relieve built up stress. The energy released at the center produces a variety of seismic waves that travel out in all directions through the surrounding rock. Some of these waves make their way to the surface and travel out across the countryside.

3.62.1 Tectonic Earthquake

The result of the earth's crust breaking due to geological forces on rocks and adjoining plates that cause physical and chemical changes.

3.62.2 Explosive Earthquake

The result of the detonation of a nuclear and/or chemical device.

3.62.3 Collapse Earthquake

A small earthquake(s) in underground caverns and mines caused by seismic waves produced from the explosion of rock on the surface

3.62.4 Volcanic Earthquake

A result of tectonic forces which occur in conjunction with volcanic activity.

3.62.5 Cryoseism/Snow Quakes

While not a storm, this is an occasional winter phenomenon, usually occurring in January or February, when a very localized section of earth suddenly freezes. Since it most often happens during the coldest hours of the day – between midnight and dawn – the sudden shaking, and/or noise, can be very startling.

3.63 Earthquake – Location of Hazard [S3.a.1]

Earthquakes have been reported from all 16 counties in Maine, thereby indicating some level of statewide exposure, with a somewhat higher activity in the eastern, central, and southern parts of the state. As indicated on Figure 3.59, the three areas of most seismic activity in Maine are in northwestern Aroostook and a region spanning form central to southern Maine [57, 58].

Seismic activity in Maine is typical of the Appalachian region of Northeastern North America where there is a slow but steady rate of earthquake occurrence. The earthquakes are presumably caused by modern stress being released occasionally along zones of weakness in the earth's crust, but a more specific cause for the earthquake activity is not known. Recorded earthquake locations and detailed seismic motion studies do not show any clear correlation with either local or regional geologic features.

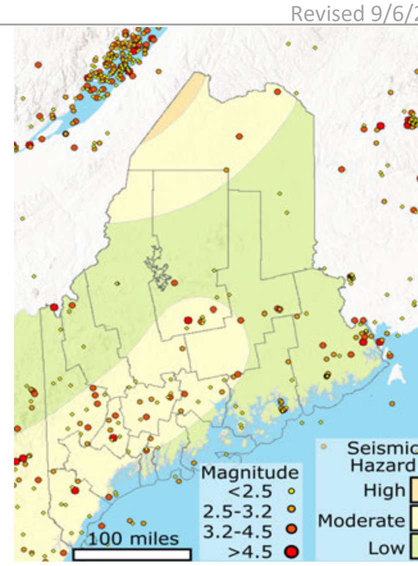

Figure 3.59: 2014 USGS Seismic Hazard Map and earthquake occurrence for Maine and region (1800-2022).

3.64 Earthquake – Intensity and Previous Occurrences [S3.a.2.]

Geologists use the Richter Scale to measure the strength, or magnitude, of an earthquake at its epicenter. However, geologists use the term 'intensity' to measure the extent of an earthquake at a given location and use the Mercalli Intensity Scale to measure intensity (Table 3.46).

Table 3.46: Richter Scale and Mercalli Intensity Scale [59]

Magnitude	Mercalli Intensity	Average Effects
1	I	Microearthquakes not felt.
2	I	Minor earthquakes felt slightly by some people.
3	II to III	Minor earthquake often felt by people but rarely causes damage.
4	IV to V	Light earthquake with noticeable shaking of indoor objects but little damage.
5	VI to VII	Moderate earthquake felt by everyone and can damage poorly constructed buildings.
6	VII to IX	Strong earthquake that can cause damage to well-constructed buildings.
7	VIII or greater	Damages most buildings, some of which partially or completely collapse.
8	VIII or greater	Major damage to buildings. Structures likely to be destroyed.
9	VIII or greater	Permanent changes in ground topography. Severe damage or collapse to all buildings.

[57] USGS Long Term National Seismic Hazard Map: https://www.usgs.gov/programs/earthquake-hazards/hazards
[58] USGS Earthquake Database search: https://earthquake.usgs.gov/earthquakes/search/
[59] Source: https://earthquake.usgs.gov/learn/topics/mag_vs_int.php

3.64.1 Previous Occurrences

Volcanic earthquakes play an enormous part in Maine's geological history, although there has not been an active volcano in Maine for approximately 420 million years. Currently, a tectonic earthquake is considered the most likely of earthquake events while still considered as a low likelihood event. Explosive earthquakes and collapse earthquakes could occur as the result of a human-induced event but are not likely to occur as a natural hazard in the State of Maine.

No significant amount of motion has been shown for any fault since the last Ice Age about 20,000 years ago, and geologic evidence demonstrates that many faults have been inactive since the formation of the Appalachians, over 300,000,000 years ago. None of the ancient faults in Maine have been identified as active.

As of this update, the largest earthquake recorded in Maine since 1747 was near Eastport in 1904 with an estimated intensity of VII. The largest accurate measurement was in 1973 just on the Quebec side of the border from Oxford County, with a magnitude 4.8.

Earthquakes have been reported from all counties in Maine, thereby indicating some level of statewide exposure, with a somewhat higher activity in the eastern, central, and southern parts of the state (Table 3.47).

Table 3.47: Earthquakes with magnitude 3 or greater in Maine and surrounding area.

Date	Place (County)	Intensity	Magnitude	Comments
1755	Cape Ann, Massachusetts	VIII	6.0	Toppled chimneys in Boston.
1857	Lewiston (Androscoggin)	VI	5.0 – 5.9	
1869	Passamaquoddy Bay (Washington)	VI	5.0 – 5.9	
1904	Eastport (Washington)	VII	*5.0 – 5.9*	Maine's largest earthquake.
1905	Sabattus (Androscoggin)	VI	5.0 – 5.9	
1912	Eastport (Washington)	VI	5.0 – 5.9	
1918	Bridgton/Norway (Cumberland/Oxford)	VI	5.0 – 5.9	
1925	La Malbaie, Quebec	IX	6.4-6.6?	90 miles from Quebec City. Damaged some types of stone and brick walls over 100 miles away.
1928	Milo (Piscataquis)	VI	5.0 – 5.9	
1935	Temiscaming, Quebec	VII	6.2	
1940	Ossipee, NH (2 events)	VII	5.5 & 5.5	Some chimneys in Augusta cracked.
1949	Houghton (Piscataquis)	VI	5.0 – 5.9	
1957	Portland (Cumberland)	VI	5.0 – 5.9	
1973	Bowmantown Twp. (Oxford)	VI	5.0 – 5.0	
1979	Bath	V	4.0	
1982	Miramichi, N.B.	VII	5.7	Felt across Maine.
1983	Dixfield	V	3.9	
1984	Machias	IV	3.8	
1988	Albion	IV	4.0	
1988	Chicoutimi, Quebec	VIII	6.0	Felt in New York City. Largest in Eastern North America since 1935.
1994	Springfield		3.9	
1997	Wilton		3.0	
1997	Quebec City	VII	5.1	Felt across Maine.
1999	Waterville		3.7	
1999	Newport-Etna area		3.0	
2000	Turner-Livermore area		3.4	
2000	Rumford		3.4	
2000	Waterville		3.2	
2001	Howland		3.3	
2002	Near Plattsburgh, N.Y.		5.3	
2005	Pembroke		3.5	
2005	Northeast of Quebec City		5.4	
2006	Portage		3.8	
2006	East of Cadillac Mountain, Mount Desert Island		3.4	
2006	East of Cadillac Mountain, Mount Desert Island		4.2	
2006	East of Cadillac Mountain, Mount Desert Island		3.1	
2010	Orrington-Bucksport area		3.0	
2010	Canada, about 35 miles north-northeast of Ottowa			Felt in southwestern Maine.
2012	Canada, near La Malbaie, Quebec		4.4	Felt in northernmost Maine.
2012	East Waterboro		4.5	
2016	Lubec		3.6	
2016	Vanceboro		3.3	
2017	Passamaquoddy bay, Eastport		3.3	
2020	Robbinston		3.0	
2022	Centerville		3.0	

The earthquake in Virginia in 2011 that damaged structures in DC, including the National Monument certainly heightened awareness of east coast earthquake possibilities. Source: Maine Geological Survey, USGS

To date, the worst earthquake in Maine history occurred in 1904 in Eastport (Washington County).

The Maine Geological Survey (MGS) provides advisory and interpretive information on earthquakes for planning and regulatory agencies. After an earthquake event, the MGS collects information from people in the area and through an earthquake questionnaire made available to the general public and to county emergency management agencies.

The New England Seismic Network, operated by USGS, maintains a network of seismic stations across New England that monitors, analyzes, and reports earthquake activity in Maine.

3.65 Earthquake – Probability of Future Occurrence

Based on 124 years' worth of data, the probability of a major earthquake (intensity VI or higher) occurring in Maine is about once every 11.5 years. However, the table above also shows that major earthquakes do not occur on a regular basis. They may come in clusters, as they did in the early 1900s, or "swarms" as they did in 2011, then skip several decades before occurring again. To date, there is no accurate way to predict when another major earthquake will occur in Maine.

Based on past earthquake data collected over a limited time span (1975-1982) from New England and assuming that Maine is a representative part, John Ebel, of Weston Observatory, has estimated the return times for earthquakes (Table 3.48).

Table 3.48: Return Times for Earthquakes of Different Magnitudes in Maine

Magnitude	4.6	5.0	5.5	6.0	6.5	7.0
Return Time (Years) (+/-) (20-30%)	24	52	138	363	955	2,512

NOTE: Sources for the above paragraphs: Henry Berry, Physical Geologist

3.65.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Seismic hazard is not anticipated to change in Maine within the next update cycle of this Plan.

Earthquake – Vulnerability Assessment

TIER 1 HAZARD

3.66 Earthquake – Impacts

Most Maine earthquakes are of small magnitude (less than 2.0 on the Richter scale) and are therefore too small to feel. No Maine earthquake has caused significant damage to date. The persistent activity, however, indicates that some crustal deformation is occurring and that a larger earthquake cannot be ruled out.

Most Maine buildings are not constructed to withstand the lateral motion of a significant earthquake (magnitude six or higher). Brick and masonry structures that have not been reinforced are especially prone to earthquake damage. Interestingly, the masonry structures that are more resilient against wildfire damage are more vulnerable to earthquakes.

Coastal and lakefront structures built on water-saturated, unconsolidated material such as artificial fill may be vulnerable to liquefaction in a severe earthquake (liquefaction is a loss of cohesion between particles due to lubrication by water during vibration causing a sudden loss of strength). Most death and injury during earthquakes result from people being struck or trapped by falling debris.

Other possible concerns in an earthquake emergency would be the disruption of infrastructure facilities, such as road access, gas and oil pipelines, sewer systems, electricity and water supplies, and the disruption of emergency services such as police, firefighting, ambulance, and hospital services.

With increased development, the likelihood of marked destruction escalates. Metropolitan areas encounter far more structural damage because of the density and design of urban buildings, especially multi-story structures.

The majority of infrastructure across the State of Maine is aging and unable to sustain the impact of a significant earthquake event. Should an event occur, there is a likelihood that significant damage would be incurred at a high cost to the affected area. Both public and private aging infrastructure remain vulnerable to damages associated with an earthquake event, however the cost of bringing an older facility up to code is usually excessive and unfeasible.

3.67 Earthquake – Vulnerability of State Assets [S5.]

3.67.1 Potential Dollar Losses to State owned buildings, infrastructure, critical facilities

USGS earthquake hazard assessments identify regions in Maine where there are low, moderate, and high potential for a seismic event. Building replacement costs for state assets potentially exposed to earthquakes located in moderate to high hazard areas equal $2.88 billion (2,742 total assets). The top 10 state assets, ordered by building replacement cost, are listed in Table 3.49. Many of these are located in the Capital District, where some of the most valuable state assets are located. The state asset with the greatest earthquake risk is the Maine State House, where the state legislature conducts business. Any potential damages to the State House would directly impact the ability of the state to conduct legislation. Maine Municipal Bond Bank and State Redevelopment Authorities would also be impacted by a damaging earthquake with many extended economic and development challenges for local communities. There is no guarantee that these assets will be damaged in a natural hazard event.

These assets are not expected to sustain 100% damages from a magnitude 5 or 6 earthquake, so total damages from a single seismic event are expected to be much less than the total valuation. Because the degree of damage is difficult to predict for an event that has never occurred in Maine, total building replacement values are reported as a measure of potential exposure for structures in moderate to high earthquake hazard areas (Table 3.50). Damage curves are not factored into this assessment. The total scope of state assets potentially exposed to seismic hazards, based on the USGS hazard map, are shown in Figure 3.57.

Table 3.49: Top 10 state assets located in moderate to high earthquake hazard area, ranked by building replacement cost.

Address	County	Occupancy	Property Type	Year Built	Last Inspected	Total	Agency
210 State St, Augusta	Kennebec	OFFICE	Class 4 building	1832	1/10/2003	$86,630,000	ADF, BUREAU OF GENERAL SERVICES ADMIN
1 Court St, Augusta	Kennebec	OFFICE	Class 4 building	2014	7/1/2017	$85,000,000	MMB, MAINE MUNICIPAL BOND BANK
78 Exchange St, Bangor	Penobscot	OFFICE	Class 4 building	2009	7/1/2017	$65,000,000	MMB, MAINE MUNICIPAL BOND BANK
2 Pegasus St, Brunswick	Cumberland	SHOP	Steel/masonry	2005	7/1/2014	$56,553,900	MRRA, MIDCOAST REGIONAL REDEVELOPMENT AUTHORITY
112 Orion St, Brunswick	Cumberland	SHOP	Steel/masonry	1982	2/15/2012	$55,628,960	MRRA, MIDCOAST REGIONAL REDEVELOPMENT AUTHORITY
250 Arsenal St, Augusta	Kennebec	MEDICAL FACILITY	Class 4 building	2004	7/1/2016	$52,875,000	DHS, RIVERVIEW PSYCHIATRIC CENTER
675 Westbrook St, South Portland	Cumberland	PRISON	Steel/masonry	2002	11/27/2018	$48,940,000	COR, LONGCREEK YOUTH DEVELOPMENT CENTER
74 Orion St, Brunswick	Cumberland	OFFICE	Steel/masonry	1956	9/27/2017	$46,310,000	MRRA, MIDCOAST REGIONAL REDEVELOPMENT AUTHORITY
54 Pleasant St, Castine	Hancock	DORMITORY	Steel/masonry	1970	7/1/2017	$42,744,000	MMA, MAINE MARITIME ACADEMY
111 Sewall St, Augusta	Kennebec	OFFICE	Steel/masonry	1955	6/30/2001	$41,395,380	ADF, BUREAU OF GENERAL SERVICES ADMIN

Table 3.50: Potential exposure of state assets to a seismic event. Building Replacement cost (Value) in millions USD 2022.

Region	Assets in moderate to high hazard area		
	Assets Count	Value	% of total value
State of Maine	2,742	$2,880.5	85.8%
Androscoggin	103	$131.9	100.0%
Aroostook	61	$9.8	3.4%
Cumberland	604	$628.2	100.0%
Franklin	92	$15.4	73.2%
Hancock	78	$180.3	89.2%
Kennebec	518	$990.5	100.0%
Knox	97	$155.5	95.2%
Lincoln	80	$44.1	100.0%
Oxford	94	$37.1	95.5%
Penobscot	288	$363.6	94.8%
Piscataquis	56	$18.4	57.3%
Sagadahoc	87	$28.3	100.0%
Somerset	142	$124.6	95.4%
Waldo	179	$46.7	100.0%
Washington	-	-	-
York	263	$105.9	100.0%

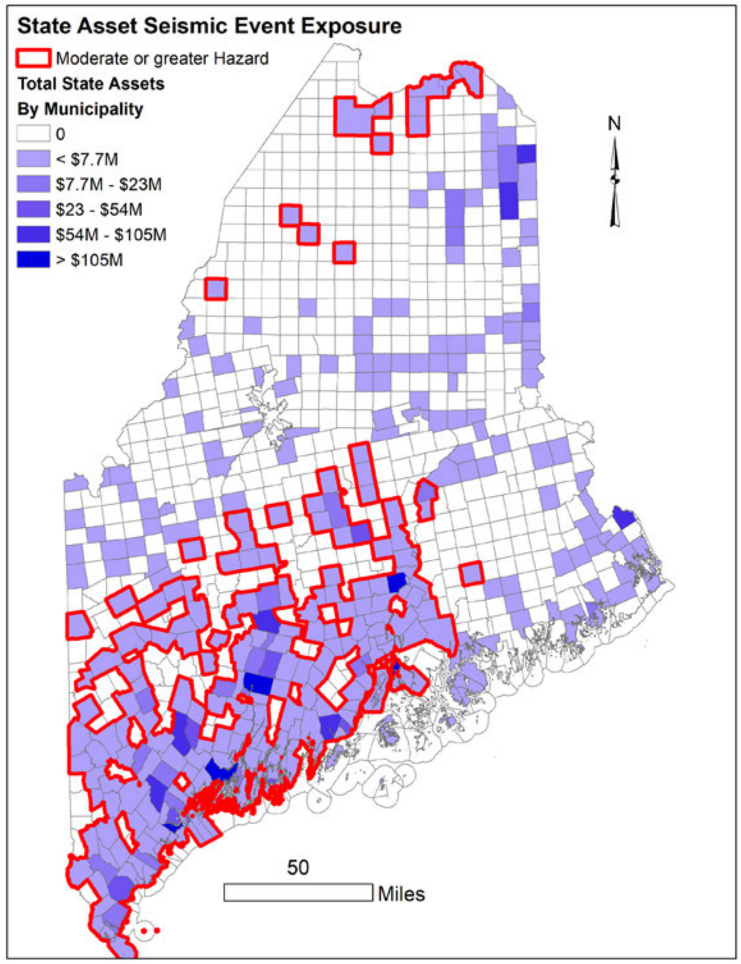

Figure 3.60: State assets exposed to moderate to high earthquake hazard.

3.67.2 Community Lifeline Risks

A major earthquake in Maine would likely impact all community lifelines but it is impossible to narrow down a specific location where the hazard may occur. The cities of Portland, Lewiston, and Bangor would likely have the greatest level of vulnerability due to the total population and infrastructure exposed to the hazard. As noted above, the Capital District in Augusta could be severely impacted by a damaging earthquake, limiting the ability to govern the state.

3.68 Earthquake – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

It is infeasible to accurately predict where future earthquakes will occur in Maine, though larger events are anticipated to impact broader areas that are more likely to occur in moderate to high hazard areas denoted by USGS. However, it is possible that an earthquake may occur anywhere in or directly adjacent to Maine, putting a greater importance on local building codes that potentially mitigate against seismic damages. The Maine Uniform Building and Energy Code (MUBEC) incorporates Seismic Codes into regulations for building construction in Maine communities with populations exceeding 4,000. Smaller communities have local authority to enact their own building codes and standards.

3.68.1 Identifying Jurisdictions with greatest vulnerability [S6.a.1.]

Disadvantaged Communities

The objective of the disadvantaged communities' assessment is to identify potential disadvantages felt by communities who are disproportionately impacted by natural hazards both historically and under future projections. Of the 19 disadvantaged communities in Maine, 7 are located in rural areas that are not regulated by MUBEC [60] and may not locally incorporate Seismic Codes (Figure 3.61). Another important consideration is that building codes are not retroactive; structures in MUBEC-regulated jurisdictions that predate the adopted building codes may not necessarily be brought up to the new standard. Figure 3.61 identifies the jurisdictions where MUBEC applies, and the disadvantaged communities located within and outside of these jurisdictions. Although Washington County is considered to have a low earthquake hazard exposure, the City of Eastport has witnessed multiple moderate-sized seismic events in the past, suggesting that exposure for disadvantaged communities in that area may be greater than these data suggest.

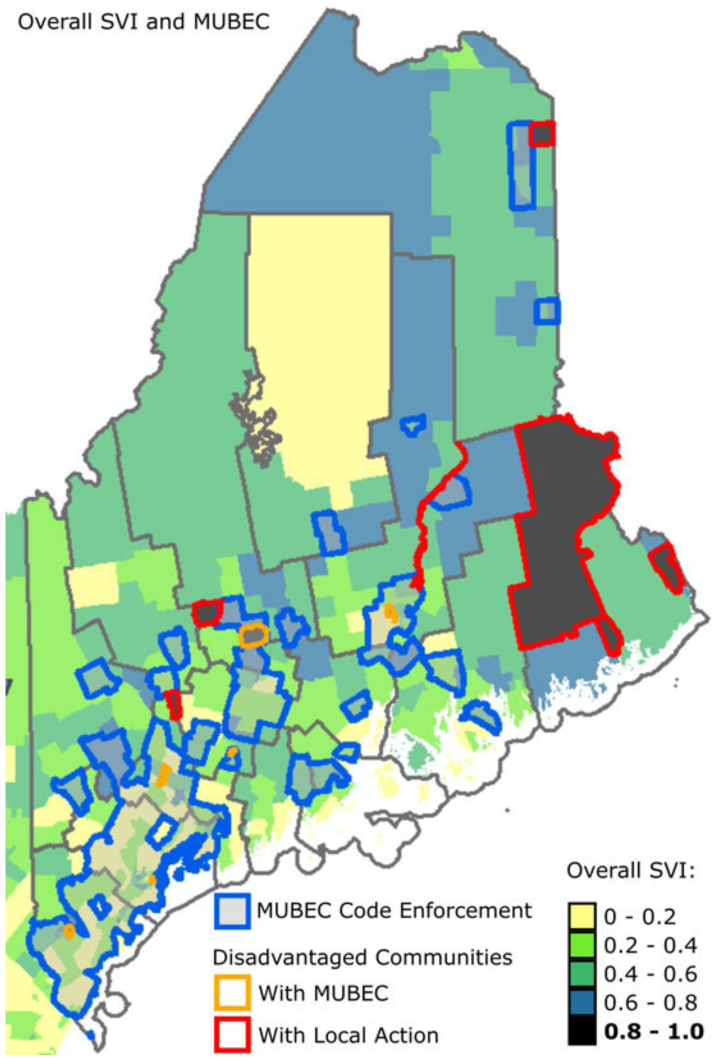

Figure 3.61: Map of Overall SVI, highlighting jurisdictions with and without MUBEC Code Enforcement

[60] Office of the State Fire Marshal, MUBEC: https://www.maine.gov/dps/fmo/building-codes

3.68.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Hazard-Asset Footprint Overlay Analysis

It is not expected that all buildings will suffer 100% losses from a magnitude 5 to 6 earthquake in Maine. Because the degree of damage is difficult to predict for an event that has never occurred in Maine, total building replacement values are reported as a measure of potential exposure for structures in moderate to high earthquake hazard areas. Damage curves are not factored into this assessment.

The total valuation for all identified structure assets in Maine is $329 Billion (2022 USD). There are $240 billion in assets identified within moderate to high earthquake hazard areas, though not all of these assets are necessarily vulnerable to damage from seismicity. Exposure estimates are further disseminated by county in Table 3.51.

Table 3.51: Potential earthquake exposure for all structure assets in moderate to high hazard areas (millions 2022 USD)

Region	**Assets in WUI**		
	Count	Value	% of total value
State of Maine	530,131	$239,692	72.76%
Androscoggin	40,678	$20,282	100.00%
Aroostook	9,185	$3,646	17.01%
Cumberland	104,437	$54,242	89.93%
Franklin	10,842	$4,724	55.36%
Hancock	3,100	$1,323	7.46%
Kennebec	65,768	$29,533	100.00%
Knox	3,342	$1,208	10.31%
Lincoln	9,212	$3,313	31.02%
Oxford	34,258	$13,864	86.38%
Penobscot	62,543	$29,334	83.10%
Piscataquis	12,460	$4,584	79.27%
Sagadahoc	11,237	$4,670	56.88%
Somerset	32,914	$13,947	88.15%
Waldo	23,082	$9,262	85.14%
Washington	-	-	-
York	107,073	$45,759	99.94%

Forest Pests – Hazard Profile

TIER 2 HAZARD

3.1 Forest Pests – General Definition and Types of Events [S3.a., S3.b.]

A Forest Pest/Damage Agent is an insect, disease, weed or other abiotic or biotic factor that can cause damage or death to a host tree. Some forest pests, such as the browntail moth[1], can cause damage to forests as well as pose direct health risks to humans. Damage Agents are categorized as: Insects, Diseases, Weeds, and Other Damage Agents. Within insects and diseases, the categories are broken out into the area of the tree damaged, or the type of damage inflicted on the tree; i.e., wood boring, gall makers, and foliage diseases. Weeds are divided by the habit of the weed species; e.g., tree, shrub, and vine. Other damage agents are divided into three sections by cause of the damage to the host tree: Abiotic Damage, Human Damage, and Animal Damage[2].

The Maine Forest Service maintains a Forest Pest Index including 87 different insects and diseases, each of which may target different tree species[3]. Not all of these forest pests are currently found in Maine, though based on growth trends many of these are expected to eventually enter the state. As a result, it can be challenging to generalize the impacts, location, intensity, and occurrence of each forest pest under a single Hazard Profile. The Maine Forest Service categorizes the impacts of forest pests as contributing to either chronic or acute stress. Several native and invasive species contribute to these types of forest stress.

3.1.1 Chronic Stress

Chronic stress is recurring and lasts for long periods of time. Longstanding stressors like white pine blister rust, balsam woolly adelgid, beech bark disease and others throughout the state as well as newer arrivals beech leaf disease and hemlock woolly adelgid in central and coastal counties are examples of stressors that lead to chronic impacts and frequently compound with other long-term hazards such as drought or other chronic forest pests.

3.1.2 Acute Stress

Acute stress imposes an immediate impact on a forest. Fast-acting agents such as emerald ash borer and native and introduced outbreak-prone defoliators such as spruce budworm, spongy moth and winter moth, damage forests and cause tree decline/mortality in a shorter time frame.

[1] Browntail moth: https://www.maine.gov/dacf/mfs/forest_health/invasive_threats/browntail_moth_info.htm
[2] Forest Pests of North America: https://www.forestpests.org/faq.cfm
[3] Maine Forest Pest Index: https://www.maine.gov/dacf/mfs/forest_health/forest_pest_index.html

3.2 Forest Pests – Location of Hazard [S3.a.1]

Forest pests are found in all parts of Maine. It is difficult to specify locations in general terms due to the abundance of forest pests and their variable distribution across the state. For this reason, we include examples of forest pests with known locations where spread has occurred.

3.2.1 Browntail Moth

Surveys from 2021 and 2022 indicate that browntail moth occurrence is most prevalent in central and midcoast Maine (Figure 3.63). Along the coast the greatest occurrence lies between Portland to the west and Penobscot Bay/Frenchman Bay in the east. Inland, the greatest occurrence lies between eastern Oxford County, through the Augusta area, encompassing the Bangor area to the east, and as far north as Lincoln. The web survey counts indicate that Androscoggin, Kennebec, Cumberland, Lincoln, Knox, and Waldo are the most impacted counties. Maine Forest Service provides a Browntail Moth dashboard providing updated occurrence information[4].

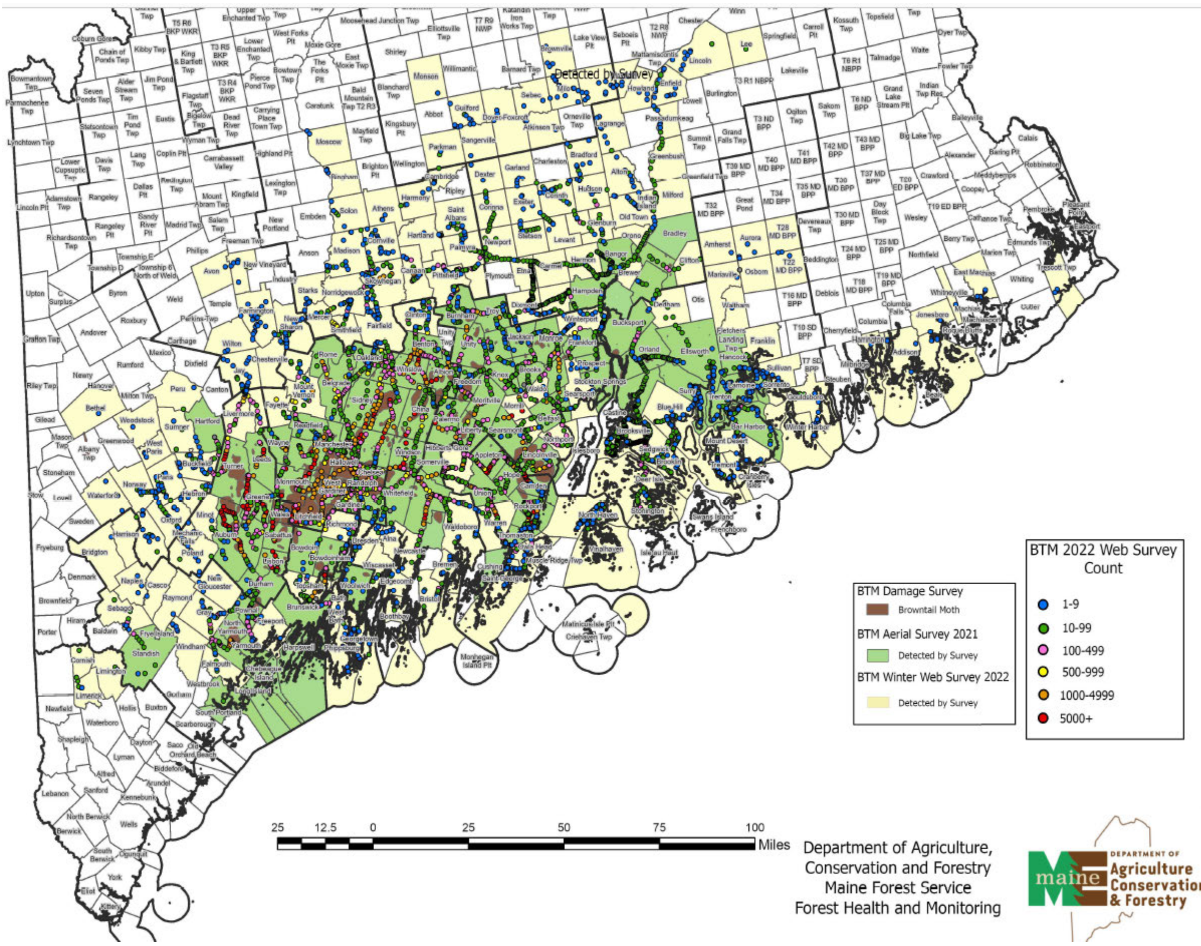

Figure 3.63: Browntail moth survey map data.

[4] Browntail Moth Dashboard: https://www.maine.gov/dacf/mfs/forest_health/forest_pest_index.html

3.2.2 Beech Leaf Disease

First reported in Ohio in 2012, beech leaf disease has been leading to decline and mortality of beech trees from Ohio to Southern New England. The first case in Maine was identified in Waldo County in May 2021, and is now found as far west as York County, as far east as Acadia National Park, Hancock County, and as far north as the Penobscot Experimental Forest (Figure 3.64). The disease may be established elsewhere, and efforts continue to determine disease distribution through survey and reports from the public.

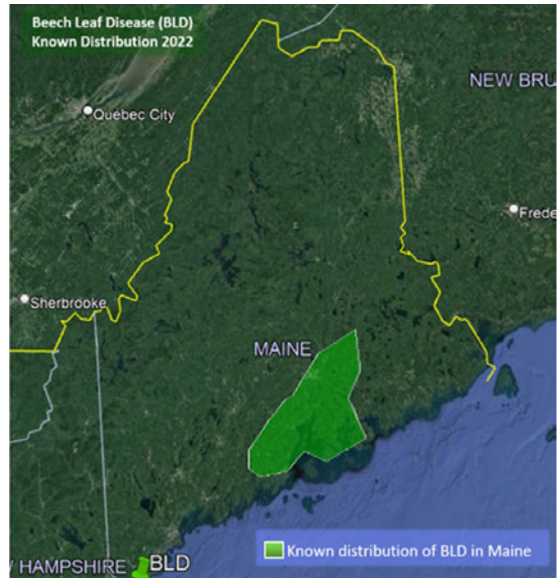

Figure 3.64: Beech Leaf Disease known distribution (2022).

3.2.3 Hemlock Wooly Adelgid

Hemlock Woolly Adelgid (Uh-**dell**-jid) is an introduced, aphid-like insect from Asia that attacks eastern hemlock. As of 2011, [eighteen states from Maine to Georgia have HWA][5]. Many infested areas display extensive tree decline and mortality. All species of hemlock are affected, but not pine, spruce, fir or other conifers. The most obvious sign is the covering of wool-like wax filaments produced as the insect matures. The woolly masses generally range from about 1/16-inch to 1/8-inch in diameter. They are most visible from late fall to early summer on the undersides of the outermost branch tips of hemlock trees.

In March 2020, the woolly adelgid quarantine area[6] in Maine was expanded to include 3 entire counties and 29 additional towns (Figure 3.65). The quarantine area for hemlock woolly adelgid in Maine includes parts or all of Androscoggin, Cumberland, Hancock, Kennebec, Knox, Lincoln, Sagadahoc, Waldo, and York Counties.

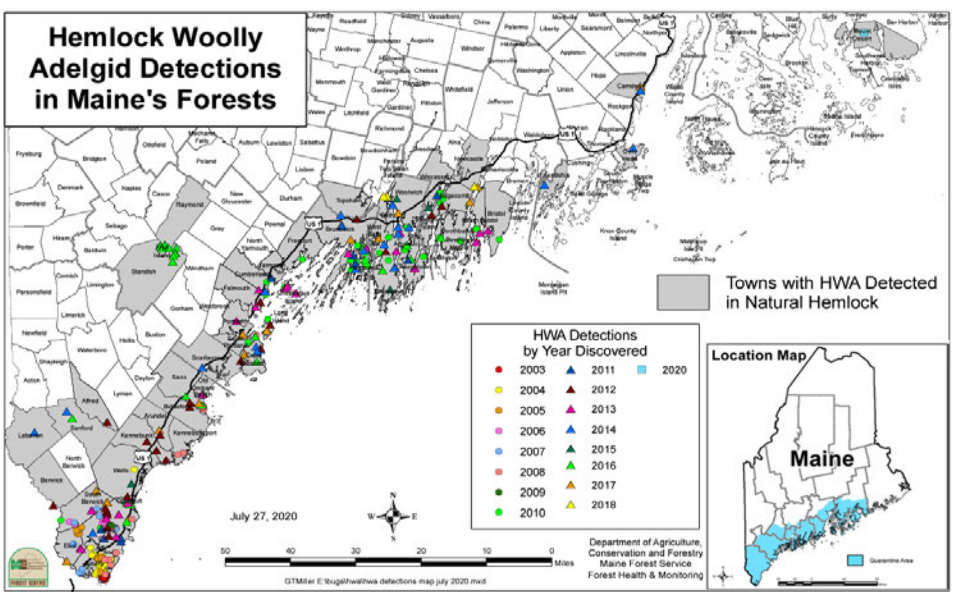

Figure 3.65: Hemlock Wooly Adelgid detection, 2003-2020. Blue in reference map indicates quarantine areas.

[5] Maine Forest Service, Hemlock Wooly Adelgid: https://www.maine.gov/dacf/mfs/forest_health/insects/hemlock_woolly_adelgid_overview.htm

[6] Maine Forest Service quarantine site: https://www.maine.gov/dacf/mfs/forest_health/quarantine_information.html

3.2.4 Emerald Ash Borer

The emerald ash borer (EAB), *Agrilus planipennis*, is one of the most serious invasive species threatening our ash resources and forests (Figure 3.66). All species of (*Fraxinus*) ash trees, but not (*Sorbus*) mountain ash, that grow in Maine are susceptible to injury and death by the emerald ash borer.

EAB was first found in Aroostook County (Madawaska, Frenchville, and Grand Isle), and York County (Acton, Berwick, and Lebanon), ME in 2018. It was detected in Cumberland County (Portland) in September 2019.

The quarantine area includes all of York County, all of Cumberland County, parts of Oxford, Kennebec, Sagadahoc, and Somerset Counties, and northern corner of Aroostook County. The quarantine boundaries were drawn to include a buffer on those towns where EAB had been detected. EAB was found in northern Aroostook County in May 2018, western York County in September 2018, and Cumberland County in September 2019.

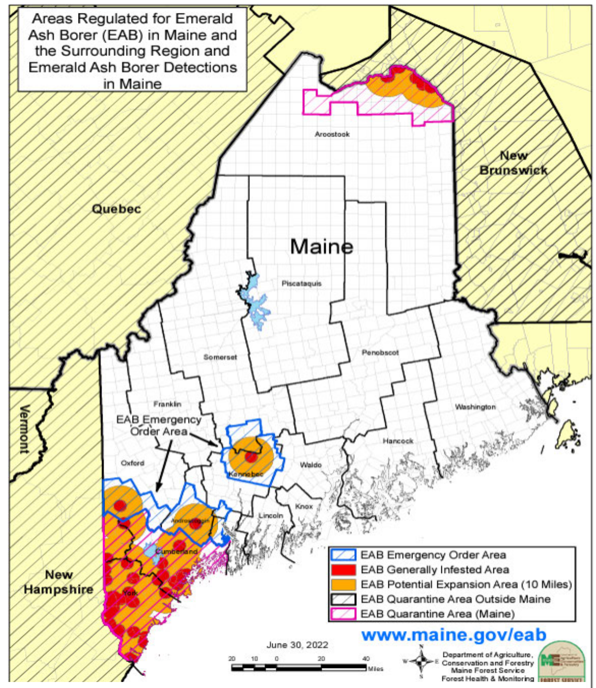

Figure 3.66: Emerald ash borer outbreak locations and quarantine orders (2022).

3.3 Forest Pests – Intensity and Previous Occurrences [S3.a.2]

The intensity of forest pest hazards is typically measured by the total area of tree damage. There is no standard scale for measuring the intensity of the hazard, but it is possible to compare the area of damage each year and identify trends. For example, the 2021 Maine Forest Health Highlights Report identified 262 thousand acres of tree/forest damage in Maine based on aerial surveys, exceeding the previous year's damage by 77 thousand acres (185 thousand in 2020)[7]. This is identified by the Maine Forest Service as a substantial increase. In addition to aerial survey results, a further 163 thousand acres of damage were identified through ground surveys, bringing the total damaged forest area to 425 thousand acres statewide, much of which takes the form of defoliation. Previous years exhibited smaller damage areas, including 14 thousand acres in 2019 and 145 thousand acres in 2018[8].

3.3.1 Previous Occurrences

Spruce Budworm Outbreak of the 1970s-80s

At its peak, the last SBW outbreak, which lasted from 1967 to 1993, covered about 136 million acres across eastern Canada and Maine[9]. The outbreak was severe and produced dead and dying stands of trees that could be seen on the horizons in some areas. This outbreak defoliated fir and spruce trees across most of the northern half of Maine, killed between 20 and 25 million cords of spruce and fir, and resulted in hundreds of millions of dollars in lost revenue to the state's forest-based economy. Efforts to protect the forest during this period launched a wave of aerial insecticide spraying across millions of acres, with the area sprayed exceeding a million acres per year at peak times during the outbreak. These protection efforts cost state and federal governments, as well as

[7] Maine Forest Health Conditions 2021: https://www.maine.gov/dacf/mfs/forest_health/documents/2021-maine-forest-health-highlights112321.pdf
[8] Maine Forest Health Conditions Highlights 2019: www.maine.gov/dacf/mfs/forest_health/documents/2019MaineForestHealthHighlightsForUSFS.pdf
[9] Maine Spruce Budworm Task Force: https://www.sprucebudwormmaine.org/historical-perspectivespast-infestations/1970s-80s-outbreak/

private landowners, many additional millions of dollars, and photos of budworm damaged fir trees in Maine resulted in conflicts over how the costs would be shared.

In addition to these immediate impacts, the SBW outbreak drastically changed forest structure and composition across northern Maine and had ripple effects on forest management, politics, public policy, and the forest-based economy over the next 40 years. For example, salvage logging to capture dead and dying trees caused landowners to increase the use of clearcut harvesting during the 1970s. These clearcuts had a large visual impact on the forest landscape, which caused substantial public controversy. This controversy led to the passage of the 1989 Forest Practices Act (FPA), which defined and heavily regulated clearcut harvesting. Efforts by landowners to reduce the use of clearcutting after implementation of the FPA were very successful. Clearcutting as a proportion of forest harvesting fell from 45% in 1989 to less than 8% by 1996 and has hovered between 2% and 6% every year since that time.

3.4 Forest Pests – Probability of Future Occurrence [S4.]

An almost invisible war takes place each year between Maine's forest and insects and diseases. Occasionally, insects or disease get the upper hand and either forests or people are affected to the point where action must take place. Native pests, while at times expensive to deal with like the Spruce budworm, don't eliminate the host species like balsam fir which the budworm feeds on heavily. Exotic pests are a different story, for example, Chestnut Blight and Dutch Elm Disease eliminating the host species of American Chestnut and American Elm as significant components of the forest [10].

Spruce Budworm

As noted by State Entomologist Allison Kanoti [11], the Maine Forest Service (MFS) and its cooperators are closely watching spruce budworm in Maine to monitor and prepare for another epidemic of this native defoliator. Over the last several years, Spruce budworm populations in Maine have left the "stable" phase and appear to be building. Pheromone and light trap catches have been above zero for a number of years, defoliation in Quebec has increased year after year, defoliation has been mapped in New Brunswick. This is an insect whose epidemics cover vast regions and flights of moths from heavily infested areas can migrate to new areas. Another outbreak in Maine, soon, is undeniable. When, where, how severe, and what the specific impacts and reactions will be, remain to be seen.

3.4.2 Projected Changes in Hazard location, Intensity, Frequency, and Duration

Introduction/spread of invasive forest pests

Increasing world trade is intensifying the opportunity for invasive pests to become established in North America. We have several invasive insects right now either active in Maine's forests or just "next door." The Hemlock Woolly Adelgid is causing damage to our coastal hemlocks while the very lethal Emerald Ash Borer has footholds in both far northern and far southern Maine; the Asian Longhorned Beetle is being fought in Worcester, Massachusetts and Oak Wilt is being addressed in several places in New York. The MFS is actively engaged in reducing the threats from pests using a number of different strategies. For those not having reached Maine, like the Asian longhorned beetle, efforts continue to slow its spread by restricting the flow of contaminated wood. For others like the Hemlock Woolly Adelgid, damage is mitigated through efforts such as the release of biological

[10] Message from the State Forester: https://www.maine.gov/dacf/mfs/forester/index.htm

[11] Maine Forest Service Spruce Budworm Report, 2019: www.sprucebudwormmaine.org/wp-content/uploads/2019/06/MFS_2018_SpruceBudwormMaineReport.pdf

agents. Fortunately, the federal government is very active and lends significant assistance to states like Maine. In all cases, the involvement of the public is absolutely essential [12].

Climate Change
As noted by Quirion et al. (2021) [13], both native and non-native insects and diseases are expected to exhibit increased impacts in response to climate change. Introduced and native insects and diseases can act solely or collectively with other forest stressors to damage or kill large numbers of trees in short periods of time, reducing a forest's capacity to sequester C as well as increasing emissions of stored C through decomposition of wood in dead or injured trees [14], [15], [16]. Historically, native and introduced forest insects and diseases have impacted an average of 20.4 million hectares, or approximately 15% of the US's total forest cover, annually [17]. An estimated 41% of the live forest biomass in the contiguous US could be impacted by the fifteen most damaging non-native insects and diseases already established in the US [18].

In general, climate projections favor many, but not all, forest insects and diseases, with a mixed effect on forest stressors. For example, the current expansion of browntail moth appears to have been aided by warm late-summer temperatures during the early instar caterpillar stage of the insect. Conversely, spruce budworm is also a young caterpillar in late-summer, and warm temperatures at that time make it less likely to survive overwinter.

[12] Message from the State Forester: https://www.maine.gov/dacf/mfs/forester/index.htm

[13] Quirion, B. R., Domke, G. M., Walters, B. F., Lovett, G. M., Fargione, J. E., Greenwood, L., ... & Fei, S. (2021). Insect and disease disturbances correlate with reduced carbon sequestration in forests of the contiguous United States. *Frontiers in Forests and Global Change*, *4*. https://doi.org/10.3389/ffgc.2021.716582

[14] Ellison, A. M., Bank, M. S., Clinton, B. D., Colburn, E. A., Elliott, K., Ford, C. R., et al. (2005). Loss of foundation species: consequences for the structure and dynamics of forested ecosystems. *Front. Ecol. Environ* 3, 479–486. doi: 10.2307/3868635

[15] Hicke, J. A., Allen, C. D., Desai, A. R., Dietze, M. C., Hall, R. J., Hogg, E. H. T., et al. (2012). Effects of biotic disturbances on forest carbon cycling in the United States and Canada. *Glob. Chang. Biol.* 18, 7–34. doi: 10.1111/j.1365-2486.2011.02543.x

[16] Lovett, G. M., Weiss, M., Liebhold, A. M., Holmes, T. P., Leung, B., Lambert, K. F., et al. (2016). Nonnative forest insects and pathogens in the United States: impacts and policy options. *Ecol. Appl.* 26, 1437–1455. doi: 10.1890/15-1176

[17] Dale, V. H., Joyce, L. A., McNulty, S., Neilson, R. P., Ayres, M. P., Flannigan, M. D., et al. (2001). Climate change and forest disturbances. *Bioscience* 51, 723–734.

[18] Fei, S., Morin, R. S., Oswalt, C. M., and Liebhold, A. M. (2019). Biomass losses resulting from insect and disease invasions in US forests. *Proc. Natl. Acad. Sci. U. S. A.* 116, 17371–17376. doi: 10.1073/pnas.1820601116

Forest Pests – Vulnerability Assessment

TIER 2 HAZARD

3.5 Forest Pests – Impacts

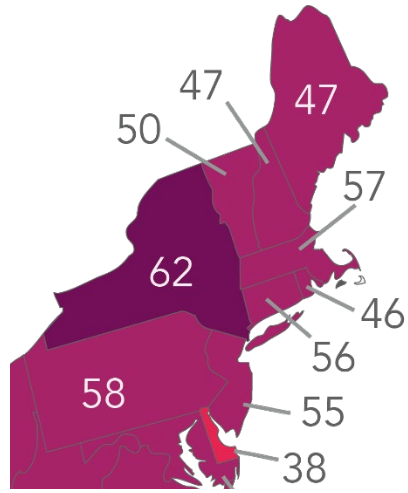

Figure 3.67: Imported forest pests occur in every state in the US. Map credit: Cary Institute/Leslie Tumblety https://www.caryinstitute.org/science/tree-smart-trade/tree-smart-trade-resources

Maine now hosts several invasive insects with several more advancing toward the state (Figure 3.67). The Hemlock Woolly Adelgid is causing damage to our coastal hemlocks while the very lethal Emerald Ash Borer has footholds in both far northern and far southern Maine; the Asian Longhorned Beetle is being fought in Worcester, Massachusetts and Oak Wilt is being addressed in several places in New York. The MFS is actively engaged in reducing the threats from pests using a number of different strategies. For those not having reached Maine, like the Asian longhorned beetle, efforts continue to slow its spread by restricting the flow of contaminated wood. For others like the Hemlock Woolly Adelgid, damage is mitigated through efforts such as the release of biological agents. Fortunately, the federal government is very active and lends significant assistance to states like Maine. In all cases, the involvement of the public is absolutely essential.

The impacts of forest pests include but are not limited to ecosystem damage, negative impacts to forest resource and tourism economies, impacts to state protected lands such as state parks in forested areas, health risks, increased wildfire vulnerability due to greater available fuels, increased vulnerability to erosion and mass wasting due to loss of root structures holding soil in place, and loss of a cultural identity in a heavily forested state.

3.6 Forest Pests – Vulnerability of State Assets [S5.]

State forests, parks, and other conserved lands are likely the most directly vulnerable of all state assets to forest pests. Impacts may include direct declines in forest health and indirect impacts to visitation and the tourism economy (especially for pests such as browntail moth). Table 3.52 and Figure 3.68 indicate the current expanse of three four pests (emerald ash borer, hemlock woody adelgid, browntail moth, beech leaf disease) overlain on conserved lands for local, private, state, and federal jurisdiction. Browntail moth expanse is provided based on greater relative occurrence, as its impacts are felt to varying degree across most of the state.

Table 3.52: Total number of conserved lands by interest type located in counties with some reported exposure to forest pests*. Percentages denote proportion of statewide conserved lands per interest type.

Region/exposure area	State	Municipal	Federal	Private/Other
State	3,176	2,101	1,804	4,850
Browntail Moth	2,060 (64.9%)	1,657 (78.9%)	755 (41.9%)	3,279 (67.6%)
Hemlock Wooly Adelgid	1,497 (47.1%)	1,496 (71.2%	1,016 (56.3%)	3,212 (66.2%)
Emerald Ash Borer	1,304 (41.1%)	1,419 (67.5%)	841 (46.6%)	2,286 (47.1%)
Beech Leaf Disease	815 (25.7%)	551 (26.2%)	438 (24.3%)	1,646 (33.9%)

*Not all portions of each county are currently exposed to these forest pests. Total browntail moth exposure is greater than reported in these "higher impact" counties.

Conserved lands contribute to Maine's economy. In 2021, Maine's State Parks and Historic Sites drew a record of 3.3 million visitors, surpassing the prior visitor record of 3 million in 2020. These visitors and their activities contribute an estimated $100 million to the state's economy[19]. Further, a new National Park Service report shows that visitors to national parks in Maine spent $490 million in 2021. The total of 4.1 million visits supported 7,070 jobs and had a cumulative economic output of $770 million[20]. Damage/impacts by forest pests would likely reduce visitation and bring down economic output on local to regional levels.

The forest products industry also contributes an estimated $276 million in state and local taxes[21]. Any impact to productivity and/or forest land value caused by large-scale forest pest activity (such as spruce budworm outbreaks) may impact tax contributions to state and local government. There is no guarantee that these assets will be damaged in a natural hazard event.

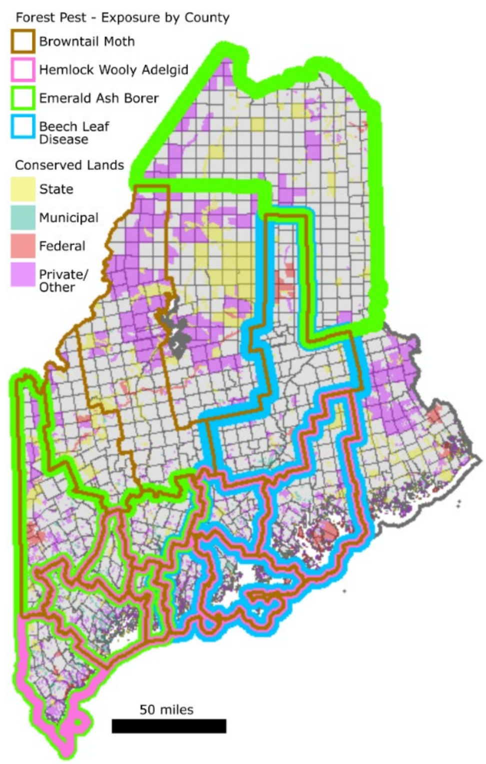

Figure 3.68: Forest pest exposure by county, with conserved lands.

[19] Maintain Maine State parks report: https://www.maine.gov/jobsplan/program/maintain-maine-state-parks

[20] National Park visitation: https://www.nps.gov/subjects/socialscience/vse.htm

[21] Maine Forest Products Council 2019 Forest Products Economic Impact: Revised November 2021: https://maineforest.org/wp-content/uploads/2022/08/2019-FP-Impact-Final-to-MFPC-Revised-Nov-2021.pdf

3.6.1 Potential Dollar Losses to State Owned Buildings, Infrastructure, Critical Facilities

As noted above, forest pests may impact the economic benefits of conserved lands as well as the tax value of forest land across the entire state. Direct impacts to state owned buildings and infrastructure are more challenging to determine at this time but are likely to be secondary to the direct impacts to forests.

3.6.2 Community Lifeline Risks

Maine Forest Service will continue to monitor the impacts of forest pests and work collaboratively with MEMA to determine risks to community lifelines.

3.7 Forest Pests – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

3.7.1 Identifying Jurisdictions with Greatest Vulnerability [S6.a.1.]

Jurisdictions that rely on forest resources will be directly impacted by the spread of forest pests in Maine. An assessment by the Cary Institute[22] identifies that local governments and homeowners will likely bear the brunt of economic impacts (Figure 3.69).

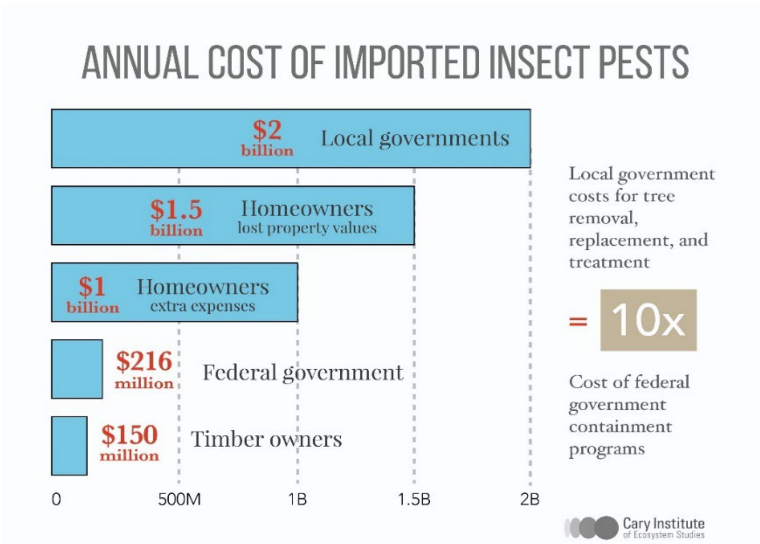

Figure 3.69: Annual average cost of forest pests for different entities. https://www.caryinstitute.org/science/tree-smart-trade/tree-smart-trade-resources

Disadvantaged Communities

Economically disadvantaged rural communities will likely see the greatest impacts, economic or otherwise, of forest pests. Exposure in these jurisdictions is anticipated to be greater due to proximity in the Wildland Urban Interface, traditional reliance on a forest resource-based economy, and their capacity to mitigate against this and related issues is overall far less than wealthier jurisdictions.

3.7.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

Maine's forest products sector includes (but is not limited to) businesses, organizations, and individuals involved with logging and forestry, paper and related product manufacturing, sawmills and wood-product manufacturing, wood furniture manufacturing, the generation of biomass electricity, and the Maine Forest Service. The estimated overall annual (2019) economic contribution of Maine's forest products sector, including multiplier effects, was an estimated $8.1 billion in output, over 31,000 jobs, and $1.7 billion in labor income. The total employment impact of 31,822 jobs in 2019 is equivalent to about 4 percent of the jobs in Maine. Put another way, roughly 1 out of 25 jobs in Maine is associated with the forest products sector. Maine's forest products sector had a total, including multiplier effects, value-added impact of an estimated $2.8 billion. This is equivalent to 4.14 percent of the state's gross domestic product in 2019[23].

[22] Cary Institute, Tree-SMART Trade Resources: https://www.caryinstitute.org/science/tree-smart-trade/tree-smart-trade-resources

[23] Maine Forest Products Council 2019 Forest Products Economic Impact: Revised November 2021: https://maineforest.org/wp-content/uploads/2022/08/2019-FP-Impact-Final-to-MFPC-Revised-Nov-2021.pdf

Harmful Algal Blooms – Hazard Profile

TIER 2 HAZARD

3.8 Harmful Algal Blooms – General Definition and Types of Events [S3.a., S3.b.]

Harmful Algal Blooms (HABs) occur when algae – simple plants that live in the sea and freshwater – grow rapidly and produce toxic or harmful effects on people and aquatic organisms [24]. Human illnesses caused by HABs, though rare, can be debilitating or even fatal. Other algae are nontoxic but may cause hypoxia in the water as they decay [25], clog the gills of fish and invertebrates, smother aquatic vegetation, or contaminate drinking water.

HABs generally occur in summer months though there are some algal species that may also spread in winter. More comprehensive HAB-related preparedness and health risk mitigation considerations are detailed in other planning efforts provided by the Maine Department of Marine Resources [26] and Maine Department of Environmental Protection [27].

Every U.S. coastal and Great Lakes state experiences HABs. These blooms are a national concern because they affect not only the health of people and marine ecosystems, but also the "health" of our economy — including communities along the coast and in lake regions dependent on the income of jobs generated through fishing and tourism. In Maine, HABs typically occur between April and October, but some species have also recently come out of seasonal dormancy and bloomed in winter months [28].

3.8.1 *Marine HABs*

The Maine Department of Marine Resources (DMR) Public Health Bureau tests coastal shellfish areas for biotoxins bi-weekly beginning in March, changing to weekly testing from May to October, or later when necessary. Precautionary regional closures along the coast are implemented annually starting in May when the likelihood of biotoxin blooms increases with the temperature. With climate change and increasing nutrient pollution potentially causing HABs to occur more often and in locations not previously affected [29], it's important for us to learn as much as we can about how and why they form and where they are, so that we can reduce their harmful effects.

Biotoxin closures of shellfish areas occur because conditions in the water make shellfish unsafe for human consumption. Maine DMR Public Health Bureau monitors several biotoxins produced by different types of marine algae known as phytoplankton. The types of phytoplankton include: *Alexandrium* ("Red Tide"), which produces the toxins that causes Paralytic Shellfish Poisoning; *Pseudo-nitzschia*, which produces the toxin that causes Amnesic Shellfish Poisoning; and *Dinophysis* and *Prorocentrum lima*, which produce the toxins that cause Diarrhetic Shellfish Poisoning. It's normal for biotoxin-producing algae to be present in marine water. They are usually at very low concentrations and pose no problems. Toxic shellfish can be found in clear, clean, and remote waters off the coast of Maine. Toxic shellfish do not look or taste any different from non-toxic shellfish and toxins cannot be cooked out. Visit Maine DMR's shellfish closures inventory [30] to find out whether it is safe to harvest

[24] NOAA, "What is a harmful algal bloom?": https://www.noaa.gov/what-is-harmful-algal-bloom
[25] NOAA, "Hypoxia": https://oceanservice.noaa.gov/hazards/hypoxia/
[26] Maine DMR Bureau of Public health Programs: https://www.maine.gov/dmr/fisheries/shellfish/bureau-of-public-health-programs
[27] Maine DEP Cyanobacteria webpage: https://www.maine.gov/dep/water/lakes/cyanobacteria.html
[28] Maine DMR, "Biotoxins in Maine": https://www.maine.gov/dmr/fisheries/shellfish/bureau-of-public-health-programs/biotoxins-in-maine
[29] EPA, "Climate change and harmful algal blooms": https://www.epa.gov/nutrientpollution/climate-change-and-harmful-algal-blooms
[30] Maine DMR Growing Area Closures: https://www.maine.gov/dmr/fisheries/shellfish/closures

in a specific area. Bacterial closure information which is caused by pollution instead of biotoxins is also located on the same webpage.

Additionally, DMR monitors visible marine algal blooms, considered "nuisance blooms", through aerial surveillance and water sampling with accompanying light microscopy identification. Though the nuisance bloom algal species do not pose a human health risk they may cause marine organism die-off. Notable temporal and spatial nuisance bloom events are communicated to the public but do not lead to bivalve shellfish closures.

3.8.2 *Freshwater HABs*

Most freshwater HABs are caused by a type of bacteria called cyanobacteria. Under certain conditions, the cyanobacteria can quickly multiply, and many species of the bacteria can produce toxins that can cause rashes, nausea, diarrhea, and in severe cases death. Maine DEP has created several Water Programs that help to mitigate risks associated with freshwater HABs[31], therefore we provide only a brief summary of this hazard. Maine DEP's monitoring program primarily tracks blooms that reduce the transparency of the water to less than 2 meters. Blooms not only turn the water murky, but they can also cause bad odors (musty or fishy smell), green or blue-green scums or streaks near-shore, and foam[32]. Since 2008, DEP has been measuring concentrations of microcystins (toxins produced by some freshwater cyanobacteria) in lakes that regularly support algal blooms and in lakes considered free of blooms. By sampling a variety of great ponds with surface areas of 150 acres or more, biologists are confident that we are establishing a dataset that will characterize all Maine lakes and provide insight on how toxin concentrations compare to EPA's guidelines. In addition, these data will form the basis for how the State of Maine's Department of Health and Human Services, Center for Disease Control will create an advisory specific to our lakes.

3.9 Harmful Algal Blooms – Location of Hazard [S3.a.1.]

HABs include multiple different algal species that exist in either freshwater or marine environments. Marine HABs of all observed types and extents may occur across the entire coast of Maine. Refer to Maine DMR's Shellfish Closure and Aquaculture Leases interactive map for real-time information on closures[33]. Numerous coastal municipalities enforce shellfish ordinances, in part to assist with managing shellfish closure orders[34].

Freshwater HABs tend to occur in lakes beneath the Marine Transgression, an area that was depressed below sea level due to substantial ice overburden during the Last Glacial Maximum of the Laurentide Ice Sheet and subsequent melting[35]. Clays deposited by the marine transgression provide greater availability of nutrients required for growth of HABs. However, there are a number of exceptions to this trend, especially in northern Maine. Visit DEP's Algal Bloom Risk map for more information on impacted locations and bloom frequency for lakes[36]. There are currently 6 lakes at very high risk (annual bloom likely) and 27 lakes at high risk (will likely bloom again) of HABs, based on current information.

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[31] Maine DEP Water Programs: https://www.maine.gov/dep/water/programs/index.html

[32] Maine DEP, "Cyanobacteria": https://www.maine.gov/dep/water/lakes/cyanobacteria.html

[33] DMR Shellfish Closures Map: https://www.maine.gov/dmr/fisheries/shellfish/shellfish-closures-and-aquaculture-leases-map

[34] General Shellfish Ordinance Information: https://www.maine.gov/dmr/fisheries/shellfish/municipal-shellfish-management-program/general-shellfish-ordinance-information

[35] Joseph T. Kelley, Daniel F. Belknap, R.Craig Shipp, Sedimentary framework of the southern Maine inner continental shelf: Influence of glaciation and sea-level change, Marine Geology, Volume 90, Issues 1–2, 1989, Pages 139-147, doi.org/10.1016/0025-3227(89)90124-2.

[36] Dep Algal Bloom Risk Map: https://www.maine.gov/dep/water/lakes/bloomriskmap.html

3.10 Harmful Algal Blooms – Intensity and Previous Occurrences [S3.a.2.]

As noted by Record et al. (2022)[37], Maine has a rapidly growing shellfish aquaculture industry with careful toxin monitoring. Paralytic shellfish toxins are sampled in shellfish tissue weekly at multiple sites by DMR during the bloom season and are processed by Bigelow Analytical Services. The toxin testing dataset dates back to 2014 and follows a chemical analytical technique that uses high-performance liquid chromatography approved for regulatory purposes (Rourke et al., 2008), generating information on 12 congeners of saxitoxin that contribute to a total toxicity value for each sample (μg SAX eq 100 g-1 shellfish). The toxin level used to initiate shellfish growing area closures is ≥80 μg SAX eq 100 g-1 shellfish. The Interstate Shellfish Sanitation Conference provides the National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish and threshold values for managing outbreaks and mitigating against health issues[38].

As noted by DEP[39], most Freshwater HABs in Maine are "nuisance blooms" that reduce water transparency. DEP defines nuisance blooms as the condition when water clarity is 2 meters (6.6 feet) or less, while HABs are the condition when water clarity is less than 1-meter (3.3 feet)[40]. Tests conducted by DEP indicate that most Maine lakes do not produce algal blooms and are safe to drink (after disinfection) and recreate in. In contrast, lakes that regularly produce algal blooms are most likely to produce toxins, the highest concentrations of which are found in the scums that accumulate along the shoreline; these scums may be 100-1000 times the levels of concern issued by EPA. Swimming areas and deep waters occasionally produce toxin concentrations that exceed EPA guidelines, but in the range of 1-10 times EPA's guidelines. Results also indicate that toxins are produced later in the bloom period, when cell numbers are most dense, and cells are beginning to die. Toxins are not readily absorbed through the skin, and it is not clear if health problems can arise from inhaling water droplets with toxins. Though small amounts can cause mild reactions in sensitive individuals, significant human illness has been only rarely reported. However, severe reactions and death of pets or livestock drinking contaminated water have been reported from many locations outside of Maine. The Environmental Protection Agency (EPA) provides health and safety threshold values for the toxins generated by various species of algae[41]. Refer to DMR and DEP informational sites for further information.

3.10.1 Previous Occurrences

Prior to 1972, paralytic shellfish poisoning (PSP) toxicity was historically restricted to the far eastern sections of Maine near the Canadian border, with the first documented PSP in Maine in 1958. In 1972, a massive, visible red tide of *Alexandrium fundyense* stretched from southern Maine through New Hampshire and into Massachusetts, causing toxicity in southern areas for the first time. Virtually every year since the 1972 bloom event, western Maine has experienced PSP-related algal blooms, and on a less-frequent basis, New Hampshire and Massachusetts have as well. This pattern has been viewed as a direct result of *Alexandrium* cysts being retained in western Gulf of Maine waters once introduced there by the 1972 bloom[42].

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[37] Record NR, Evanilla J, Kanwit K, Burnell C, Cartisano C, Lewis BJ, MacLeod J, Tupper B, Miller DW, Tracy AT, White C, Moretti M, Hamilton B, Barner C and Archer SD (2022) Benefits and Challenges of a Stakeholder-Driven Shellfish Toxicity Forecast in Coastal Maine. Front. Mar. Sci. 9:923738. doi: 10.3389/fmars.2022.923738

[38] FDA National Shellfish Sanitation Program: https://www.fda.gov/media/143238/download

[39] Maine DEP, "Cyanobacteria": https://www.maine.gov/dep/water/lakes/cyanobacteria.html

[40] DEP algal bloom webpage: https://www.maine.gov/dep/water/lakes/algalbloom.html

[41] EPA Cyanobacteria Monitoring recommendations in recreational waters: https://www.epa.gov/sites/default/files/2019-09/documents/recommend-cyano-rec-water-2019-update.pdf

[42] Woods Hole Oceanographic Institute Harmful Algal Bloom/Red Tide information: https://www.whoi.edu/sbl/liteSite.do?litesiteid=3230&preview=true

3.11 Harmful Algal Blooms – Probability of Future Occurrence [S4.]

According to NOAA's National Centers for Coastal Ocean Science[43], the magnitude and severity of *Alexandrium* blooms, and the subsequent need for shellfish harvesting closures to protect human health, vary considerably from year to year and between decades. Shellfish toxicity was severe and widespread from 1978 to 1988 and again from 2003 to 2009 but has been lower since then. The causes of the decadal variations are the subject of ongoing research. Currently the Gulf of Maine is in a low to moderate red tide cycle.

For freshwater HABs, there are six lakes expected to have annual blooms and 27 more lakes that will likely bloom again on an annual or longer period. A further 55 lakes could occasionally blooms, and 11 lakes that have bloomed in the past but are unlikely to again, given other data. During the summer of 2022, a few lakes produced more algae than in previous years, but did not reach bloom status; this could change in future years (more lakes, more blooms).

3.11.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Research conducted in Florida[44] indicates that increased temperatures of nearshore ocean water caused by climate change could lead to increased growth of harmful microorganisms. These include algae that form noxious or toxic blooms, including red tides, bacteria, and other pathogens. This situation could have negative consequences regarding human health and also ocean-related economies. Though the Gulf of Maine differs substantially from the coast of Florida, another early study from Canada[45] suggests that marine HABs will generally become more prevalent and intense in the future in cold water marine environments as well.

Freshwater HABs are also expected to become more prevalent and grow in intensity due to two factors: average annual increases in atmospheric temperatures due to climate change, and increased nutrient loads caused by further development in lake watersheds[46]. These blooms may limit freshwater recreational use, pose health risks, and increase stress on drinking water systems that draw from surface waters, which includes many public drinking water suppliers in Maine.

[43] NCCOS: coastalscience.noaa.gov/news/low-to-moderate-red-tide-bloom-predicted-for-gulf-of-maine-in-2022/

[44] Havens, K. (2015). Climate change and the occurrence of harmful microorganisms in Florida's ocean and coastal waters. https://edis.ifas.ufl.edu/publication/SG136

[45] Mudie, P. J., Rochon, A., & Levac, E. (2002). Palynological records of red tide-producing species in Canada: past trends and implications for the future. *Palaeogeography, Palaeoclimatology, Palaeoecology*, *180*(1-3), 159-186.: https://www.sealevel.ca/petra/papers/redtides.pdf

[46] "Worsening algal blooms are making Maine's lakes and ponds more toxic": https://wgme.com/news/local/worsening-algae-blooms-are-making-maines-lakes-and-ponds-more-toxic

3.12 Harmful Algal Blooms – Impacts

Health-related impacts of HABs, particularly marine HABs, would be expansive in Maine if not for the careful testing and regulatory efforts of DMR Bureau of Public Health. As a result, the impacts of a large HAB event in Maine would be primarily economic, due to the temporary closure of shellfish harvest and sale.

Freshwater HABs are also closely monitored through testing efforts by DEP, and the greatest expected impacts of persistent HABs is economic implications for tourism in Maine's lake districts.

3.13 Harmful Algal Blooms – Vulnerability of State Assets [S5.]

HABs have potentially detrimental effects to state-owned freshwater and marine beaches and other facilities offering water recreation. These facilities may include state parks and conservation lands. HAB-related beach closures are an unusual occurrence in Maine, however there are occasional beach closures caused by bacterial outbreaks. Refer to the Maine Health Beaches Dashboard for real-time coastal beach water quality information [47].

3.13.1 Potential Dollar Losses to State Owned Buildings, Infrastructure, Critical Facilities

HABs are not expected to have a direct impact on sate-owned infrastructure. However, future occurrences could have potential impacts to revenue drawn from Maine State Parks. According to a 2021 report made by Maine's Department of Agriculture, Conservation and Forestry, State Park visitors and their associated activities contribute an estimated $100 million to our state's economy [48]. A portion of this may be at risk with the increasing prevalence of HABs in Maine. There is no guarantee that these assets will be damaged in a natural hazard event.

3.13.2 Community Lifeline Risks

The Departments of Environmental Protection and Marine Resources will continue to monitor the impacts of HABs and work collaboratively with MEMA to determine risks to community lifelines.

[47] Maine Healthy Beaches Dashboard: https://www.maine.gov/dep/water/beaches/beach-status.html
[48] The Case for Maine State Parks: http://legislature.maine.gov/doc/5156

3.14 Harmful Algal Blooms – Vulnerability of Jurisdictions and Disadvantaged communities [S6.]

3.14.1 Identifying Jurisdictions with Greatest Vulnerability [S6.a.1.]

All coastal jurisdictions are at risk of HABs; jurisdictions where shellfishing is a large portion of their local economy, such as in the midcoast and Penobscot/Frenchman Bay region, will hold greater economic risk. Many of these communities have authorized shellfishing ordinances in part to plan for these risks [49]. Maine DMR is effective at mitigating against public health risks through rigorous testing and closure planning based on the thresholds noted above.

Disadvantaged Communities

Disadvantaged communities traditionally reliant on a shellfish/fishing-based economy will bear the economic brunt of marine HABs, while inland communities reliant on a tourism-based economy will see impacts from growing freshwater HAB occurrence. To complicate issues, these communities are often feeling the parallel stress of increased development in areas that were previously serving a resource-based economy. The Island Institute recently documented 20 miles of coastal working waterfront out of Maine's 5,300-mile coastline, and development trends indicate working waterfronts will further decrease in the next 30 years [50]. Such a trend would reduce the total number of locations available for clean harvesting of shellfish to more easily avoid local HAB occurrence. Freshwater HABs respond to the availability of nutrients; increased development in a watershed will invariably increase the total runoff of nutrients into the water column, increasing the likelihood of blooms and also, potential impacts on tourism.

3.14.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

As determined by Dr. Kevin Athearn in 2008 [51], the molluscan shellfish industry is one of Maine's most valuable marine sectors. In 2006, the industry generated $82.3M (in 2022 USD) in total economic impact for the state including labor income. In 2001, this value was $105.8M (2022 USD). Occasional closures of shellfish growing/harvesting areas and aquaculture leases are a frequent occurrence, though longer-term, complete closures across the Maine coast would cause major local to regional economic issues, supply shortages in shellfish markets, and health impacts in the very unlikely event of an unidentified outbreak.

Dr. Adam Daigneault of the University of Maine is in the process of conducting a study of the economic impacts of Maine's lakes and ponds [52]. According to preliminary results, Maine's lakes and ponds produce more than $10 billion per year in net economic value, including nearly $3 billion per year in recreation and other lake-use expenditures. Damages to these freshwater resources by future HAB occurrence may substantially impact these values, including potential losses to shorefront property owners and the municipalities that depend on tax revenue from these prime properties.

[49] Jurisdiction shellfish ordinances: https://www.maine.gov/dmr/fisheries/shellfish/municipal-shellfish-management-program/general-shellfish-ordinance-information/general-town-shellfish-information

[50] Island Institute: The Last 20 Miles https://www.islandinstitute.org/wp-content/uploads/2020/09/TheLast20Miles_web.pdf

[51] Athearn, K. 2008. Economic Impact of Maine's Shellfish Industry. 439 http://maineclammers.org/wp-content/uploads/2013/07/eco_impact_shellfish_es_jan08.pdf.

[52] Genoter, M. and Daigneault, A. (2022), Valuing the Economic Benefits of Maine's Great Ponds in the 21st Century

Air Quality – Hazard Profile

3.15 Air Quality – General Definition and Types of Events [S3.a., S3.b.]

Temperatures are rising, snow and rainfall patterns are shifting, and more extreme climate events, like heavy rainstorms and record high temperatures, are becoming more common. The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants (also known as "criteria air pollutants"). These pollutants are found all over the U.S. They can harm your health, the environment, and cause property damage. The State of Maine is known as the exhaust pipe of the east coast due to its location, wind patterns and transportation systems, and air pollution traveling from the south through New England and the south and west from Canada through the State of Maine. As the State's population and tourism increases, the State is posturing for mitigation in the future of air pollution effects.

3.15.1 Criteria Air Pollutants

Ozone is an odorless, colorless gas made up of three oxygen molecules (O3) and is a natural part of the environment. It occurs both in the Earth's upper atmosphere, or stratosphere, and at ground level in the lower atmosphere, or troposphere. Tropospheric, or ground level ozone, is not emitted directly into the air, but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOC). This happens when pollutants emitted by cars, power plants, industrial boilers, refineries, chemical plants, and other sources chemically react in the presence of sunlight and increase temperature as the result of climate change. Ozone is a respiratory crisis to any human and flora or fauna because ground level ozone sheds lung tissue and provides other detrimental effects including stunted plant growth, delayed human gestation, cardiac diseases, and respiratory illnesses. The USEPA National Ambient Air Quality Standards determine ozone reports using the Air Quality Index (AQI) (Table 3.65)[53].

Particle pollution, also called particulate matter (PM), is made up of particles (tiny pieces) of solids or liquids that are in the air. Particulate matter (2.5 microns) are primarily gaseous aerosols that clog lung tissue. Particulate matter (10 microns) is primarily smoke, soot, dust, pollen, etc., which is typically expelled from the lungs. Due to the increase of drought, there has been an increase of wildfires, promoting an increase in particulate matter. The State of Maine is also a popular destination and route for tourism and commodity goods throughout the State and into Canada. These activities promote an increase in particulate matter in the form of greenhouse gas emissions and fire (campfires, wildfires, and woodstoves). The USEPA National Ambient Air Quality Standards determine particulate pollution reports using the Air Quality Index (AQI) (Table 3.53).

Also due to climate change, an increase in the production of pollen occurs, providing similar detrimental effects including an increase in respiratory illnesses. Since warmer weather signals plants to bloom, pollen seasons are starting earlier and lasting longer. Additionally, greenhouse gas emissions (GHGs) increase the atmospheric levels of carbon dioxide, a gas that stimulates plants to increase the production and release of pollen. GHGs are not featured in this SHMP update. Pollen production with the State has increased due to having over 17.5 million acres of forested areas. [54]

[53] https://www.airnow.gov/aqi/aqi-basics/
[54] https://www.hsph.harvard.edu/news/hsph-in-the-news/allergies-are-getting-worse-with-climate change/#:~:text=Since%20warmer%20weather%20signals%20plants,production%20and%20release%20of%20pollen.

Table 3.53

AQI Basics for Ozone and Particle Pollution

Daily AQI Color	Levels of Concern	Values of Index	Description of Air Quality
Green	Good	0 to 50	Air quality is satisfactory, and air pollution poses little or no risk.
Yellow	Moderate	51 to 100	Air quality is acceptable. However, there may be a risk for some people, particularly those who are unusually sensitive to air pollution.
Orange	Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is less likely to be affected.
Red	Unhealthy	151 to 200	Some members of the general public may experience health effects; members of sensitive groups may experience more serious health effects.
Purple	Very Unhealthy	201 to 300	Health alert: The risk of health effects is increased for everyone.
Maroon	Hazardous	301 and higher	Health warning of emergency conditions: everyone is more likely to be affected.

Nitrogen Dioxide (NO2) is one of a group of highly reactive gases known as oxides of nitrogen or nitrogen oxides (NO_x). Other nitrogen oxides include nitrous acid and nitric acid. NO_2 is used as the indicator for the larger group of nitrogen oxides. NO_2 primarily gets into the air from the burning of fuel. NO_2 forms from emissions from cars, trucks, buses, power plants, and off-road equipment. Breathing air with a high concentration of NO_2 can irritate airways in the human respiratory system. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms. Longer exposures to elevated concentrations of NO_2 may contribute to the development of asthma, and potentially increase susceptibility to respiratory infections. People with asthma, as well as children and the elderly are generally at greater risk for the health effects of NO_2. NO_2 along with other NO_x, reacts with other chemicals in the air to form both particulate matter and ozone. Both of these are also harmful when inhaled due to effects on the respiratory system. NO_2 and other NO_x interact with water, oxygen, and other chemicals in the atmosphere to form acid rain. Acid rain harms sensitive ecosystems such as lakes and forests. NO_x in the atmosphere contributes to nutrient pollution in coastal waters.[55]

Sulfur dioxide (SOx) EPA's national ambient air quality standards for SO_2 are designed to protect against exposure to the entire group of sulfur oxides (SO_x). SO_2 is the component of greatest concern and is used as the indicator for the larger group of gaseous sulfur oxides (SO_x). Other gaseous SOx (such as SO_3) are found in the atmosphere at concentrations much lower than SO_2. Control measures that reduce SO_2 can generally be expected to reduce people's exposures to all gaseous SO_x. This may have the important co-benefit of reducing the formation of particulate sulfur pollutants, such as fine sulfate particles. Emissions that lead to high concentrations of SO_2 generally also lead to the formation of other SO_x. The largest sources of SO_2 emissions are from fossil fuel combustion at power plants and other industrial facilities. Short-term exposures to SO_2 can harm the human respiratory system and make breathing difficult. People with asthma, particularly children, are sensitive to the effects of SO_2. SO_2 emissions that lead to high concentrations of SO_2 in the air generally also lead to the formation of other sulfur oxides (SO_x). SO_x can react with other compounds in the atmosphere to form small particles. These particles contribute to particulate matter (PM) pollution. Small particles may penetrate deeply into the lungs and in sufficient quantity can contribute to health problems. At high concentrations, gaseous SOx can harm trees and

[55] https://www.epa.gov/no2-pollution/basic-information-about-no2#What%20is%20NO2

plants by damaging foliage and decreasing growth. SO_2 and other sulfur oxides can contribute to acid rain which can harm sensitive ecosystems.[56]

3.15.2 Acid Rain

Acid Rain or acid deposition is a broad term including any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. This can include rain, snow, fog, hail or even dust that is acidic. Acid rain results when sulfur dioxide (SO_2) and nitrogen oxides (NOX) are emitted into the atmosphere and transported by wind and air currents. The SO_2 and NOX react with water, oxygen, and other chemicals to form sulfuric and nitric acids. These then mix with water and other materials before falling to the ground. Wet deposition is what we most commonly think of as acid rain. The sulfuric and nitric acids formed in the atmosphere fall to the ground mixed with rain, snow, fog, or hail. Dry deposition are acidic particles and gases can also deposit from the atmosphere in the absence of moisture as dry deposition. Acidic particles and gases may deposit onto surfaces (water bodies, vegetation, buildings) quickly, or may react during atmospheric transport to form larger particles that can be harmful to human health. When the accumulated acids are washed off a surface by the next rain, this acidic water flows over and through the ground, which can harm plants and wildlife, such as insects and fish. The amount of acidity in the atmosphere that deposits to earth through dry deposition depends on the amount of rainfall an area receives. Measuring Acid Rain is based on the pH scale, refer to Figure 3.69:

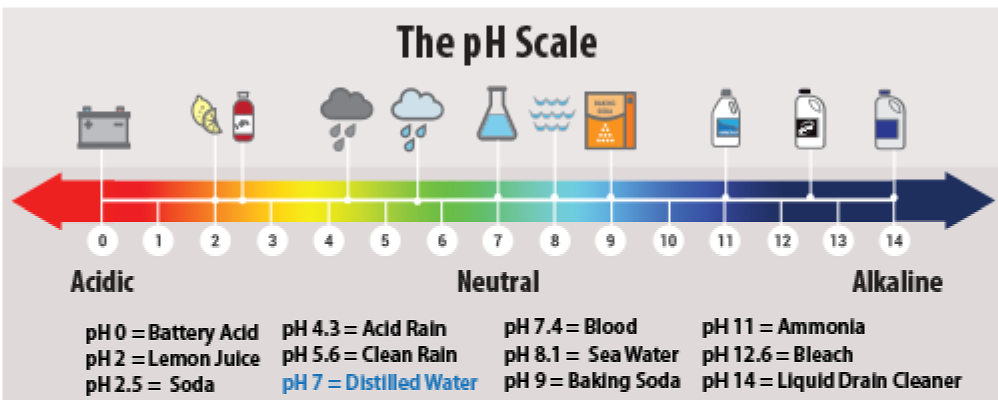


Figure 3.69

[56] https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#what%20is%20so2

3.16 Air Quality – Location of Hazard, Intensity and Previous Occurrences [S3.a.1, S3.a.2.]

The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set health-based limits, called National Ambient Air Quality Standards (NAAQS), for six dangerous outdoor air pollutants: particulate matter, ozone, nitrogen oxides, sulfur dioxide, carbon monoxide and lead. "State of the Air" looks at two of the most widespread and dangerous pollutants from this group, fine particulate matter, and ozone.

Ozone and short-term particle pollution. The data on air quality throughout the United States were obtained from the U.S. Environmental Protection Agency's Air Quality System (AQS). The American Lung Association contracted with Dr. Allen S. Lefohn, A.S.L. & Associates, Montana, to characterize the hourly averaged ozone concentration information and the 24-hour averaged PM2 .5 concentration information for the three-year period for 2019-2021 for each monitoring site[57].

Exposure to unhealthy levels of ozone air pollution makes breathing difficult for more Americans all across the country than any other single pollutant. More than 30% of the nation's population, including 23.6 million children, 15 .4 million people ages 65 or older, and millions in other groups at high risk of health harm, are exposed to high levels of ozone on enough days to earn the air they breathe a failing grade.[58]

Unhealthy for Sensitive Groups (USG) days are typically rare in Maine. Air quality is largely a transmission issue in Maine; what is brought in from the west exceeds what is generated in the state itself. But what is brought in rarely causes exceedance of thresholds. The biggest sources of air quality issues in Maine are wildfire smoke and ozone.

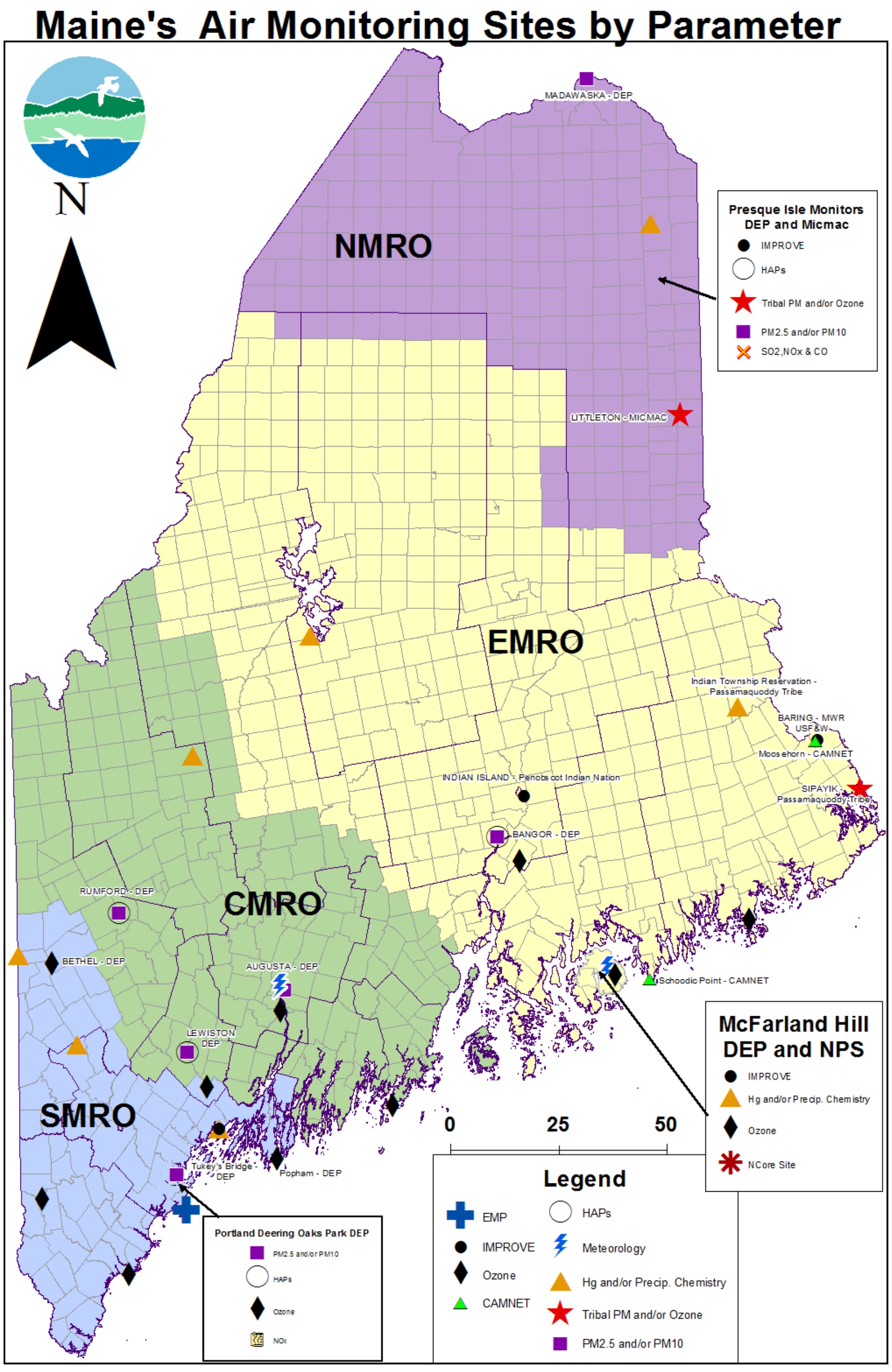
Maine does not emit a substantial amount of ozone, most of the amounts that locally meet USG thresholds are transported from the west and activated in the presence of strong sunlight. It is a photochemical pollutant. Ozone monitors are activated from April through the end of September as the occurrence of ozone is largely contingent on seasonal temperatures for Maine. Ozone peaks in early spring are of greatest concern.

Central and eastern region wildfires in 2021 caused some instances of USG, or orange-level, air quality levels. Fires in the Canadian prairies caused higher levels of pollution to drift into Maine, with several days of running average at USG levels. Otherwise, Maine has not experienced a USG level of air quality for several years.
"In the 70's total suspended particulates, but in 80's they parsed out PM10, now PM 2.5 reason being is the super fine stuff is what goes in and doesn't come out. More of a health burden. PM 2.5 continuous monitors were added late '99".

The State of Maine's Environmental Protection Agency monitors all criteria air quality pollutants (Figure 3.70):

[57] https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf
[58] https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf

Figure 3.70



Maine's Air Monitoring Sites by Parameter
N
NMRO
EMRO
CMRO
SMRO
MADAWASKA - DEP
LITTLETON - MICMAC
Presque Isle Monitors DEP and Micmac
IMPROVE
HAPs
Tribal PM and/or Ozone
PM2.5 and/or PM10
SO2,NOx & CO
Indian Township Reservation - Passamaquoddy Tribe
BARING - MWR USF&W
Moosehorn - CAMNET
SIPAYIK - Passamaquoddy Tribe
INDIAN ISLAND - Penobscot Indian Nation
BANGOR - DEP
RUMFORD - DEP
BETHEL - DEP
AUGUSTA - DEP
LEWISTON DEP
Schoodic Point - CAMNET
McFarland Hill DEP and NPS
IMPROVE
Hg and/or Precip. Chemistry
Ozone
NCore Site
0
25
50
Tukey's Bridge - DEP
Popham - DEP
Portland Deering Oaks Park DEP
PM2.5 and/or PM10
HAPs
Ozone
NOx
Legend
EMP
IMPROVE
Ozone
CAMNET
HAPs
Meteorology
Hg and/or Precip. Chemistry
Tribal PM and/or Ozone
PM2.5 and/or PM10
Data Source MEGIS and MEDEP; updated 5/25/2022

Per the American Lung Association's State of the Air report, the below counties statistics on ozone and particulate pollution for 2023 are below (Tables 3.54 and 3.55) [59]:

Maine reports data on **10** out of **16** counties. Counties with no ozone data are not shown.

Sorted by Wgt. Avg.

County	Grade	Wgt. Avg.	Orange Days	Red Days	Purple Days
Hancock	C	1.7	5	0	0
York	C	1.3	4	0	0
Cumberland	C	1.0	3	0	0
Knox	B	0.7	2	0	0
Androscoggin	A	0.0	0	0	0
Aroostook	A	0.0	0	0	0
Kennebec	A	0.0	0	0	0
Oxford	A	0.0	0	0	0
Penobscot	A	0.0	0	0	0
Washington	A	0.0	0	0	0

(Table 3.54)

Maine reports data on **7** out of **16** counties. Counties with no particle pollution data are not shown.

Sorted by Wgt. Avg.

County	Grade	Wgt. Avg.	Orange Days	Red Days	Purple Days	Maroon Days	Grade (Annual)	Design Value
Aroostook	C	1.8	1	3	0	0	Pass	4.4
Oxford	B	0.3	1	0	0	0	Pass	5.1
Androscoggin	A	0.0	0	0	0	0	Pass	5.5
Cumberland	A	0.0	0	0	0	0	Pass	7.1
Hancock	A	0.0	0	0	0	0	Pass	3.2
Kennebec	A	0.0	0	0	0	0	INC	INC
Penobscot	A	0.0	0	0	0	0	Pass	4.4

(Table 3.55)

59 https://www.lung.org/research/sota/city-rankings/states/maine

Environmental Effects of Ozone: Elevated exposures to ozone can affect sensitive vegetation and ecosystems, including forests, parks, wildlife refuges, and wilderness areas. In particular, ozone can harm sensitive vegetation during the growing season.[60] Ozone can affect sensitive vegetation and ecosystems, including forests, parks, wildlife refuges and wilderness areas. In particular, ozone can harm sensitive vegetation during the growing season. When sufficient ozone enters the leaves of a sensitive plant, it can:

- Reduce photosynthesis, which is the process that plants use to convert sunlight to energy to live and grow.
- Slow the plant's growth.
- Increase sensitive plants' risk of:
    - Damage from insects
    - Effects of other pollutants
    - Harm from severe weather.

Also, some plants can show visible marks on their leaves when ozone is present under certain conditions.
Disease,

The effects of ozone on individual plants can then have negative impacts on ecosystems, including:
- changes to the specific assortment of plants present in a forest
- changes to habitat quality
- changes to water and nutrient cycles.[61]

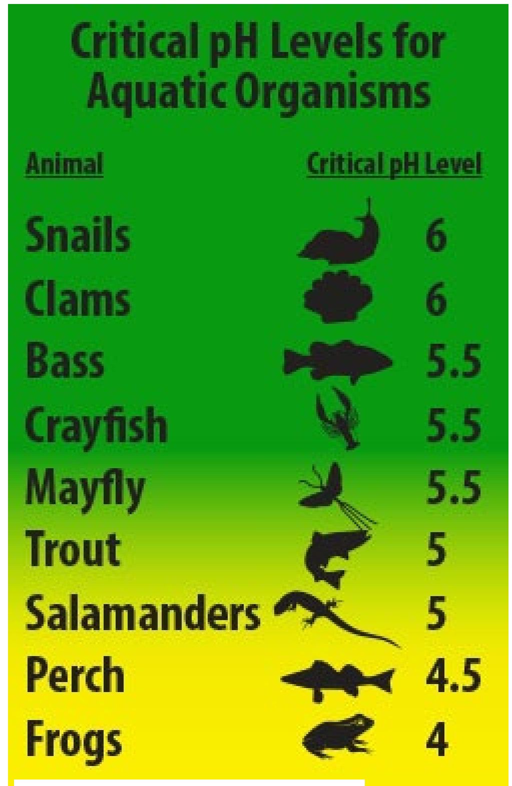


Figure 3.71

Figure 3.71 illustrates the pH level at which key organisms may be lost as their environment becomes more acidic. Not all fish, shellfish, or the insects that they eat can tolerate the same amount of acid.[62]

3.16.1 Summer and Winter Air Quality

Per research through the U.S. EPA and the American Lung Association, increase in temperatures and vehicle emissions promote the production of ozone. “Ozone production accelerates at high temperatures, and emissions of the natural components of ozone increase. High temperatures are also accompanied by weak winds, causing the atmosphere to stagnate. So, the air just cooks and ozone levels can build up.” - Loretta J. Mickley[63] However, at extremely high temperatures, beginning in the mid-90s Fahrenheit, ozone levels at many sites stop rising with temperature. The phenomenon, previously observed only in California, is known as ozone suppression.[64] Typically, particle pollution is seen more in the winter months, however, due to the State of Maine’s heavy

[60] https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#effects
[61] https://www.epa.gov/ground-level-ozone-pollution/ecosystem-effects-ozone-pollution
[62] https://www.epa.gov/acidrain/effects-acid-rain

[63] https://news.harvard.edu/gazette/story/2016/04/the-complex-relationship-between-heat-and-ozone/
[64] https://news.harvard.edu/gazette/story/2016/04/the-complex-relationship-between-heat-and-ozone/

tourism, campfires are a contributing factor to summer air pollution. Due to the increase of drought, the increase in wildfires during the summer months also adds to the State of Maine's particle pollutions.

During the winter, winter peaks are caused by long cold nights, skies clear, nocturnal inversions where poor air quality is trapped close to surface. Within the State of Maine, woodstoves and fireplaces contribute to higher levels of particle pollution throughout the cold Maine winter. Ozone is not an issue during the winter due to the temperatures being below the mid-90s.

Figure 3.72[65]

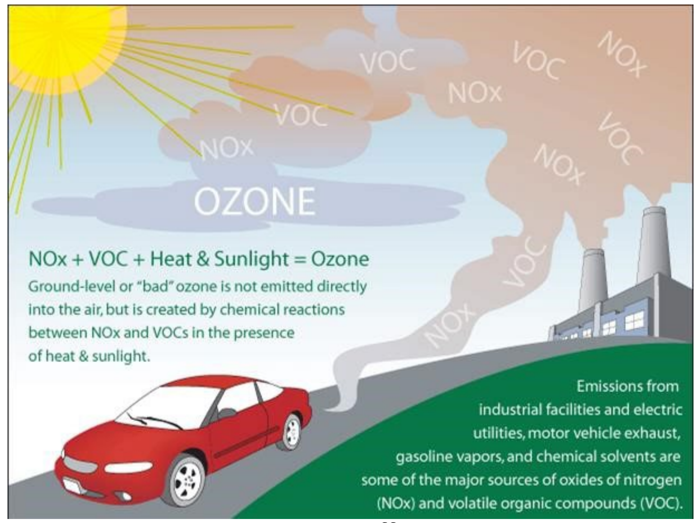


Figure 3.73[66]

3.17 Air Quality – Probability of Future Occurrence [S4.]

Due to the rise in temperature, tourism, population increase, and vehicle emissions, the probability of the State of Maine increasing air pollution is imminent. Data provided by federal and state agencies regarding increase temperature, drought, wildfire, and wind, as well as population data provides a basis of evidence.

3.17.1 Projected Changes in Hazard Location, Intensity, Frequency, and Duration

Ambient ozone levels are influenced by a complex interaction of factors that can vary from year to year. Some fluctuation is to be expected and does not necessarily represent lasting change. However, at least some of the significant improvements in ozone levels in this year's report can be attributed to the fact that the Clean Air Act has been working. Controls placed on emissions have increasingly resulted in the replacement of more polluting engines, fuels, and processes nationwide. The transition of the economy away from the coal, the dirtiest fossil fuel, has unquestionably had an impact, especially in parts of the eastern United States. It is also possible that pandemic-related changes in activity patterns in 2020 and 2021, such as increased telework, have made a difference, but that is still being studied and characterized[67]

65 https://www.cdc.gov/air/particulate_matter.html
66 https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics#wwh
67 https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf

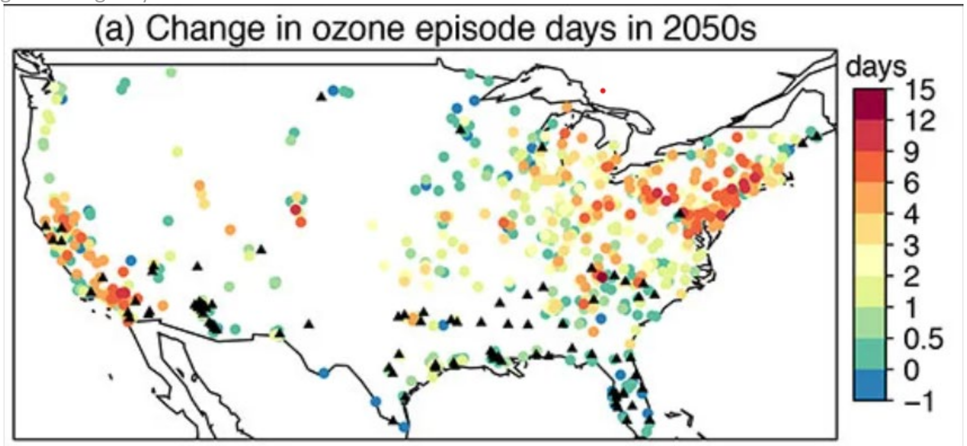
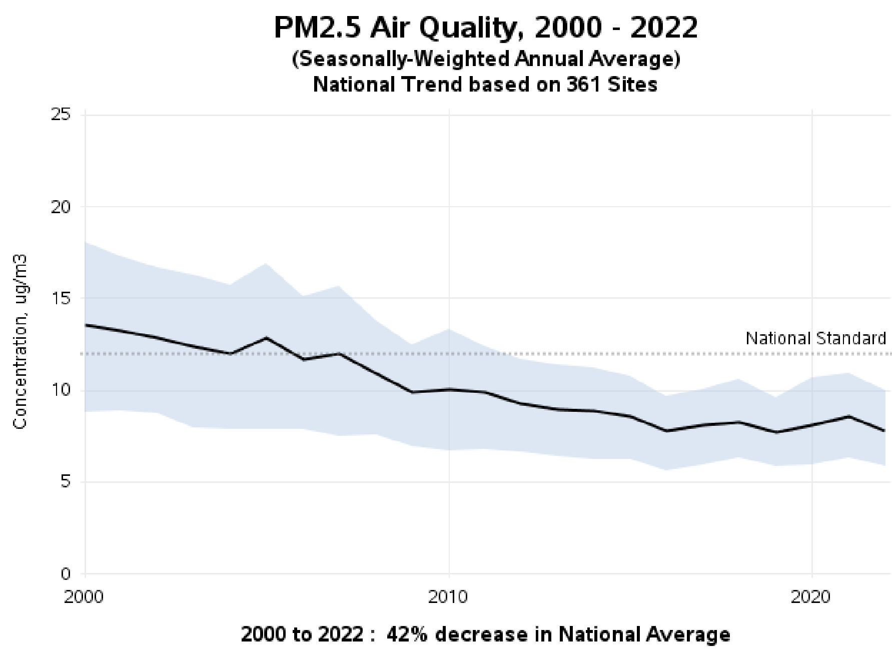


Figure 3.74: California, the Southwest, and the Northeast would be the most affected, each possibly experiencing up to nine additional days of dangerous ozone levels, with much of the rest of the country experiencing an average increase of 2.3 days.[68]

Using a nationwide network of monitoring sites, EPA has developed ambient air quality trends for particle pollution, also called Particulate Matter (PM). $PM_{2.5}$ describes fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller. Under the Clean Air Act, EPA sets and reviews national air quality standards for PM. Air quality monitors measure concentrations of PM throughout the country. EPA, state, tribal and local agencies use that data to ensure that PM in the air is at levels that protect public health and the environment. Nationally, average $PM_{2.5}$ concentrations have decreased over the years. For information on PM standards, sources, health effects, and programs to reduce PM.



[69]

Figure 3.75

[68] https://news.harvard.edu/gazette/story/2016/04/the-complex-relationship-between-heat-and-ozone/
[69] https://www.epa.gov/air-trends/particulate-matter-pm25-trends

The Acid Rain Program (ARP) has delivered significant reductions of sulfur dioxide (SO_2) and nitrogen oxides (NO_X) emissions from fossil fuel-fired power plants, extensive environmental and human health benefits, and far lower-than-expected costs. Together with more recent power sector regulations, including the Cross-State Air Pollution Rule (CSAPR), and a rapidly changing energy sector, the ARP has helped deliver annual SO_2 reductions of over 93% and annual NO_X emissions reductions of over 87%. The Power Plant Emissions Trends page has maps and data highlighting these emissions reductions, and the Progress Reports provide an annual overview of program features and results, from compliance to air quality impacts.

Figures 3.74-3.77 below illustrate acid rain trends: [70]

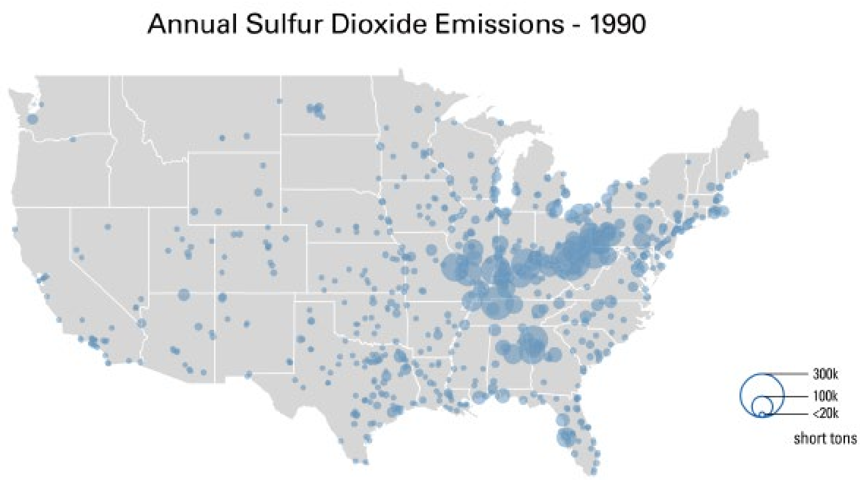


Figure 3.76

[70] https://www.epa.gov/acidrain/acid-rain-program-results

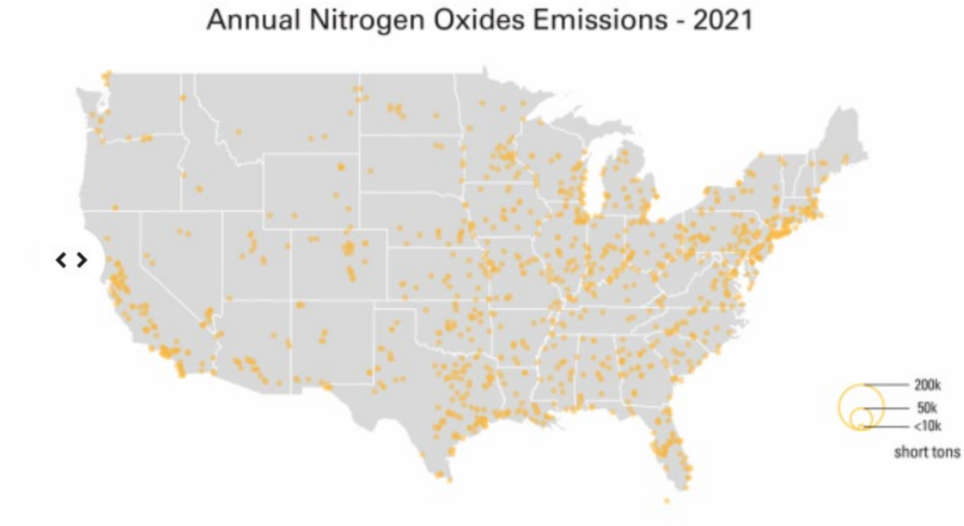


Figure 3.77

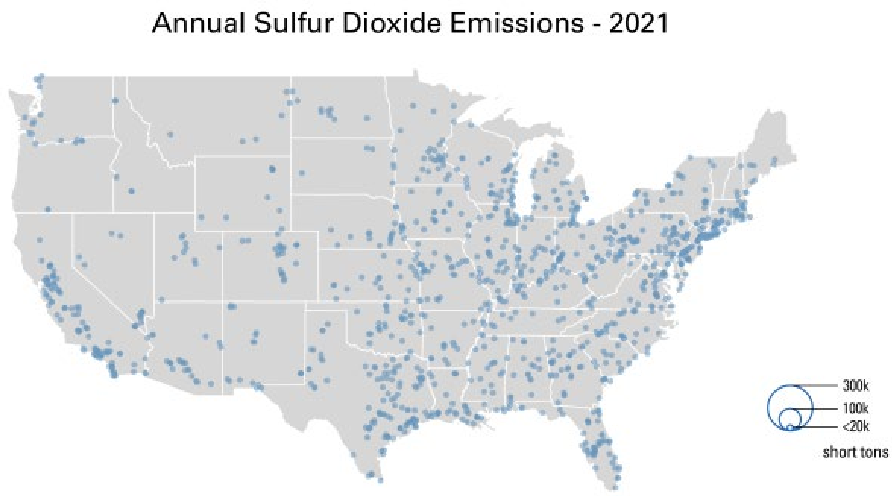


Figure 3.78

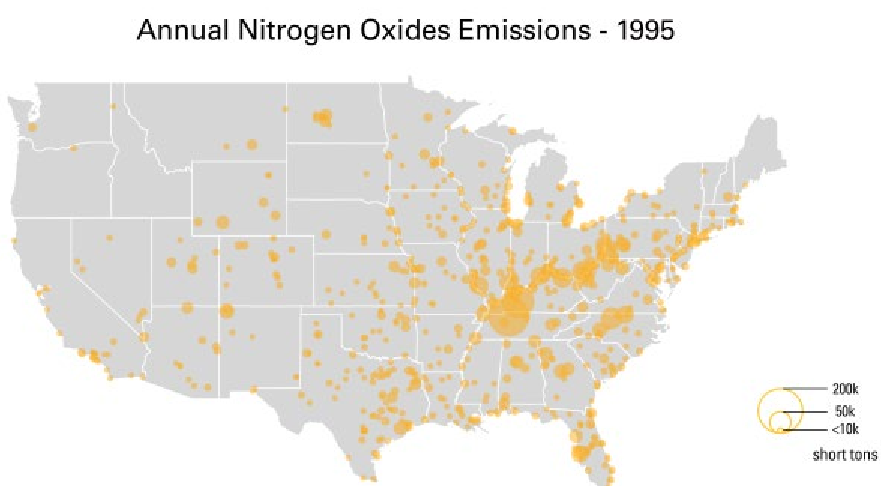


Figure 3.79

3.18 Air Quality – Impacts

Years of scientific research have clearly established that particle pollution and ozone are a threat to human health at every stage of life, increasing the risk of premature birth, causing or worsening lung and heart disease, and shortening lives. Some groups of people are more at risk of illness and death than others, because they are more likely to be exposed, or are more vulnerable to health harm, or often both.

Air pollution impact to the environment, which includes flora and fauna, shows decrease of plant growth and animal health issues. Increased vehicle transportation along the State of Maine's corridors, provides premature death of flora.[71]

Effects of Wildlife

Toxic pollutants in the air, or deposited on soils or surface waters, can impact wildlife in a number of ways. Like humans, animals can experience health problems if they are exposed to sufficient concentrations of air toxins over time. Studies show that air toxins are contributing to birth defects, reproductive failure, and disease in animals. Persistent toxic air pollutants (those that break down slowly in the environment) are of particular concern in aquatic ecosystems. These pollutants accumulate in sediments and may biomagnify in tissues of animals at the top of the food chain to concentrations many times higher than in the water or air.[72]

Crop and Forest Damage

Air pollution can damage crops and trees in a variety of ways. Ground-level ozone can lead to reductions in agricultural crop and commercial forest yields, reduced growth and survivability of tree seedlings, and increased plant susceptibility to disease, pests and other environmental stresses (such as harsh weather). As described above, crop and forest damage can also result from acid rain and from increased UV radiation caused by ozone depletion.[73]

Figures 3.78 and 3.79 illustrate human and environmental effects from air pollution.[74],[75]

[71] https://www.ontario.ca/page/effects-air-pollution-agricultural-crops
[72] https://www.mass.gov/doc/health-environmental-effects-of-air-pollution/download
[73] https://www.mass.gov/doc/health-environmental-effects-of-air-pollution/download
[74] https://www.pca.state.mn.us/air-water-land-climate/air-quality-and-health
[75] https://www.encyclopedie-environnement.org/en/life/impact-air-pollutants-on-vegetation/

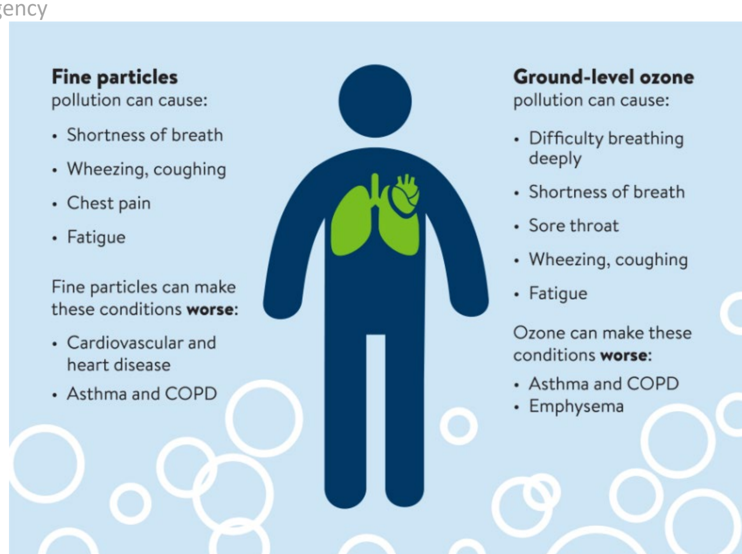


Figure 3.80

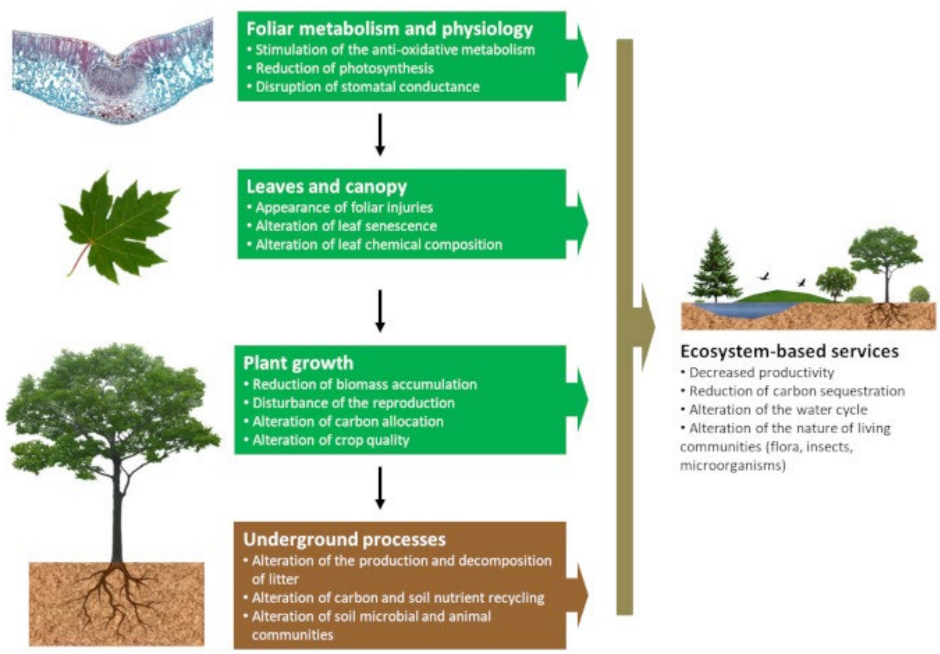


Figure 3.81

3.19 Air Quality – Vulnerability of State Assets [S5.]

3.19.1 Potential Dollar Losses to State owned buildings, infrastructure, critical facilities

No losses to buildings, infrastructure, and critical facilities are expected from poor air quality except for acid rain, however, the State of Maine state parks and forests are directly affected by drought which in turn causes wildfires that produces particulate matter that effects the air quality. Also increase in ozone production will affect the State of Maine's parks and forests by decreasing plant production and health of wildlife. An increase in public health and stress on state asset healthcare facilities is imminent.

Effects of Acid rain on materials

Not all acidic deposition is ***wet***. Sometimes dust particles can become acidic as well, and this is called ***dry deposition***. When acid rain and dry acidic particles fall to earth, the nitric and sulfuric acid that make the particles acidic can land on statues, buildings, and other manmade structures, and damage their surfaces. The acidic particles corrode metal and cause paint and stone to deteriorate more quickly. They also dirty the surfaces of buildings and other structures such as monuments. There is no guarantee that these assets will be damaged in a natural hazard event.

The consequences of this damage can be costly:

- damaged materials that need to be repaired or replaced,
- increased maintenance costs, and
- loss of detail on stone and metal statues, monuments, and tombstones.[76]

Figure 3.80 illustrates the acid rain pathway for material and environmental effects concerning state assets.

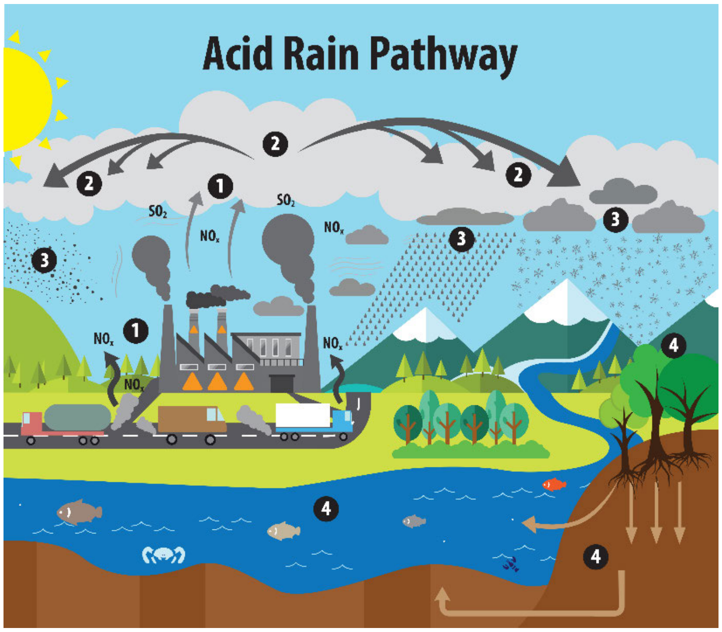


Figure 3.82

3.19.2 Community Lifeline Risks

[76] https://www.epa.gov/acidrain/effects-acid-rain#health

The Department of Environmental Protection will continue to monitor the impacts of poor air quality and work collaboratively with MEMA to determine risks to community lifelines.

3.20 Air Quality – Vulnerability of Jurisdictions and Disadvantaged communities[S6.]

3.20.1 Identifying Jurisdictions with greatest vulnerability [S6.a.1.]

Within the United States, nearly 264 million people live in the 922 counties for which there is monitored data for at least one pollutant in this year's report. The proportion of the population in those counties varies by pollutant. The majority of U.S. counties actually do not have monitors, which means that many communities, especially rural ones, do not have official monitored information on their air quality.[77]

Research has shown that the people in these high-risk groups are at the greatest risk from ozone and particle pollution:[78]

- **People of color**—Some 64 million people of color live in counties that received at least one failing grade for ozone and/or particle pollution. Over 13 million people of color live in counties that received failing grades on all three measures, including over 9 million Hispanics.
- **People experiencing poverty**—More than 14 .6 million people with incomes meeting the federal poverty definition live in counties that received an F for at least one pollutant. Nearly 2 .6 million people in poverty live in counties failing all three measures.
- **Children and older adults**—More than 27 million children under age 18 and some 18 million adults ages 65 and over live in counties that received an F for at least one pollutant. Almost 4 .3 million children and 2 .6 million seniors live in counties failing all three measures.
- **People with underlying health conditions including:** [79]
    - **Asthma**—1 .7 million children and nearly 8 .7 million adults with asthma live in counties that received an F for at least one pollutant. More than 217,000 children and 1 .2 million adults with asthma live in counties failing all three measures.
    - **Chronic Obstructive Pulmonary Disease (COPD)**—Over 5 million people with COPD live in counties that received an F for at least one pollutant. Almost 630,000 people with COPD live in counties failing all three measures.
    - **Lung Cancer**—More than 55,000 people diagnosed with lung cancer in 2019 live in counties that received an F for at least one pollutant. And nearly 6,900 people diagnosed with lung cancer live in counties failing all three measures
    - **Cardiovascular Disease**—More than 6 .6 million people with cardiovascular disease live in counties that received an F for at least one pollutant. Some 864,000 people live in counties failing all three measures.
    - **Pregnancy**—Adverse impacts from air pollution have been shown both for those who are pregnant as well as for the developing fetus. More than 1.3 million pregnancies were recorded in 2021 in

[77] https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf
[78] https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf
[79] https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf

counties that received at least one F for particle pollution. Of those, nearly 198,000 are in counties that received failing grades for all three measures

The health burden of air pollution is not evenly shared. Some people are more at risk of illness and death from air pollution than others. Several key factors affect an individual's level of risk:[80]

- **Exposure**—Where someone lives, where they go to school and where they work make a big difference in how much air pollution they breathe. In general, the higher the exposure, the greater the risk of harm.
- **Susceptibility**—Pregnant people and their fetuses, children, older adults and people living with chronic conditions, especially heart and lung disease, may be physically more susceptible to the health impacts of air pollution than other adults.
- **Access to healthcare**—Whether or not a person has health coverage, a healthcare provider, and access to linguistically and culturally appropriate health information may influence their overall health status and how they are impacted by environmental stressors like air pollution.
- **Psychosocial stress**—There is increasing evidence that non-physical stressors such as poverty, racial/ethnic discrimination and fear of deportation can amplify the harmful effects of air pollution.

These risk factors are not mutually exclusive and often interact in ways that lead to significant health inequities among subgroups of the population. Taken all together, these high-risk categories account for a large proportion of the U.S. population. Table 3.56 represents the 16 counties within the State of Maine and their vulnerability to air pollution. [81]

[80] https://www.lung.org/getmedia/338b0c3c-6bf8-480f-9e6e-b93868c6c476/SOTA-2023.pdf
[81] https://www.lung.org/research/sota/city-rankings/states/maine

Table 3.56: State of Maine air pollution vulnerability

County	Total Pop	Under 18	65 & Over	Pediatric Asthma	Adult Asthma	COPD	Lung Cancer	Cardio-vascular Disease	Pregnancy	Poverty Estimate	Non White
Androscoggin	111,034	23,686	20,318	1,697	11,145	7,465	75	8,394	1,013	15,136	11,544
Aroostook	66,859	12,416	16,754	889	6,807	5,173	45	6,033	505	9,666	4,469
Cumberland	305,231	55,405	59,680	3,969	31,816	21,350	207	24,085	2,918	22,937	31,800
Franklin	29,687	5,264	6,899	377	3,074	2,234	20	2,576	254	3,351	1,436
Hancock	56,192	9,331	14,693	668	5,849	4,462	38	5,217	448	6,077	3,308
Kennebec	124,486	23,630	25,774	1,693	12,790	8,931	85	10,166	1,096	13,702	7,471
Knox	41,084	7,083	11,100	507	4,228	3,271	28	3,845	304	4,171	2,159
Lincoln	35,828	6,013	10,299	431	3,688	2,944	24	3,487	259	3,266	1,677
Oxford	58,629	10,575	13,389	758	6,058	4,459	40	5,133	465	8,728	3,126
Penobscot	152,765	27,168	29,618	1,946	16,010	10,736	104	12,092	1,424	21,301	10,455
Piscataquis	17,165	3,039	4,605	218	1,758	1,386	12	1,629	125	2,376	1,156
Sagadahoc	37,071	6,801	8,724	487	3,805	2,796	25	3,233	306	3,209	2,175
Somerset	50,592	9,358	11,293	670	5,205	3,796	34	4,360	406	7,378	2,410
Waldo	39,912	7,292	9,648	522	4,091	3,041	27	3,528	321	5,124	1,970
Washington	31,121	5,970	7,973	428	3,136	2,413	21	2,825	237	5,602	3,474
York	214,591	38,878	46,398	2,785	22,232	15,753	146	18,007	1,846	17,548	14,082
TOTAL:	**1,372,247**	**251,909**	**297,165**	**18,045**	**141,692**	**100,210**	**931**	**114,610**	**11,927**	**149,572**	**102,712**

3.20.2 Potential Dollar Losses to Jurisdictions and Property Owners [S6.a.2.]

According to the Global Burden of Disease 2019 study, air pollution from fine particulate matter caused 6.4 million premature deaths and 93 billion days lived with illness in 2019. Over the past decade, the toll of ambient air pollution has continued to rise. Air pollution's significant health, social, and economic effects compel the World Bank to support client countries in addressing air pollution as a core development challenge. This publication estimates that the global cost of health damages associated with exposure to air pollution is $8.1 trillion, equivalent to 6.1 percent of global GDP. People in low and middle-income countries are most affected by mortality and morbidity from air pollution. Air pollution negatively impacts the U.S. economy, costing the U.S. roughly 5 percent of its yearly gross domestic product (GDP) in damages ($790 billion in 2014). The highest costs come from early deaths, attributable to exposure to fine particulate matter (PM2.5).[82] Research dollar loss in public health/air quality, death 7.5mil/pp, hospitalization 2.3m/pp, and treat/release - 61K/pp, self-treat – 14k/pp.[83]

The US Acid Rain Program (Title IV of the 1990 Clean Air Act Amendments) has achieved substantial reductions in emissions of sulfur dioxide (SO2) and nitrogen oxides (NOx) from power plants in the United States. We compare new estimates of the benefits and costs of Title IV to those made in 1990. Important changes in our understanding of and ability to quantify the benefits of Title IV have occurred. Benefits to human health now take a much higher profile because the contribution of SO2 and NOx emissions to the formation of fine particulate (PM2.5) is substantial, and evidence of the harmful human health effects of PM2.5 has emerged in the last 15 years. New estimates of the health benefits of PM2.5 reductions are the largest category of quantified health and environmental benefits and total over $100 billion USD annually for 2010 when the program is expected to be fully implemented. Although important uncertainties exist in any specific estimate of the benefits, even if the estimates were calculated using more limiting assumptions and interpretations of the literature, they would still substantially exceed the costs. Estimates of annualized costs for 2010 are about $3 billion USD, which is less than half of what was estimated in 1990. Research since 1990 also suggests that environmental problems associated with acid deposition and nitrogen deposition are more challenging to resolve than originally thought and will require larger reductions in emissions to reverse. The greater than expected benefits to human health, the greater vulnerability of natural resources and ecosystems, and the lower-than-expected costs all point to the conclusion that further reductions in SO2 and NOx emissions from power plants beyond those currently required by Title IV are warranted.[84]

[82] https://earth.stanford.edu/news/how-much-does-air-pollution-cost-us
[83] https://openknowledge.worldbank.org/entities/publication/c96ee144-4a4b-5164-ad79-74c051179eee
[84] https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=OAP&dirEntryID=139587

Hazards Not Profiled

Hazards not profiled because of little or no hazardous impact on Maine include avalanches, subsidence, volcanic activity, and natural electromagnetic pulses.

3.20.3 Pandemic

Widespread health crises caused by naturally occurring pathogens or viruses are defined by FEMA as a natural hazard. Maine CDC provides comprehensive plans for COVID-19[85], influenza and flu-like pandemics[86], and other diseases for the State of Maine, therefore MEMA chooses to rely on guidance from this program for pandemic-related hazards rather than build a new plan.

3.20.4 Avalanches

Avalanches occur when large storms bring substantial amounts of snow or rainfall to steep sloped areas, destabilizing the snowpack. Indicators of a potential avalanche risk include cracking or caving in of snowpack along slopes or other avalanches in the adjacent area. Avalanches do occur in Maine, but they are isolated to a small number of undeveloped, steep terrain areas, such as Baxter State Park and the western mountains[87].

3.20.5 *Subsidence*

Subsidence is the gradual settling or sudden sinking of an area of land[88]. There are a number of natural processes that may contribute to subsidence, including earthquakes, soil compaction, glacial isostatic adjustment, erosion, and sinkhole formation. Maine has experienced regional, gradual subsidence due to glacial isostatic adjustments due to changes in ice overburden during and after the Last Glacial Maximum[89]. Eastern Maine has also exhibited some tectonic subsidence that, combined with sea level rise, potentially contributed to coastal erosion[90]. There have also been some isolated cases of subsidence by sinkholes forming across Maine and these cases are typically caused by erosion and weathering of soil and bedrock by surface and groundwater. For example, a 50-foot-deep sinkhole formed in Rockland in 2010 caused by the gradual erosion and dissolution of limestone bedrock underneath the surface[91]. Though instances of subsidence are typically too isolated or too gradual to warrant substantial action to mitigate the risk to Maine communities, planning partners will continue to monitor conditions to anticipate future planning needs. Along the coast, subsidence can be a contributing factor to long-term sea level rise.

3.20.6 Volcanic activity

Volcanic Activity occurs via vents that act as a conduit between the Earth's surface and inner layers, and erupt gas, molten rock, and volcanic ash when gas pressure and buoyancy drive molten rock upward and through zones of weakness in the Earth's crust. According to the National Risk Index, volcanic activity is a non-applicable risk in Maine[92]. Though Maine is home to multiple extinct volcanoes that formed hundreds of millions of years ago,

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[85] Maine CDC COVID-19 Plan: https://www.maine.gov/dhhs/mecdc/infectious-disease/epi/airborne/coronavirus/index.shtml

[86] Maine CDC Influenza Plans: https://www.maine.gov/dhhs/mecdc/infectious-disease/epi/influenza/maineflu/pandemic-plans.shtml

[87] WAGM, “Avalanches…they do happen in Maine”: https://www.wagmtv.com/2021/02/23/avalanchesthey-do-happen-in-maine/

[88] NOAA “What is subsidence?”: https://oceanservice.noaa.gov/facts/subsidence.html

[89] Borns, H.W. et al. (2004), “The deglaciation of Maine, USA”, *Earth Science Faculty Scholarship*, 276. https://www.polartrec.com/files/journals/docs/the-deglaciation-of-maine-usa.pdf

[90] Lee, F.T. (1985), Geomechanical aspects of subsidence in Eastern Maine, USGS Open-File Report 85-519: https://pubs.usgs.gov/of/1985/0519/report.pdf

[91] Bangor Daily News, “50-foot deep sinkhole opens on Rockland road”: https://www.bangordailynews.com/2010/02/16/news/50footdeep-sinkhole-opens-on-rockland-road/

[92] FEMA, “Volcanic activity”: https://hazards.fema.gov/nri/volcanic-activity

the geologic forces required to form eruptions today no longer exist and do not occur in the northeast region[93]. Extremely large volcanic eruptions, though unlikely, may pose significant global impacts through the alteration of atmospheric temperatures by release of volcanic gasses and risks to human health and infrastructure through broad distribution of volcanic ash.

3.20.7 Geomagnetic Storm/Natural Electromagnetic Pulse (EMP)

A geomagnetic storm is a major disturbance of Earth's magnetosphere that occurs when there is a very efficient exchange of energy from the solar wind into the space environment surrounding Earth. The largest storms that result from these conditions are associated with solar coronal mass ejections (CMEs) where a billion tons or so of plasma from the sun, with its embedded magnetic field, arrives at Earth. CMEs typically take several days to arrive at Earth, but have been observed, for some of the most intense storms, to arrive in as short as 18 hours[94].

During storms, the currents in the ionosphere, as well as the energetic particles that precipitate into the ionosphere add energy in the form of heat that can increase the density and distribution of density in the upper atmosphere, causing extra drag on satellites in low-earth orbit. The local heating also creates strong horizontal variations in the in the ionospheric density that can modify the path of radio signals and create errors in the positioning information provided by GPS. While the storms create beautiful aurora, at worst they also can disrupt navigation systems such as the Global Navigation Satellite System and create harmful or damaging geomagnetic induced currents in the power grid and pipelines. NOAA provides the Geomagnetic Storm Scale, or G-Scale, used to describe space weather that can disrupt systems on Earth[95].

Larger and far more impactful geomagnetic storms are possible and have occurred in recorded history. As stated by the EMP commission[96]:

Natural EMP from a geomagnetic super-storm, like the 1859 Carrington Event or 1921 Railroad Storm, or nuclear EMP attack from terrorists or rogue states, as apparently practiced by North Korea during the nuclear crisis of 2013, are both existential threats that could kill up to 9 of 10 Americans through starvation, disease, and societal collapse. A natural EMP catastrophe or nuclear EMP attack could blackout the national electric grid for months or years and collapse all the other critical infrastructures--communications, transportation, banking and finance, food and water--necessary to sustain modern society and the lives of 310 million Americans.

The EMP Commission recognizes high-altitude nuclear EMP attacks as the worst potential EMP threat. Given that nuclear attacks are an adversarial rather than natural hazard, we choose not to profile this hazard but will instead follow guidance from adversarial planning mechanisms addressing this largely unexplored issue.

The U.S. Geological Survey started a conversation with Maine Geological Survey about where a geomagnetic observatory might be established in Maine. The State will soon receive criteria that will help with site selection, but there are already some options to redevelop unoccupied structures across the state that fit criteria. As of the writing of this plan, Maine Geological Survey, USGS, and MEMA have begun discussions.

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[93] USGS: https://www.usgs.gov/faqs/will-extinct-volcanoes-east-coast-us-erupt-again

[94] NOAA definition of Geomagnetic Storm: https://www.swpc.noaa.gov/phenomena/geomagnetic-storms

[95] NOAA Space Weather Scales: https://www.swpc.noaa.gov/noaa-scales-explanation

[96] The EMP Threat: The State of Preparedness Against the Threat of an Electromagnetic Pulse (EMP) Event: https://republicans-oversight.house.gov/wp-content/uploads/2015/05/Pry-Statement-5-13-EMP.pdf

Additional Findings from Local Hazard Mitigation Plans

Stafford Act 44 CFR §201.4(c)(2)(i)-(iii)[97]

3.21 Summary of Potential Losses Identified in County Risk Assessments

This section incorporates the findings of county Multi-Jurisdictional Hazard Mitigation Plans to provide an statewide overview of the total loss estimates for Maine (Table 3.57). Though many of the resources created for county LHMPs is incorporated into this plan in the "Vulnerability of Jurisdictions…" sections, this provides a summary of findings provided by local planners. Unlike the individual asset-based loss estimates provided in the vulnerability assessments above, these loss estimates are based on a combination of historic damage amounts reported for disaster declarations and Hazus models, both of which are general estimates of potential damages. These estimates were taken from the submitted local county hazard mitigation plans. This review will describe the distribution of losses across the state, with specific reference to quantifying losses to local critical facilities.

Table 3.57: potential losses identified in county hazard mitigation plans based primarily on Public Assistance dollars

County	Tier 1 Hazards (in 2022 $USD)									Tier 2 Hazards		
	Wildfire	Flooding	Severe Summer Weather	Severe Fall/Winter Weather	Tropical cyclone	Drought	Earthquake	Erosion	Mass Wasting	Forest Pests	Harmful Algal Blooms	Air Quality
Androscoggin	-	$1.19	$0.45	$3.90	$0.93	-	$126.48*	-	-	-	-	-
Aroostook	$827.91	$12.15	$120.90	$120.90	$8.15*	$93.80	$564.34*	-	-	-	-	-
Cumberland	$184.18	$11.98	$76.01	$11.90	$1,051.95*	$12.82	$2,060.98*	-	$1.22	-	-	-
Franklin	$21.20	$7.35	-	$2.37	$39.50*	-	$103.12*	-	-	-	-	-
Hancock	$37.18	$11.64	$4.57	$3.65	$197.94*	-	$40.22*	-	-	-	-	-
Kennebec	$68.20	$24.46	-	$8.77	$9.22*	-	$55.63*	-	-	-	-	-
Knox	$3.77	$8.70	-	$2.66	$1,963.45*	-	$28.83*	-	$1.57	-	-	-
Lincoln	$19.57	$2.27	-	$1.95	$8.66	$6.80	$30.78*	-	-	-	-	-
Oxford	$40.48	$12.37	$4.66	$3.47	$28.09*	-	$363.71*	-	-	-	-	-
Penobscot	$7,050.65	$3.40	$1.69	$8.39	$573.10*	-	$69.18*	-	-	-	-	-
Piscataquis	$10.95	$3.43	$1.85	$0.97	$1.23	$247.53	$24.07*	-	-	-	-	-
Sagadahoc	$9.07	$7.08*	-	$1.95	$7.74*	-	$31.49*	$0.65	-	-	-	-
Somerset	$64.94	$1,117.44*	-	$3.52	$375.67*	-	$44.51*	-	-	-	-	-
Waldo	-	$2.45	$3.48	$1.03	$3.48	-	$6.20*	-	-	-	-	-
Washington	$22.45	$7.04	-	$3.45	$2.76	-	$820.00*	-	-	-	-	-
York	-	$305.94	-	$1.16	$171.85*	-	$432.61*	-	-	-	-	-
Total	$8,360.55	$1,538.88	$213.62	$180.04	$4,443.72	$360.95	$4,802.17	$0.65	$2.79	$0.00	$0.00	$0.00

*Loss estimates produced by NESEC using Hazus. Otherwise, loss estimates were projected from reported damages from past natural disaster events including the Flood of 1987, Fire of 1947, 2007 Patriots Day Storm, Ice Storm of 1998, Windstorm of 2017, Salmon River Flood of 2008, Westbrook Landslide of 2020.

Source: County Local Hazard mitigation Plans 2016-2022, NESEC Hazus model reports.

[97] Stafford Act 44 CFR §201.4: https://www.law.cornell.edu/cfr/text/44/201.4

The majority of County Plans utilize a culmination of base population and inflated costs associated with historical events to estimate potential losses in a worst case-scenario across their top three to four hazards. For this reason, estimated potential losses across severe summer weather, drought, earthquake, erosion, and landslide hazards may not be discussed within the County Hazard Mitigation Plans. Many plans also combine severe summer weather with hurricanes without distinguishing potential losses, leading to potential inaccuracies. The York County Hazard Mitigation Plan did not specify potential losses in terms of monetary losses per hazard, so total potential losses may not be accurately represented.

The Northeast States Emergency Consortium (NESEC) produced loss estimates for flood, tropical cyclone, and earthquake hazards using Hazus; where county estimates are unavailable these Hazus values were used instead. Tier 2 hazards (forest pests, harmful algal blooms, air quality) are newly introduced and therefore are not included in county plans predating this 2023 update.

3.21.1 Local hazard vulnerability descriptions

Counties interpret flooding, severe fall/winter weather, Severe Summer Weather, and Wildfires as high priority hazards for nearly all areas in Maine. The following paragraphs represent a composite summary of the findings from the various county plans as well as the knowledge gained in the preparation of this Plan.

Wildfires

All Maine counties are susceptible to wildfires. The primary damage is to homes located in the wildland-urban interface and loss of valuable timberland. A larger percentage of homes in rural counties are located within the wildland-urban interface, however, wildfires are still a major threat to the higher population-density southern counties. The northern counties have vast tracts of undeveloped forestland that could be damaged by wildfires.

Severe Summer Weather

Severe summer storms, in the form of thunderstorms, microbursts, tornadoes, and severe storms can occur in any county in Maine. Damages typically involve the washout of roads, downed utility lines and trees crashing onto homes.

Flooding

In all Maine counties, the greatest amount of damage from flooding events occurs to the state and local roadway system. This is followed in severity and probability with damage to homes and businesses located along the shores of rivers, lakes and the coastal waters.

Severe fall/winter weather

In all Maine counties, severe fall/winter weather can damage overhead utility lines, cause flooding (ice jams and spring melt off), and dump debris and large amounts of snow in the roads. Although the entire state can experience ice storms, it is the southern coastal counties that experience ice storms most often. Conversely, the more northern and western counties experience greater snowstorms.

Hurricanes

Hurricanes tend to downgrade to a Category 1 by the time they reach Maine. These events typically follow either a coastal, diagonal, or northern route. Maine hurricane events have caused widespread inland flooding, coastal storm surge and wind damage. Damages usually range from washed out roads, flooded homes and businesses, downed utility lines, and trees crashing onto homes. All Maine counties can experience the effects of a hurricane.

Erosion/Landslides
Although profiled in only a few county plans, it has become clear through this planning effort, and recent mitigation projects, that coastal erosion and landslides along the coast and in some interior locations are a growing problem. Erosion is affecting Maine's beaches and about half of the state's coastal shoreline. The problem is most severe in coastal York and Cumberland counties in Southern Maine. At approximately $100,000 per 100 feet of mitigation, the challenge for Maine is finding the funding to address the issue.

Drought
Drought has occurred in all counties in Maine. The primary damage is low water wells in all counties, and damages to crop production in the agricultural counties.

Earthquake
Earthquakes have not caused any structural damages in Maine in the past and statistically, are not likely to cause such damage in the future.

3.21.2 Effects of Changes in Development on Loss Estimates
Most of the losses cited above will not change as a result of the development that has taken place since preparation of the county plans. In general, each county has about the same number of roads, bridges, critical facilities, and utility distribution lines in 2023 as it had when the county plans were prepared between 2010 and 2012. These findings from local plans conflict somewhat with changes in development that have been identified in the making of this plan. Please refer to the section below indicating changes in development found by state assessments and provided to county planners for future use.

3.22 Further Resources for Local and Regional Hazard Mitigation Planning Efforts
Climate Mapping for Resilience and Adaptation: https://livingatlas.arcgis.com/assessment-tool/search

Social Vulnerability Index: https://www.atsdr.cdc.gov/placeandhealth/svi/interactive_map.html

Social Vulnerability Index Dashboard:
https://neo.maine.gov/DOE/neo/Nutrition/Reports/NutritionPublicReports.aspx?reportPath=ED534byDistrict

National Risk Index: https://hazards.fema.gov/nri/map

Resilience Analysis and Planning Tool:
https://fema.maps.arcgis.com/apps/webappviewer/index.html?id=90c0c996a5e242a79345cdbc5f758fc6

Changes in Development in Hazard-Prone Areas

Stafford Act 44 CFR §201.4(d) [98]

3.23 Changes in Population

Recent updates for local hazard mitigation plans in Maine use 2020 Census data in the preparation of their risk assessments (Table 3.58). The latest Census data show that Maine grew by 6.9% between 2000 and 2020. However, the growth was not evenly distributed throughout the state. Together, York and Cumberland County (the state's largest county on the basis of population) grew by a total of 62,687 people, or 72% of the state's total growth during the last 20 years. Growth pressures along the coastal areas of these and other counties continued to push seaside housing and lot prices higher, including areas that may be subject to coastal erosion, coastal landslides and hurricane storm surges.

Increasing development around lakes likely has not resulted in an increase in hazard potential because shore land zoning setbacks and floodplain management ordinance elevation requirements do a great deal to mitigate risk in those areas.

Table 3.58: Change in County Population 2000 – 2020 [99]

County	2000 Population	2010 Population	2020 Population	Change 2000-2020	
				#	%
Androscoggin	103,793	107,702	111,139	7,346	7.1%
Aroostook	73,938	71,870	67,105	-6,833	-9.2%
Cumberland	265,612	281,674	303,069	37,457	14.1%
Franklin	29,467	30,768	29,456	-11	0.0%
Hancock	51,791	54,418	55,478	3,687	7.1%
Kennebec	117,114	122,151	123,642	6,528	5.6%
Knox	39,618	39,736	40,607	989	2.5%
Lincoln	33,616	34,457	35,237	1,621	4.8%
Oxford	54,755	57,833	57,777	3,022	5.5%
Penobscot	144,919	153,923	152,199	7,280	5.0%
Piscataquis	17,235	17,535	16,800	-435	-2.5%
Sagadahoc	35,214	35,293	36,669	1,455	4.1%
Somerset	50,888	52,228	50,477	-411	-0.8%
Waldo	36,280	38,786	39,607	3,327	9.2%
Washington	33,941	32,856	31,095	-2,846	-8.4%
York	186,742	197,131	211,972	25,230	13.5%
Maine - Total	1,274,923	1,328,361	1362,359	87,436	6.9%

[98] Stafford Act 44 CFR §201.4: https://www.law.cornell.edu/cfr/text/44/201.4
[99] Decennial Census: 2000, 2010, 2020: https://www.census.gov/data.html

3.24 Changes in Development [S7.]

3.24.1 Building Permits Survey

The US Census Bureau conducts an annual Building Permit Survey [100] covering total units and valuation for each state. In Maine, building permits have increased steadily from 2014 to 2021 (Figure 3.83), with the greatest increase in permits and valuation from 2020 to 2021. This indicates a recent increase in development in Maine, though it does not indicate whether development is occurring in locations with a greater likelihood of exposure to natural hazards. Local building codes, ordinances, and zoning are established to reduce the overall likelihood of exposure.

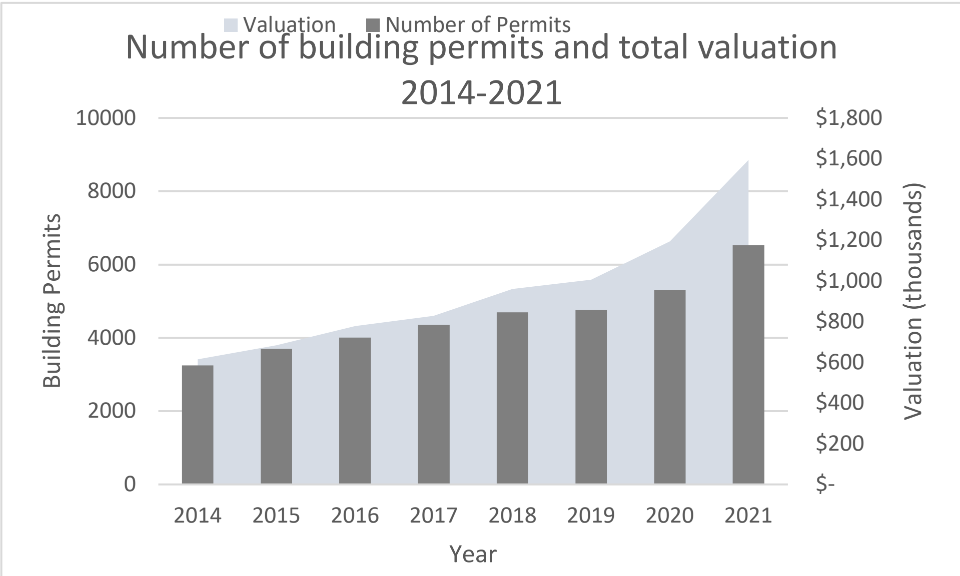

Figure 3.83: Building permits and valuation in Maine 2014 to 2021.

[100] State Annual Building Permit Survey: https://www.census.gov/construction/bps/stateannual.html

3.24.2 Remote Sensing Data

Maine lacks a comprehensive repository of local building permit data; therefore, alternative approaches are required to monitor development in potentially hazard-prone areas. Sentinel-2 10-meter Land Use/Land Cover Timeseries data offer spatial information on changes in land use/land cover through remote sensing techniques. MEMA identified areas of new development by taking the difference in developed area between 2017 and 2021 (using the Clip tool in ArcMap version 10.8.1). There is some assumed error in these calculations due to the spatial resolution of the data, necessary simplification of polygon boundaries during analysis, and to the process of classifying built/developed areas from the return data using supervised deep learning classification algorithms. However, Sentinel-2 is currently the most accurate global remote sensing resource for purposes of tracking land use change [101].

The individual areas of new development are too small to observe on a statewide map, so results are summarized in Table 3.59 and Figure 3.84. Based on this assessment, the total area of new development has increased by 14.5%. The total area of built/developed land covers 2.4% of the entire land area of Maine.

Table 3.59: Trends in development in hazard prone areas determined by use of categorized Sentinel-2 10-meter imagery [102].

Total built/developed area 2021	546,455
Net change in developed area since 2017	79,497
Total % Change	14.5%
Portion of total increase in development by hazard area:	
No Identified Hazard Location	6.7%
% Change in FEMA 100-year flood zone	5.0%
% Change in Wildland Urban Interface	89.0%
% Change in Category 1 Storm Surge	1.0%
% Change in Category 2 Storm Surge	2.4%
% Change in Category 3 Storm Surge	3.9%
% Change in Category 4 Storm Surge	5.6%

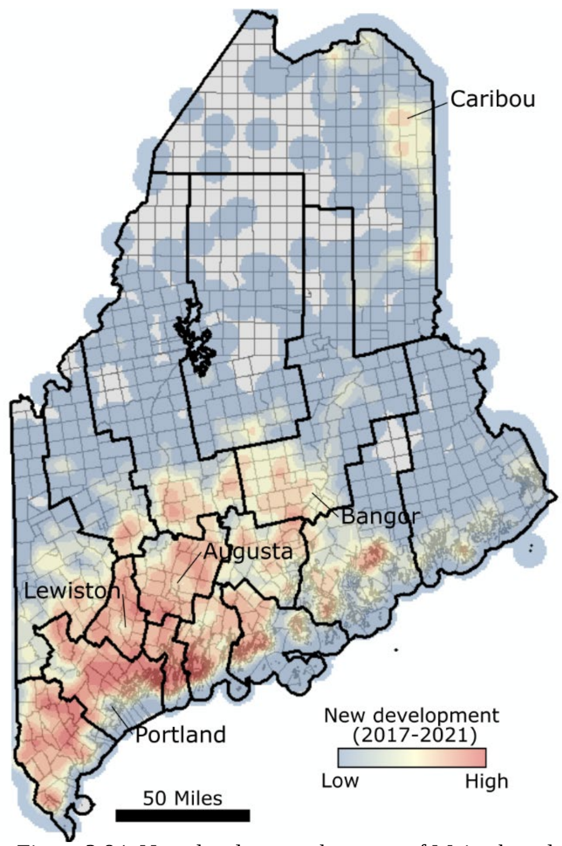

Figure 3.84: New development heatmap of Maine based on Sentinel-2 data, 2017-2021.

Of this change in developed land, 5% occurred within the 100-year flood zone while 1% of development occurred in the area that may be exposed to Category 1 storm surge. The Wildland Urban Interface (WUI) is the area between unoccupied land and human development, where wildfires are more likely to occur, as delineated by the US Forest Service [103]. The majority (89%) of development has occurred in the WUI. This high value makes sense given that the WUI is delineated to encompass developing areas. However, please note that wildfires that have occurred in Maine within the last several decades are relatively small and within the scope of control of local fire districts and the Maine Forest Service.

[101] Xi, Y., Thinh, N. X., & Li, C. (2019). Preliminary comparative assessment of various spectral indices for built-up land derived from Landsat-8 OLI and Sentinel-2A MSI imageries. *European Journal of Remote Sensing*, *52*(1), 240-252.https://www.tandfonline.com/doi/full/10.1080/22797254.2019.1584737

[102] Sentinel-2 10 meter Land Use/Land Cover Timeseries Imagery download site: https://www.arcgis.com/apps/instant/media/index.html?appid=fc92d38533d440078f17678ebc20e8e2

[103] Radeloff, V.C., Helmers, D.P., Kramer, H.A., Mockrin, M.H., Alexandre, P.M., Bar-Massada, A., Butsic, V., Hawbaker, T.J., Martinuzzi, S., Syphard, A.D. and Stewart, S.I. (2018). Rapid growth of the US wildland-urban interface raises wildfire risk. *Proceedings of the National Academy of Sciences*, *115*(13), 3314-3319. http://silvis.forest.wisc.edu/wp-content/uploads/2018/10/Radeloff_2018_PNAS_SI.pdf

3.24.3 Septic permitting data

MEMA's Natural Hazards Planner reviewed septic permitting data[104] for years 2015-2019 including municipalities across the state. More recent data are currently unavailable, and not all municipalities provide data. Septic permits are a good proxy for determining new residential development in a community, but only in rural or suburban locations where public sewer utilities are unavailable. For example, septic permitting is rare in the City of Portland because the sewer district manages most of the jurisdiction. However, many of Portland's suburbs utilize private septic systems.

Septic permits were counted for 96 municipalities, located across several regions in Maine. Of these municipalities the average number of permits was 120 for the 2015-2019 time period. Of these regions, the greatest number of septic permits were registered in the Portland Suburbs, followed by York County. The Town of Gorham had the greatest number of permits with 1,222, followed by Windham with 984, Wells with 474, and York with 448. The Towns of Wells and York are coastal and therefore may experience greater overall vulnerability due to exposure to coastal hazards.

Other regions that saw higher than average permit totals include Midcoast Maine, the Capital Region, Bangor Suburbs, Lewiston Suburbs, and the Ellsworth-Bar Harbor Region. Of these locations, the Town of Sidney (213), Town of Hermon (208), City of Ellsworth (198), City of Augusta (184), Town of Bar Harbor (181), and Town of Poland (172) saw the greatest totals.

Still other regions that were studied were all below the state average. These regions include the Machias-Downeast Region, Caribou-Presque Isle Region, Dover-Foxcroft Region, and Franklin and Somerset Counties. Though some of these areas are forecast to increase in population in the next 5-10 years, these areas have traditionally seen population declines in recent decades and these septic permitting data support that trend.

3.24.4 Changes in Ordinance, Codes, and Policy Guidance [S7.a.3.]

As noted in Section 4 – State Capabilities, there are many state and federal regulations that prevent state assets from ever being constructed in hazard prone areas. Currently all physical development of state infrastructure is intended to improve resilience of our state-run transportation infrastructure, such as the upsizing and increased elevation of roads and coastal assets. MaineDOT guidelines for road stream crossings increase the standards of road infrastructure to mitigate against flood and erosion risks. Improvements in the Piscataqua Bridge were recently completed, reducing overall risk of damage to this important gateway to Maine. Finally, there has been a significant growth in solar farms in Maine, some of which are located on state lands, which may be vulnerable to the hazards profiled in this plan.

According to other state agencies, there have been no other major changes in development that have impacted vulnerability of state assets. As a result, the primary changes in development that impact the vulnerability of state assets is the passing of laws and regulations that incorporate new sea level rise and related hazard trends[105]. The Maine Legislature recently passed laws requiring state regulatory agencies to incorporate sea level rise trends into all current and future coastal development. The state will adhere to these new regulations and enforce them for all further private and municipal development where applicable.

Municipalities are responsible for enacting and updating local floodplain ordinances. The State of Maine offers guidance for this process through State Model Ordinance, though towns are not required to use the model

[104] Maine Septic System Permit Search: https://apps.web.maine.gov/cgi-bin/online/mecdc/septicplans/index.pl
[105] An Act to Help Municipalities Prepare for Sea Level Rise: https://legislature.maine.gov/legis/bills/getPDF.asp?paper=HP0407&item=3&snum=129

ordinance. Recent modifications to guidance have occurred from 2015 to 2019[106] and guidance/templates are offered through the website of the Maine Floodplain Management Program[107].
The most recent update to the State Model Ordinance was applied to cases in Zone A floodplains. The ordinance now allows the applicant to build so that the lowest floor of the building is two feet higher than the highest adjacent grade to the building. This means no below grade crawl spaces or basements should be allowed. In Zone A, flood insurance is rated on the elevation differential between the highest adjacent grade to the building and the lowest floor. The lower the floor is below the highest adjacent grade; the more expensive flood insurance becomes. Amendments located at Article III.H.; Article V.B.2.; and Article VI.F., G., and H.

The Southern Maine Planning and Development Commission (SMPDC) and partners (FB Environmental) have published Municipal Guidance for Coastal Resilience: Model Coastal Ordinance Language for Maine Municipalities to support municipal staff and planning boards with integrating resilience measures into land use regulations[108]. The document provides a menu of land use provisions and resilience measures that municipalities can incorporate into existing ordinances or combine for a standalone coastal resilience ordinance. Suggested measures are intended to integrate with floodplain management ordinances, shoreland zoning, subdivision and site plan review, and other zoning and land use regulations. Importantly. the model ordinance language facilitates land use planning that accounts for climate change impacts, minimizes risk from those impacts, and is designed for flexibility and adaptability to changing environmental conditions.

The Office of the State Fire Marshal is in the process of updating the Maine Uniform Building and Energy Code (MUBEC), which applies to all towns in the State of Maine and is enforced in communities with population exceeding 4,000 as determined by the last decennial census. The update will bring MUBEC into conformance with 2021 International Codes, including updates to building design, construction, inspection, and maintenance standards, as well as general health, safety, and egress standards[109]. Currently MUBEC consists of 2015 International Residential Code, Building Code, Existing Building Code, Energy Conservation Code, and Mechanical Code, in addition to 2016 Standards from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).

3.25 Future Development and Redevelopment Projections [S7.a.]

3.25.1 Risk Implications from Development [S7.a.3.; S7.a.4]
Current trends in development and population increase suggest continued growth in areas already host to new development. These include the Portland suburbs, Midcoast Region, York County, and various locations in Central Maine. These general trends do not specifically indicate a forecasted increase in development in hazard prone areas except potentially for coastal communities with generally greater exposure to wind and storm surge inundation impacts from tropical and extratropical cyclones.

Dallas Plantation, a small community in Franklin County, has experienced a sudden increase in development caused in part by the recent reopening and redevelopment of the Saddleback Ski Resort. Development in this area is taking the form of subdivisions of ski condos in steep sloped areas accessed by dead end roads. These areas will need to be monitored closely to assess a potential increase in risk from erosion, mass wasting, wildfire, severe summer and winter weather, flooding, and many other natural hazards.

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[106] 2015-2019 Changes to State Model Floodplain Management Ordinance: https://www.maine.gov/dacf/flood/docs/ordinances/2015thru2019OrdinanceChanges.pdf
[107] https://www.maine.gov/dacf/flood/whichord.shtml
[108] SMPDC Model Coastal Ordinance: https://smpdc.org/index.asp?SEC=EB353312-031E-4651-8CE5-4B482BABB42A&DE=610B6C36-DB91-4ED7-BD39-96F98BC9EE91
[109] 2021 International Building Code Overview of Changes: https://codes.iccsafe.org/content/IBC2021P2

In 2020, the City of Westbrook experienced a large landslide along the banks of the Presumpscot River. Though damages were not substantial, the city has chosen to move forward with a Presumpscot River Corridor Vulnerability Assessment to determine further mass wasting risks along the banks of the river. The timing for this vulnerability assessment is important because Westbrook is currently one of the fastest growing communities in Maine.

An overall increase in population may equate to a general increase in vulnerability due to a greater total population at risk of natural hazards within a more densely populated area and incomplete coverage of implementation of the latest International Code Council's family of codes. Local emergency services, often already stretched thin, may need greater support in order to continue to function properly. State assets such as parks, protected lands, historic sites, and other public facilities may see greater visitation that, if left unchecked, may lead to degradation of state resources, make them more vulnerable if exposed to natural hazards. For example, as noted in the Erosion Hazard Profile, some of the most visited state parks are fragile coastal beaches that are susceptible to dune erosion and devegetation that can accelerate beach recession if a greater number of visitors end up disturbing the sites.

Contrary to the findings in this State Hazard Mitigation Plan, virtually all Local Hazard Mitigation Plans from Maine jurisdictions note that changes in development have recently been minimal, with no change in natural hazard risks.

Maine's population is aging, which increases overall community vulnerability in the event of a natural hazard. Challenges that increase risk for aging populations include a greater prevalence of chronic conditions, multi-morbidity, cognitive impairment, and medication concerns.

There are positive implications for future policy developments focused on resilience planning and mitigation. Maine has recently incorporated sea level rise projections into regulations associated with coastal development and environmental protection. Further inland, work has begun to improve FIRMs in communities that are in dire need of more accurate and digital floodplain resources. FEMA has also enacted their Risk Rating 2.0 platform, which more accurately prices flood insurance policies based on risk. FEMA's HMA programs are now accepting a greater array or wildfire mitigation projects and there is interest in exploring more opportunities for drought mitigation efforts.

A combination of three years of drought and steady population increase has led some water utilities to consider merging to offer greater overall supply to their municipalities. Gray and Yarmouth water districts intend to apply for a BRIC grant to combine their districts as they will not be able to keep up with growing supply needs on their own. Wiscasset water district may also merge with four other adjacent towns due to increased service population and recent saltwater intrusion into their aquifer.

3.25.2 Maine Population and Demographics Outlook 2018-2028 [S7.a.1.]

Recent development trends in Maine have been strongly influenced by the COVID-19 pandemic, causing growth to increase by more than expected for many parts of the state. The State Economist completed a revised population outlook report[110] to account for this recent shift, replacing a report completed in 2018 to forecast population trends out to 2028. Overall the State Economist projects a population increase of 2.1% from 2018 to 2028. However, Maine's prime working age population is projected to decrease by 7.8% as the state continues to age. The

[110] Maine Population Outlook 2018-2028: https://www.maine.gov/dafs/economist/sites/maine.gov.dafs.economist/files/inline-files/Maine%20Population%20Outlook%20to%202028.pdf

population aged 65 or over is the only population expected to have a net increase from 2018 to 2028. The Baby Boom generation is by far the largest population in the State at 27.4%.

Eleven of sixteen counties are expected to gain population from 2018-2028. York County is projected to see the greatest growth rate of 8.3%. Piscataquis has the largest negative projected growth rate of -6.8%.

Maine County Total Population				Five-year Percent Change			
	2018 (historical)	2023	2028		2018-2023	2023-2028	2018-2028
Androscoggin	107,679	108,473	109,074	Androscoggin	0.7%	0.6%	1.3%
Aroostook	67,327	66,551	65,761	Aroostook	-1.2%	-1.2%	-2.3%
Cumberland	294,065	294,659	295,597	Cumberland	0.2%	0.3%	0.5%
Franklin	30,055	30,494	31,116	Franklin	1.5%	2.0%	3.5%
Hancock	54,911	54,852	54,613	Hancock	-0.1%	-0.4%	-0.5%
Kennebec	122,301	123,805	125,161	Kennebec	1.2%	1.1%	2.3%
Knox	39,836	40,682	41,297	Knox	2.1%	1.5%	3.7%
Lincoln	34,366	34,947	35,320	Lincoln	1.7%	1.1%	2.8%
Oxford	57,790	57,418	57,104	Oxford	-0.6%	-0.5%	-1.2%
Penobscot	151,976	151,509	151,275	Penobscot	-0.3%	-0.2%	-0.5%
Piscataquis	16,830	16,190	15,689	Piscataquis	-3.8%	-3.1%	-6.8%
Sagadahoc	35,656	36,219	36,576	Sagadahoc	1.6%	1.0%	2.6%
Somerset	50,700	51,486	52,181	Somerset	1.6%	1.4%	2.9%
Waldo	39,867	41,313	42,595	Waldo	3.6%	3.1%	6.8%
Washington	31,511	31,902	32,084	Washington	1.2%	0.6%	1.8%
York	206,290	215,424	223,396	York	4.4%	3.7%	8.3%

Two-thirds of the cities and towns in Maine are projected to see population growth between 2018 and 2028. The growth rates in these 305 towns range from 0.1% to 25.6%. Sixteen towns are projected to see no change from 2018 to 2028. The remaining 201 cities and towns are projected to see declines ranging from -0.1% to -45.2%.

Most of the cities and towns projected to see growth are in counties that are also expected to see population growth. For example, all constituent towns in York and Lincoln counties are expected to grow from 2018 to 2028. Conversely, none of the towns in Piscataquis County are expected to see increases, a reflection of underlying demographics of the county, which has the oldest median age in the state.

Maine’s five largest cities are projected to remain so in 2028. However, only Auburn is expected to see growth over the 10-year period. Even though Portland has seen recent growth and Cumberland County is projected to see growth from 2018 to 2028, Portland’s share of Cumberland County has been shrinking, leading to the projected decline. However, city/town projections should be viewed with caution and used in conjunction with local knowledge, as the methodology used here is not as refined as that for the counties and the state.

Demographics and Migration Trends [S7.a.2.]

Maine’s population can only grow through in-migration due to a predominantly older population. From 2016-2019 Maine has seen net domestic migration accelerate, with 6,613 new Mainers from other states in 2019. Strong in-migration in the past four years has contributed to improved population projections and will have a positive impact on Maine’s economy in the future.

Maine’s demographics are similar to those of Vermont and New Hampshire, but quite different from the nation. The chart below compares the demographics of Maine to its Northern New England neighbors (Vermont and New Hampshire), its Southern New England neighbors (Massachusetts, Connecticut, and Rhode Island) and the

United States. Maine compares closely to the rest of Northern New England in its age structure and levels of diversity. There are more pronounced differences when comparing to Southern New England and the United States, which are home to younger and more diverse populations.

Maine's Diversity index was 18.5% in the 2020 Decennial Census, and increase from 10.8% in the 2010 census[111]. The diversity index measures the probability that two people chosen at random will be from different race and ethnicity groups. The three most diverse counties in Maine are Androscoggin (25%), Cumberland (24.8%), and Washington (20.9%). Androscoggin and Cumberland counties are home to the state's two largest cities, both of which have become a new home to immigrants and refugees. Conversely, Washington County is home to large blueberry farms that hire many migrant workers to perform harvesting operations. In 2010, Washington County had the greatest diversity index (16.4%).

The pandemic has resulted in significant short-term changes to migration as well as birth and death rates. For example, the way labor markets interact with geographic boundaries has changed over the past year. The rapid and widespread implementation of remote work made it possible for many workers, particularly those in middle- and high-wage jobs, to work from anywhere. If this trend toward remote work continues in the long-term, it could usher in an era of counter-urbanization, which Maine could benefit from. Maine's lower population density may have been attractive to urban dwellers throughout the height of the pandemic, as it posed less risk than crowded city centers. While migration patterns generally change gradually over time, the COVID-19 pandemic could lead to a sudden, drastic change in migration patterns, however, it remains to be seen what the long-term effects are.

Challenges with tracking development [S7.a.4.]

This plan identifies specific examples of rapid development in some communities in Maine. Unfortunately, there is limited authority at state or county levels to establish a definitive process for monitoring development, requiring us to use several different techniques. For example, most permitting processes are regulated at the municipal level. Municipalities may elect to share this information with the state. As a result, there is no one best way to track development at a scale that is useful for determining whether it is causing a change in natural hazard risks or if it is in an area prone to natural hazards.

County EMAs often take on the responsibility of updating Local Hazard Mitigation Plans on the behalf of their jurisdictions. It is equally challenging for counties to discern these development trends, and often towns indicate that they do not know of any development occurring. It is likely too challenging for local governments to review building permits, septic permits, and other permits indicating new development and determine whether they are posing a risk to the community. As a result, many Local Hazard Mitigation Plans report that development is minimal, that populations are generally decreasing in Maine, and that there is no change in risk. Given that this conflicts with findings in this State Hazard Mitigation Plan, MEMA has begun to provide much greater technical assistance to counties in order to better capture these development trends and verify any perceived changes in risk. Local Regional Planning Organizations may also support these efforts.

[111] Maine Census Facts: https://www.census.gov/library/stories/state-by-state/maine-population-change-between-census-decade.html

State and Local Capabilities

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Section 4 – State Capabilities

Stafford Act 44 CFR §201.4(c)(3)(i)-(ii),(iv)-(v)[1]

4.1 State Mitigation Authorities [S8.a.]

The State of Maine has established several capabilities that directly or indirectly support natural hazard mitigation efforts, several of which have been introduced since the 2018 State Hazard Mitigation Plan (SHMP) update. This section describes State land use laws, building codes, NFIP administration, and mitigation funding. The State Mitigation Funding Capability Assessment Matrix (Table 4.1) and State Mitigation Non-Funding Capability Assessment Matrix (Table 4.2) offer a more detailed inventory of funding, programs, plans, policies, regulations, or practices to support mitigation. These tables include the funding source agency, an evaluation of their effect on mitigation efforts, and the specific hazard addressed.

4.1.1 Land Use Laws and Policies [S8.a.1.]

Maine has several policies related to land use and development in hazard prone areas, described here.

Executive Order Dated March 4, 1968

Evaluation of Flood Hazard in Locating State Owned, State Insured, and State Approved Public Improvements and Other Facilities[2] – This executive order precludes future development of state assets within known flood hazard areas to lessen risks of flood losses in connection with State-owned lands and installations and State insured or State-approved or supported improvements.

Mandatory Shoreland Zoning Act

The Mandatory Shoreland Zoning Act[3] requires municipalities to adopt, administer, and enforce local ordinances that regulate land use activities in the shoreland zone. The shoreland zone is comprised of all land areas within 250 feet, horizontal distance, of the normal high-water line of any great pond or river; upland edge of a coastal wetland, including all areas affected by tidal action; upland edge of defined freshwater wetlands; and all land areas within 75 feet, horizontal distance, of the normal high-water line of certain streams. The purposes are as follows:

- to prevent and control water pollution;
- to protect fish spawning grounds, bird and wildlife habitat;
- to protect buildings and lands from flooding and accelerated erosion;
- to protect archeological and historic resources;
- to protect commercial fishing and maritime industries;
- to protect freshwater and coastal wetlands;
- to control building sites, placement of structures and land uses;
- to conserve shore cover, and visual as well as actual points of access to inland and coastal waters;
- to conserve natural beauty and open space; and
- to anticipate and respond to the impacts of development in shoreland areas.

[1] Stafford Act 44 CFR §201.4: https://www.law.cornell.edu/cfr/text/44/201.4
[2] Executive Order Dated March 4, 1968: http://lldc.mainelegislature.org/Open/Exec/ExecutiveOrders/66_Curtis/1968/eo_1968no01.pdf
[3] Mandatory Shoreland Zoning Act: https://www.maine.gov/dep/land/slz/

Since shoreland zoning regulations are administered and enforced by each municipality through municipal specific ordinances, the local code enforcement officer is typically the first point of contact for shoreland zoning questions. Shoreland Zoning Staff at the Department of Environmental Protection assist municipalities with shoreland zoning related questions and issues, as well as provide technical assistance and training on the shoreland zoning rules.

The Department of Environmental Protection also regulates Stormwater Management[4] and Dam Licensing[5] statutes, regulations and programs. These programs and regulations deal with the man-made causes of stormwater reduction capability and water body retention. The Stormwater Management Law does not apply to small projects, including the construction of single-family dwellings. The Shoreland Zoning Program now requires that significant coastal landslide hazard areas be included in a Resource Protection District in which development is prohibited. This effectively prohibits development in these hazard areas.

Municipal Planning Assistance Program

The Municipal Planning Assistance Program provides land use planning expertise for Maine citizens, municipalities, regional planning organizations, state agencies and the Legislature, and promotes growth management principles in state and local policies, programs, regulations and investments by:

- Providing financial and technical assistance
- Coordinating with State agencies
- Implementing Maine's Growth management Act

Upon request from a town's comprehensive planning committee, the Municipal Planning Assistance Program will collect and share certain state agency data[6] that are appropriate and useful to towns undertaking a local comprehensive planning effort including State and Local hazard Mitigation Plans. The partnership between the Municipal Planning Assistance Program and MEMA is important to ensure that products from Local Hazard Mitigation Plans are presented to municipalities and integrated into comprehensive plans.

Related to this program is Maine Subdivision Law[7], which enforces a process and requirements for the division of a parcel of land for residential use. However, natural hazard mitigation is currently not incorporated into subdivision law.

[4] Maine DEP Stormwater: https://www.maine.gov/dep/land/stormwater/index.html
[5] Maine DEP hydropower state process: https://www.maine.gov/dep/land/dams-hydro/index.html#state
[6] MPAP planning data: https://www.maine.gov/dacf/municipalplanning/comp_plans/planning_data.shtml
[7] Maine Subdivision Law: https://www.maine.gov/dacf/municipalplanning/docs/2011_subdivision_law_presentation.pdf

Growth Management Act

Enacted in 1988, The Growth Management Act establishes a set of State goals providing overall direction and consistency to the planning and regulatory actions of all state and municipal agencies affecting natural resource management, land use, and development. The Legislature declares that, in order to promote and protect the health, safety and welfare of the citizens of the State, it is in the best interests of the State to achieve the following goals:

- To encourage orderly growth and development in appropriate areas of each community and region while protecting the State's rural character, making efficient use of public services and preventing development sprawl;
- To plan for, finance and develop an efficient system of public facilities and services to accommodate anticipated growth and economic development;
- To promote an economic climate which increases job opportunities and overall economic well-being;
- To promote and work to ensure choice, economic diversity and affordability in housing for low-income and moderate-income households and use housing policy to help address disparities in access to educational, occupational and other opportunities;
- To protect the quality and manage the quantity of the State's water resources, including lakes, aquifers, great ponds, estuaries, rivers and coastal areas;
- To protect the State's other critical natural resources including, without limitation, wetlands, wildlife and fisheries habitat, sand dunes, shorelands, scenic vistas, and unique natural areas;
- To protect the State's marine resources industry, ports and harbors from incompatible development and to promote access to the shore for commercial fishermen and the public;
- To safeguard the State's agricultural and forest resources from development which threatens those resources;
- To preserve the state's historic and archeological resources;
- To promote and protect the availability of outdoor recreation opportunities for all Maine citizens, including access to surface waters
- To encourage municipalities to develop policies that accommodate older adults with aging in place and that encourage the creation of age-friendly communities; and
- To plan for the effects of the rise in sea level on buildings, transportation infrastructure, sewage treatment facilities and other relevant state, regional, municipal or privately held infrastructure, property or resources.

United States Coastal Zone Management Act

As required by the United States Coastal Zone Management Act[8] of 1972, PL 92-583, the Legislature directs state and local agencies and federal agencies, with responsibility for regulating, planning, developing, or managing coastal resources, to conduct their activities affecting the coastal area consistent with nine policies. The program is administered by NOAA and there are basic requirements for state partners[9], but it also allows the flexibility needed to design programs that best address local challenges identified individually by each coastal state. Maine's Coastal Program Outlook report indicates coastal hazards as a high priority[10]. Maine's State Coastal Policies are as follows:

- Port and harbor development. Promote the maintenance, development and revitalization of the State's ports and harbors for fishing, transportation and recreation;
- Marine resource management. Manage the marine environment and its related resources to preserve and improve the ecological integrity and diversity of marine communities and habitats, to expand our understanding of the productivity of the Gulf of Maine and coastal waters and to enhance the economic value of the State's renewable marine resources;
- Shoreline management and access. Support shoreline management that gives preference to water-dependent uses over other uses, that promotes public access to the shoreline and that considers the cumulative effects of development on coastal resources;
- Hazard area development. Discourage growth and new development in coastal areas where, because of coastal storms, flooding, landslides or sea-level rise, it is hazardous to human health and safety;
- State and local cooperative management. Encourage and support cooperative state and municipal management of coastal resources;
- Scenic and natural areas protection. Protect and manage critical habitat and natural areas of state and national significance and maintain the scenic beauty and character of the coast even in areas where development occurs;
- Recreation and tourism. Expand the opportunities for outdoor recreation and encourage appropriate coastal tourist activities and development;
- Water quality. Restore and maintain the quality of our fresh, marine and estuarine waters to allow for the broadest possible diversity of public and private uses; and
- Air quality. Restore and maintain coastal air quality to protect the health of citizens and visitors and to protect enjoyment of the natural beauty and maritime characteristics of the Maine coast.

The Growth Management Law, including state Coastal Zone management Act programs, requires an evaluation every four years (MRS 30-A § 4331) of the state, regional and local efforts to achieve the purposes and goals of the law[11].

[8] Coastal Zone Management Act: https://coast.noaa.gov/czm/act/
[9] Maine Coastal Program Federal Consistency Review: https://www.maine.gov/dmr/sites/maine.gov.dmr/files/inline-files/Final_Maine_Guide_to_Federal_Consistency_Review_5thed_update5_rev1_0.pdf
[10] Maine Coastal Program Outlook: https://www.maine.gov/dmr/sites/maine.gov.dmr/files/inline-files/MCP%20Strategic%20Outlook%202021_2025_CZMA%20309%20Assessment_PUBLIC%20VERSION_NOAA_Approved_3.29.23_0.pdf
[11] Growth Management Evaluation 2023: https://www.maine.gov/dacf/municipalplanning/docs/growthmanagementevaluation2023.pdf

Land Use Planning Commission

The Maine Land Use Planning Commission[12] serves as the planning and zoning authority for the unorganized and deorganized areas of the State, including townships and plantations. These areas either have no local government or have chosen not to administer land use controls at the local level. Along with carrying out its planning and zoning responsibilities, the LUPC issues permits for smaller development projects, such as home constructions and camp renovations. For larger development projects requiring Department of Environmental Protection review under the Site Location of Development Law, the LUPC certifies that proposed land uses are allowed and that proposed development activities comply with applicable LUPC land use standards.

The responsibility of serving the unorganized and deorganized areas of Maine and helping guide land use in these areas represents a unique challenge. These areas covers over half the State, encompassing more than 10.4 million acres and include the largest contiguous undeveloped area in the northeast. The unorganized and deorganized areas include several coastal islands and portions of downeast Maine, and stretch across the western mountains and up to the Canadian border. The Legislature created the Commission to extend principles of sound planning, zoning and development to the unorganized and deorganized areas of the State to:

- Preserve public health, safety and general welfare;
- Support and encourage Maine's natural resource-based economy and strong environmental protections;
- Encourage appropriate residential, recreational, commercial and industrial land uses;
- Honor the rights and participation of residents and property owners in the unorganized and deorganized areas while recognizing the unique value of these lands and waters to the State;
- Prevent residential, recreational, commercial and industrial uses detrimental to the long-term health, use and value of these areas and to Maine's natural resource-based economy;
- Discourage the intermixing of incompatible industrial, commercial, residential and recreational activities;
- Prevent the development in these areas of substandard structures or structures located unduly proximate to waters or roads;
- Prevent the despoliation, pollution and detrimental uses of the water in these areas; and
- Conserve ecological and natural values.

The Land Use Planning Commission is responsible for regulating floodplain development in adherence with the National Flood Insurance Program[13].

[12] LUPC: https://www.maine.gov/dacf/lupc/index.shtml
[13] LUPC Land Use Districts and Standards: https://www.maine.gov/dacf/lupc/laws_rules/ch10.html

Natural Resources Protection Act

The intent of Maine's Natural Resources Protection Act[14] is to protect natural resources by requiring permitting for any activity that would be in a natural resource area or adjacent to any body of water. Natural hazards such as flooding or erosion may be more likely to occur in these areas and so the natural Resources Protection Act is relevant to hazard mitigation goals. For example, Coastal Sand Dune Rules[15] require that new coastal development will not increase erosion or flood hazards to sand dune systems.

National Historic Preservation Act

The Maine Historic Preservation Commission (MHPC)[16] implements Section 106 of the National Historic Preservation Act (as amended), which aims to protect historic and cultural properties from unintentional federal action. A federal action can be through a permit, license, or funding. It is the Commission's goal, through the project review process, to protect historic properties in the State of Maine while striking a balance between the public interest in historic preservation and governmental, commercial, and private interests in various initiatives.

When a project uses federal funds or requires a federal or state permit or federal license, the State Historic Preservation Office has the opportunity to comment on the project's effect on historic resources. Section 106 requires federal agencies to consult with the State Historic Preservation Office to:

- Identify historic properties in the project area and determine their eligibility for the National Register of Historic Places
- Consider the effect of their projects on historic properties
- Seek ways to avoid or reduce adverse effects to historic properties

Since the creation of the Maine Historic Resources Inventory in the early 1970s MHPC staff, consultants, federal and state agencies, municipalities, and volunteers have surveyed and recorded over 60,000 above ground resources and identified over 10,000 archaeological sites. This in turn enables us to identify those properties which merit nomination to the National Register of Historic Places and to thereby extend protection to those resources.

Coastal and Estuarine Land Conservation Program

The Coastal and Estuarine Land Conservation Program[17] is authorized as part of the Coastal Zone Management Act to protect coastal lands that are ecologically important or possess other coastal conservation values relevant for hazard mitigation.

From 2002 to 2019, the Coastal and Estuarine Land Conservation Program protected more than 110,000 acres through funds to state and local governments to purchase threatened coastal and estuarine lands or obtain conservation easements, including over 16,000 acres protected as in-kind matching contributions.

Coastal Zone Enhancement Program

Improvements to state and territory coastal management programs are encouraged through the Coastal Zone Enhancement Program[18]. The focus is on nine enhancement areas: wetlands, coastal hazards, public access, marine debris, cumulative and secondary impacts, special area management plans, ocean and Great Lakes resources, energy and government facility siting, and aquaculture. The program was established in 1990 under Section 309 of the Coastal Zone Management Act.

[14] Natural Resources Protection Act: https://www.maine.gov/dep/land/nrpa/
[15] Sand Dune Rules: https://www.maine.gov/dacf/mgs/pubs/online/dunes/dunes-exp.htm
[16] MHPC Project Review: https://www.maine.gov/mhpc/programs/project-review
[17] Coastal and Estuarine Land Conservation program: https://coast.noaa.gov/czm/landconservation/
[18] Coastal Zone Enhancement program: https://coast.noaa.gov/czm/enhancement/

Road Repair and Local Technical Assistance

The Maine Department of Transportation is responsible for the repair, maintenance, and upgrade work to state-owned highways. When funds are available, the Maine DOT upgrades and/or elevates road surfaces to reduce the possibility of flood damage to roads. The Maine DOT also maintains the Maine Local Roads Center which provides technical assistance to municipalities for completing the same actions. There is seldom sufficient funding, either at the state or municipal level, to complete all the roadwork that is necessary.

Maine, however, has made significant progress in recent years by helping communities mitigate flood damages to roads, bridges, ditches, and culverts. The Maine Emergency Management Agency has partnered with the Local Roads Center to sponsor a series of ongoing workshops throughout the state on the use of geo-synthetics to mitigate flood damages to local transportation systems through the stabilization of banks, fill, rip-rap, improvements to road surfaces and other structures. On a continuous, annual basis, the Local Roads Center workshops help local officials understand how they can plan for and implement infrastructure improvements that are likely to withstand the impacts of various hazards including flooding. On the downside, not all communities have been represented at the workshops. There continues to be a constant turnover of elected local officials, including road commissioners, therefore training is not always consistent.

Forest Practices Act

The Forest Practices Act[19] was designed to promote sustainable forestry in order to protect forest management, forest industries and rural communities in Maine. The Forest Practices Act has had many benefits for mitigating wildfire, erosion, flooding, wind damage, mass wasting, and other related hazards. Primarily, it reduces the threat of liquidation harvesting, where forest harvesting is held to three standards: 1) Standards for Regeneration after clearcuts; 2) Performance Standards for Clearcuts; and 3) Separation Zones. This law also requires notification prior to harvest. Related rules and acts include Liquidation Harvesting[20], Statewide Standards for Timber Harvesting[21], Maine Natural Resources Protection Act[22], U.S. Endangered Species Act[23] and Maine Endangered Species Act[24], Maine Boundary Line Law[25], and Tree Growth Tax Law[26].

Maine GeoLibrary Board Statute

The mission of the GeoLibrary was set by legislature in state statutes; Title 5, Part 4, Chapter 163 2001 through 2006[27]. The Board seeks to expand and promote the value of geographic spatial data through widespread distribution and innovative use for the benefit of Maine's citizens. Though it is not a regulatory entity, Maine Geolibrary offers an invaluable capacity for spatial planning through the distribution of relevant public geospatial data. For example, the geospatial datasets used in the risk assessment of this plan and all LHMPs for communities in Maine are disseminated and provided by GeoLibrary.

[19] Forest Practices Act: https://www.sappi.com/maine-forest-regulations
[20] Liquidation Harvesting: http://www.maine.gov/dacf/mfs/publications/rules_and_regs/chap_23_rules.pdf
[21] Statewide Standards for Timber Harvesting: http://www.maine.gov/dacf/mfs/policy_management/water_resources/sws/sws.html
[22] Maine Natural Resources Protection Act: http://www.maine.gov/dep/land/nrpa/
[23] U.S. Endangered Species Act: http://www.fws.gov/endangered/laws-policies/
[24] Maine Endangered Species Act: https://www.maine.gov/ifw/fish-wildlife/wildlife/endangered-threatened-species/legislation.html
[25] Maine Boundary Line Law: http://www.shelterwoodmaine.com/pdf/BOUNDARY_LINES.pdf
[26] Tree Growth Tax Law: http://www.maine.gov/tools/whatsnew/attach.php?id=392600&an=1
[27] Maine GeoLibrary: https://www.maine.gov/geolib/index.html

Community Wildfire Protection Plans and Firewise Communities

Community Wildfire Protection Plans (CWPPs)[28] are collaborative, community-driven frameworks that outline local priorities for wildfire risk mitigation. Since the passage of the Healthy Forest Restoration Act in 2003, thousands of plans have been developed across the United States. The considerable flexibility given to communities as they develop their CWPPs has led to plans that are tailored to their individual needs. There is considerable variation in the scope, scale, and goals of the CWPPs in place across the country.

Maine has approximately 70 CWPPs for communities and home or lake associations. With the newly mandated expiration period of ten years for CWPP's, all but ten CWPP's are out of date. The communities include Thompson Lake in Oxford, Taylor Pond in Auburn, Brightwater-Windburg in Phippsburg, Raymond Neck, Southwest Harbor, Harford's Point near Greenville, Portage lake, Stoneham, Stow, and Albany/Mason Townships.

Many other communities have also become involved in the state Firewise program. These communities are Indian Point in Georgetown (2009), Cushing Island in Portland (2011), Sprucewold in Boothbay Harbor (2011), Pequawket Lake Preservation Association in Limington (2012), Little Diamond Island in Portland (2012), Great Diamond Island in Portland (2013), Bustins Island (2014), Wynburg-Brightwater-Wynburg East in Phippsburg (2017), and Harfords Point near Greenville (2021). Many Firewise and CWPP communities are located in remote areas where wildfire suppression resources are very limited, such as coastal islands and small communities surrounded by forest, suggesting the importance of wildfire mitigation.

The goals of Firewise are to:

- Reduce loss of lives, property, and resources to wildland fire
- Maintain communities in a way that is compatible with our natural surroundings
- The Firewise USA Sites approach emphasizes community responsibility and involvement

The Maine Forest Service's "Wildfire Risk Reduction" program can assist communities in getting federal grants to create new or update obsolete CWPP's. The USDA Forest Service recently created the Community Wildfire Defense Grant (CWDG) program, which uses CWPP's as the "gateway" to obtain federal funding for mitigation projects. The CWDG grant has thousands of dollars available to help with writing CWPP's, forest fuel reduction and improving water supplies for wildland fire suppression. MEMA intends to support these efforts to mitigate local wildfire risks, please refer to Section 6 – Mitigation Strategy.

Dam Safety Program

As noted in Section 3 – Risk Assessment, Maine's Dam Safety Program keeps digital and hard copy records of Emergency Action Plans (EAPs) for high hazard dams. These EAPs include dam breach or failure inundation areas and are kept as digital and hard copy files and are available upon request but are not available through the MEMA website to protect personally identifiable information; Contact Maine's Dam Safety Program Administrator (tara.ayotte@maine.gov) for more information.

[28] CWPP guidelines: https://www.usfa.fema.gov/downloads/pdf/publications/creating_a_cwpp.pdf

4.1.2 Building Codes [S8.a.2.]

The Bureau of Building Codes and Standards (BBCS) was created in 2010 under Maine Statute to provide administrative and technical support to the Technical Building Codes and Standards Board. The BBCS also provides non-binding technical interpretation of the codes for professionals and the public.

Codes are published by the International Code Council to incorporate natural environmental considerations into structure stability and safety. All codes target hazard resistant provisions and address natural environmental issues such as flooding, wind, heavy snow, frost depth, and all other hazards profiled in this plan.

MUBEC

Maine Uniform Building and Energy Code (MUBEC) applies to all towns within the State of Maine. Application of MUBEC is based on population for communities above 4,000 residents based on the most recent decennial U.S. Census. Communities with fewer than 4,000 residents have the option to enforce MUBEC by local action. Smaller communities generally do not have the capacity to enforce MUBEC and so often choose an alternative approach with the use of Third-Party Inspectors.

The Office of the State Fire Marshal is responsible for updating MUBEC and providing training and certification to municipal code enforcement officers but has no regulatory authority or capacity to verify that MUBEC is being enforced for new development. All permitting authority is managed by local code enforcement officers. Management of code enforcement at a local level makes it challenging to confirm the degree to which MUBEC is being enforced with no state-level oversight of permitting and development.

MUBEC is made up of the following codes and standards. Maine has adopted the national model codes and standards with amendments[29]. Currently MUBEC implements codes from 2015. Current codes were adopted after 2015 and before the last SHMP update in 2018. In 2024 the state will adopt the ICC family of codes for 2021. ICC codes are updated every three years.

- 2015 International Residential Code (IRC)
- 2015 International Building Code (IBC)
- 2015 International Existing Building Code (IEBC)
- 2015 International Energy Conservation Code (IECC)
- 2015 International Mechanical Code (IMC)

The following standards are also adopted as part of the MUBEC and are mandatory. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standards:

- 62.1 - 2016 (Ventilation for Acceptable Indoor Air Quality)
- 62.2 - 2016 (Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings)
- 90.1 - 2016 (Energy Standard for Buildings except Low-Rise Residential Buildings) editions without addenda.
- E-1465-2008, Standard Practice for Radon Control Options for the Design and Construction of New Low-Rise Residential Buildings.

In 2021 the Office of the State Fire Marshal also delivered a public service announcement for code officers and fire inspectors to inspect abandoned buildings in their communities due to recent fatalities from fire within an abandoned structure[30].

[29] MUBEC rules and laws: https://www.maine.gov/dps/fmo/building-codes/mubec-rules
[30] Abandoned Buildings Public Service Announcement: https://www.maine.gov/dps/fmo/sites/maine.gov.dps.fmo/files/inline-files/AbandonedBuildingsNotice12172021.pdf

MUBEC Update

The Office of the State Fire Marshal is currently in the process of updating MUBEC as staff to the Technical Building Codes and Standards Board to incorporate 2021 editions of the International Codes which include the IRC, IBC, IEBC, IMC, and IECC. Code updates are published on a three-year cycle. By statute the state is no longer allowed to be more than one full cycle from the most recent published edition of the codes, meaning that Maine's implementation of 2015 codes is currently behind schedule. The update for MUBEC to enforce 2021 codes is anticipated to go into effect by the fall of 2023. This code cycle requirement also pertains to many FEMA and DOE grant programs. Federal agencies are encouraging adoption and enforcement of modern building codes as part of the National Initiative to Advance Building Codes[31].

There has been a proposal in recent legislation to suggest a "study" of the program that is charged with implementing and training to the updated codes[32]. The study will be in a position to consider staffing needs that would best support the State effort to make MUBEC and the codes included as successful as possible. The code family is in place to provide safe and resilient structures for all types of construction in Maine. The hope is that the office would have the resources to complete this task and assist the municipalities in Maine through the Code Enforcement program.

Third-Party Inspector Program

The third-party Inspector Program (TPI Program) can be a valuable asset for smaller communities with part-time code officers. TPIs are certified to review building plans, conduct inspections, and provide reports to the developer and municipality just as a municipal code officer does, but they are able to work within multiple local jurisdictions and "float" between towns as a contracted service that would otherwise have very limited capacity for building inspection and MUBEC enforcement. Currently the TPI program is underutilized, and the Office of the State Fire Marshal is taking steps to encourage greater participation and understanding of the benefits.

History of MUBEC

In 1988, the Legislature was concerned that many small towns did not have code officers and many more did not have the training and knowledge to effectively administer state and local codes and land use regulations. The Legislature decided that, if state goals were to be achieved, there was a need to not only train, but to test and certify code officers for specific competencies. It established, as part of the Growth Management Act, a state-administered program to train and certify code officers. Today, the purpose of the program remains to build and strengthen local capabilities to administer and enforce land use and building ordinances[33].

The Technical Building Codes and Standards Board was created in 2010 under M.R.S. 10 §9722. Duties of the board are to adopt and amend the Maine Uniform Building and Energy Code, identify, and resolve conflicts of the building code and life safety codes. Board meetings are scheduled for the third Thursday of every month.

Technical Advisory Groups (TAGs) are groups of experts that provide the MUBEC Technical Codes and Standards Board with detailed information and recommendations on amendments to the MUBEC. The current TAGs are:

- Fire/Life Safety Codes
- International Building Code
- International Residential Code
- International Energy Code
- International Existing Building Code
- Mechanical/Ventilation
- Sprinklers
- Training and Certification

[31] NABC: https://www.fema.gov/sites/default/files/documents/fema_niabc-progress-report_122022.pdf
[32] Building Code Study Resolve: http://www.mainelegislature.org/legis/bills/getPDF.asp?paper=HP0128&item=2&snum=131
[33] Maine Code Officer Certification Standards: https://www.maine.gov/sos/cec/rules/16/219/219c052.docx

Reporting building code compliance is largely in the hands of municipal code compliance officers and therefore Maine is lacking a standard approach to publicly documenting code compliance across all municipalities. However, some resources provide at least partial documentation for some municipalities[34].

4.1.3 Administration of State NFIP [S8.a.3.]

Maine Department of Agriculture, Conservation and Forestry's Floodplain Management Program (FMP) provides technical assistance, model floodplain ordinances to municipalities, training for local officials and professional groups (e.g., professional land surveyors, insurance agents and realtors), and manages the National Flood Insurance Program (NFIP) within the state. The effort to enact floodplain ordinances in every Maine community has had the greatest effect of loss reduction on real property in the state. Participation in the NFIP is voluntary. Maine has the largest number of communities in New England (490 organized towns and 400+ unorganized townships). 97% of Maine communities participate in NFIP, including the unorganized territories.

The state Land Use Planning Commission is the permitting and enforcement authority in the unorganized areas of the state, but the FMP is the entity that administrates NFIP for Maine. Also, the Municipal Planning Assistance Program works with the Floodplain Management Program to ensure that municipal comprehensive plans (and other planning initiatives) incorporate NFIP compliance in all aspects of local government management. Each of these entities have been housed within the Department of Agriculture, Conservation, and Forestry since the dissolution of the State Planning Office in 2012, which encourages stronger coordination on NFIP administration. As a result, most jurisdictions in Maine (97%) are NFIP compliant.

The US Army Corps of Engineers coordinates with FMP in order to process permitting of any project that is located within the floodplain or potentially impacts flow in streams and rivers. FMP may also coordinate with the Department of Environmental Protection in cases where infrastructure projects are being developed in the shoreland zone, and consequentially in the floodplain. This department also controls permitting for post-disaster debris removal and processing.

The Maine Emergency Management Agency works closely with FMP to document NFIP compliant communities for purposes of local and state hazard mitigation planning as well as mitigation grant applications. MEMA and FMP also collaborate and co-host the annual Flood Safety Awareness Week, in which pre- and post-disaster recovery and mitigation opportunities are promoted. MEMA also collaborates with FMP for the Hazard Mitigation Grant Review Council involving pre- and post-disaster mitigation opportunities, distribution of NFIP information and map updates to county and local emergency managers, facilitating Local Hazard Mitigation Plan updates, and updates to the Interagency Disaster Recovery Plan. MEMA and FMP also participate in Silver Jackets, where multiple organizations can cooperate with efforts to improve NFIP compliance.

The State NFIP Coordinator also coordinates with FEMA Headquarters, FEMA Region I, and FEMA's Hazard Mitigation Assistance programs on joint partnerships and workshops to support NFIP administration in Maine.

The Maine Bureau of Insurance collaborates with FMP to promote local flood insurance policies and incorporate post-disaster data on repetitive loss structures, severe repetitive loss structures. FMP also works with partners to review and provide general technical assistance to state agencies and programs. For example, FMA conduct reviews for Executive Order 11988 for floodplain management to assure that federal agencies also comply with NFIP. Maine Department of Environmental Protection works with FMP to determine whether regulated sites are located in the floodplain and are compliant with NFIP. The Office of the State Fire Marshal also coordinates with FMP to ensure proper land use regulations and NFIP are part of code enforcement officer training. Many additional state and federal agencies cooperate with FMP to encourage municipal NFIP compliance.

[34] CostructConnect building codes list: https://ref.constructconnect.com/building-codes/?search=Maine

Banks and other financial institutions have been instrumental in the success of local floodplain management efforts because they will not issue mortgages for structures in identified flood hazard areas unless the applicant purchases flood insurance.

Maine is also pro-active in promoting the NFIP Community Rating System (CRS), which recognizes communities with good performance in floodplain management. Based on a point system for activities that enhance flood mitigation and floodplain management beyond the minimum NFIP regulations, communities may improve their standing in the NFIP which results in lower flood insurance premiums. Maine has seen a decline in the CRS participation over the last 5 years. Currently, 15 communities are enrolled in the CRS Program. One community is working on entering CRS. This is down from a high of 17 participating communities. CRS communities represent 26% of the state's flood insurance policy base.

The 2010 State Hazard Mitigation Plan recognized that Maine's flood hazard mitigation efforts were somewhat limited by the aging Flood Insurance Rate Maps. Within the last 10 years or so, significant progress has been made.

NFIP recently changed its pricing methodology to a new format named Risk Rating 2.0 that better reflects a property's flood risk. In addition to the new pricing approach, NFIP now allows policy holders easier option to pay insurance online using an app and there are income-based insurance coverage increments for low income households.

Hurricane Surge Inundation Maps have been completed by the Army Corps of Engineers, and MEMA has distributed copies to all affected municipalities. Maine Geological Survey hosts the Sea Lake and Overland Surges from Hurricanes (SLOSH) maps for Maine[35] and the Maine Emergency Management Agency hosts the Hurricane Evacuation Zone maps[36] that were delineated based on storm surge analysis in the 2020 Maine Hurricane Evacuation Study.

4.1.4 Participation in Risk MAP [S8.a.4.]

FEMA's Risk Map Program has produced a number of new, digital floodplain maps that are much more detailed and easier to use than the earlier FIRMS. Updated maps for Waldo, Lincoln, and Sagadahoc Counties became effective in July of 2015 and updated maps for Fort Kent (Aroostook), Hancock, and Knox became effective in July of 2016. Washington County had updated maps go effective in July of 2017. Cumberland and York Counties have had updated preliminary maps issued and anticipate a mid 2024 effective date.

Flood Insurance Rate Maps

Many counties in Maine have recently had their FIRMs updated or are in the process of doing so. For more information on the map status, please see the Flooding profile of the Risk Assessment. New mapping is complete in the Lower Penobscot River Watershed affecting 24 communities. New maps will be released July 19, 2023.

Discovery, which is the first step in the process of producing new maps, has begun in the Dead River Watershed, the Lower Kennebec River Watershed, the Piscataquis River Watershed, the Saco River Watershed, the Upper Androscoggin River Watershed, and the Aroostook and Northern Penobscot River watersheds. Re-delineation of floodplains to 2' contours through the use of LiDAR is taking place in Hancock and Oxford Counties.

The State has also continued to make significant progress updating flood risk maps to support mitigation efforts since the 2013 State Hazard Mitigation Plan. Specific projects include:

[35] Maine SLOSH maps: https://www.maine.gov/dacf/mgs/hazards/slosh/index.shtml
[36] Maine Hurricane Dashboard: https://storymaps.arcgis.com/stories/4fb502bf0ea6467693ff4191a1859e92

Sea, Lake, and Overland Surges from Hurricanes (SLOSH) Maps with support from U.S. Army Corps of Engineers, FEMA, MEMA, and the Maine Geologic Survey potential hurricane inundation from storm surge for Category 1 and 2 hurricanes was modeled in 2013. The U.S. Army Corps of Engineers has since modeled potential storm surge inundation from Category 3 and 4 hurricanes using the same methodology. All 138 jurisdictions that are vulnerable to hurricane storm surge have storm surge inundation maps for Category 1-4 hurricanes.

Sharing Flood Risk Data

Special Flood Hazard Areas are included in municipal planning resource maps, but one problem is that many areas of the State are not covered by digital flood data, or are covered by inaccurate Q3 data, so the information provided to the community may not be available or accurate until FEMA provides new digital FIRMs. This confirms the importance of the Risk MAP program improving flood hazard map data. The Maine Flood Hazard Map Application is provided by FMP to the public for use in mitigation, community planning, and mitigation action development[37]. The FMP also directs the public to the FEMA Map Service Center[38]. The Maine Risk Map, hosted by MEMA for public use, also includes the most recent effective and preliminary FIRMs[39], and all of these resources are used to update Local, Tribal, and State Hazard Mitigation Plans. MEMA's Natural Hazards Planner provides related GIS technical assistance and data analytics for local planning purposes. These resources are promoted through Maine's Flood Safety Awareness Week and at other community emergency management functions. Recent flood map discovery reports, Community Summary of Map Action toolkits, and other resources are available at the FMP website[40]. All requests for NFIP and FIRM information are directed to the State NFIP Coordinator.

LIDAR Mapping

The Maine Office of Geographic Information Systems continues to acquire LIDAR coverage across Maine. The Maine GeoLibrary 2022 South Central LiDAR Project has been collecting new LiDAR for the southwest areas of the State as well as a portion in central Maine. This will be used as FEMA updates maps. LIDAR data has been generated by a consortium of agencies including NOAA and the Army Corps of Engineers for the entire coast and for some inland counties. The state is close to having LIDAR coverage all over the state.

Substantial Damage Administration

Substantial Damage is when a structure has been damaged by 50% of its market value. Coincident is Substantial Improvement, when a structure is improved by 50% of its market value. When this threshold is met, the structure must be brought into compliance with floodplain standards. Communities have the option of instituting a higher standard such as lowering the threshold so that a structure must be brought into compliance at a lower percentage of damage/improvement, or a cumulative threshold such as a limited number of years or the lifetime of the structure.

As the community permits development, the cost of all building materials and labor are recorded. When these improvement costs reach the market value, the code enforcement officer must require the structure to be brought up to floodplain management standards.
The market value can be determined by the community. This value can be the tax assessed or independently assessed value, the resale value, the replacement value, or the cash value, as long as the process is used consistently for all structures in the community.

FEMA requests that the community keep a record of the value of structures located in the floodplain. If there is a large flooding event that affects many structures, this information will make the recovery much easier.

[37] Maine Flood Hazard Map Application: https://maine.maps.arcgis.com/apps/webappviewer/index.html?id=3c09351397764bd2aa9ba385d2e9efe7
[38] FEMA Map Service Center: https://msc.fema.gov/portal/home
[39] Maine Risk Map: https://experience.arcgis.com/experience/202cb7e1444c4881b44b7586136ef9e7/
[40] FMP website: https://www.maine.gov/dacf/flood/mapping.shtml

A Substantial Damage Plan is recommended at the community, county, or state level. The plan can be used to make recovery after a disaster easier. FEMA offers a Substantial Improvement/Substantial Damage Desk Reference, this book provides guidance on the minimum requirements of the NFIP regulations. Refer to Appendix – NFIP Substantial Damage Plan.

4.2 State Mitigation Funding [S8.b.; S11]

4.2.1 State Funding Resources [S8.b.1.]

Since the publication of the 2019 State Hazard Mitigation Plan, there has been improvement in state funding for hazard mitigation both through the Community Resilience Partnership program and increased state allotment of FEMA Hazard Mitigation Assistance Grants. There is also a growing understanding of natural hazard mitigation and the many risks associated with climate change thanks to the plans, programs, and funding opportunities described below.

Community Resilience Partnership

The Governor's Office of Policy Innovation and the Future (GOPIF) launched the Community Resilience Partnership[41] on December 1, 2021. Through grants and direct support to municipal and Tribal governments, the Community Resilience Partnership assists communities to reduce carbon emissions, transition to clean energy and become more resilient to climate change effects such as extreme weather, flooding, rising sea levels, public health impacts, and more.

Communities in Maine can join the Partnership individually, or through a regional group, after completing three simple steps including (1) adopting a resolution of commitment, (2) completing a pair of self-assessments, and (3) holding a community workshop to prioritize initial climate resilience and clean energy actions. Participation in the Partnership is open to all municipalities and federally recognized Tribes in Maine.

Communities with a record of climate action may join the Partnership by reviewing past activities, completing the self-assessments, providing proof of a qualifying community workshop, and passing or amending a resolution. Communities yet to begin climate action can choose to complete the steps on their own but may find greater benefit in working with a service provider and neighboring communities to join the Partnership as a group.

Community Action Grants can support two categories of climate action by communities: (1) actions from the List of Community Actions, an approved list of climate mitigation and adaptation activities that align with the strategies of *Maine Won't Wait*, and (2) other projects proposed by a community that support capacity building, planning, and implementation projects.

These options offer guidance for communities starting on climate plans and incentivize a baseline level of climate action across the state. They also provide flexibility by allowing communities to choose actions from the List that are most relevant and feasible, while also providing support for community climate and energy priorities that may not appear on the List of Community Actions.

The Community Resilience Partnership offers two types of grants:

1. Community Action Grants: Municipal and tribal governments and unorganized territories in Maine who have joined the Partnership may apply directly for funds to support projects that reduce energy use and costs and/or make their community more resilient to climate change effects, such as flooding, extreme weather, drought, and public health impacts.

2. Service Provider Grants: Regional service provider organizations may apply for funds to recruit groups of two to five communities to complete the enrollment activities, join the Partnership, and apply for Community Action Grants.

[41] Community Resilience Partnership: https://www.maine.gov/future/climate/community-resilience-partnership

Coastal Community Grant Program

The coastal community competitive grant program[42] provides funds to towns and regional organizations for projects in the areas of public access, water quality improvement, storm hazard resiliency, and marine-related economic development. Eligible applicants include counties, municipalities, unorganized territories, tribal governments, and Regional Planning Organizations in Maine's coastal zone. Groups of two or more coastal municipalities are eligible to submit a multi-municipal application.

Coastal Community grants include projects in Maine's coastal zone with a focus on the following priority coastal issues, as identified by the Maine Coastal Program[43] and the Maine Climate Council's Maine Won't Wait: A Four-Year Plan for Climate Action[44]:

- Building Community Resiliency to Adapt to a Changing Climate
- Planning for Green Infrastructure
- Preparing for Flooding, Sea Level Rise, Coastal Storms and Storm Surge, and Shoreline Erosion
- Land Use Activity Impacts to Water Quality

The National Oceanic and Atmospheric Administration provides funding for these grants in cooperation with the Maine Department of Marine Resources Maine Coastal Program.

Municipal Stream Crossing Upgrade Grant Program

Since 2015, Maine voters have approved a total of four bonds that fund the upgrade and replacement of stream crossings throughout Maine. These monies support the DEP's competitive grant program that matches local funding for the upgrade of municipal culverts at stream crossings to cost-effectively improve fish and wildlife habitats, reduce flooding, and increase community safety.

4.2.2 FEMA Hazard Mitigation Assistance Pre- and Post-Disaster Programs [S8.b.2.; S11.b.; S11.c.]

While ultimately funded by FEMA, the Hazard Mitigation Assistance (HMA) programs are all administered by the Maine Emergency Management Agency (MEMA) to sub-applicants upon award. MEMA is responsible for the maintenance of the State Emergency Operations Plan (EOP) and State Hazard Mitigation Plan (HMP) which helps state agencies to mitigate against, prepare for, and respond to natural disaster events. The following is a description of FEMA Hazard Mitigation Assistance programs and how they are utilized in Maine.

Since the 2019 SHMP update, growing interest in the HMA program has led to an unprecedented number of applications by municipal, county, and state entities. MEMA has been able to meet this new need for technical assistance and administration of grant programs, taking full advantage of state allotted mitigation funds. These programs are separated as either pre-disaster or disaster grants. Pre-disaster grants are

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[42] Coastal Community Grant Program: https://www.maine.gov/dacf/municipalplanning/financial_assistance.shtml
[43] Maine Coastal Program: https://www.maine.gov/dmr/programs/maine-coastal-program
[44] Maine Won't Wait: https://www.maine.gov/climateplan/

Building Resilient Infrastructure and Communities (BRIC) [Pre-Disaster]

The BRIC program makes Federal funding allocations available annually for State and National Competition, and Tribal set aside. The BRIC program seeks to fund effective and innovative activities that address future risks to natural disasters, including ones involving wildfires, drought, hurricanes, earthquakes, extreme heat, and flooding (Figure 3.1). Addressing these risks helps communities become more resilient. Funding can be used for 1) Capacity-and Capacity-Building (C&CB) activities including hazard mitigation planning; building code adoption & enforcement activities; project scoping to identify mitigation action; and 2) Mitigation Projects including culvert upsizing/drainage improvements, acquisition/demolition, critical infrastructure retrofits/upgrades, and road/bank stabilization. Maine state agencies, local governments, and municipalities have applied for BRIC grants to assist with updating local hazard mitigation plans, project scoping, building code training, and management costs. Funding is only available to those with current FEMA-approved LHMPs.

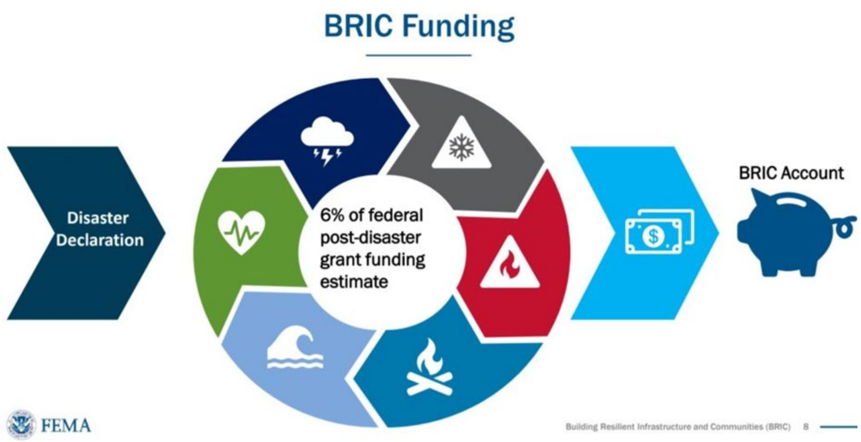


Figure 3.1: BRIC Funding is based on estimates of multi-hazard post-disaster funding.

Building Resilient Infrastructure and Communities (BRIC) Direct Technical Assistance (DTA) [Pre-Disaster]

The Building Resilient Infrastructure and Communities (BRIC) Direct Technical Assistance (DTA) is a no-cost opportunity that gives full support to counties, federally recognized tribes, and municipal partners that may not have the resources to begin climate resilience planning and project solution design on their own. FEMA provides communities climate risk assessments, community engagement, partnership building, mitigation and climate adaptation planning, and BRIC program requests throughout the grant lifecycle. Support for BRIC DTA communities will be given from pre-application activities to grant closeout.

Flood Mitigation Assistance (FMA) [Pre-Disaster]

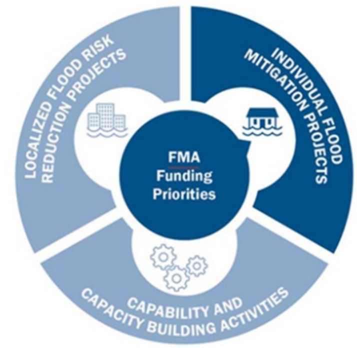


Figure 3.2: FMA funding priorities.

FMA is a nationally competitive grant that provides funding annually to states, local communities, federally recognized tribes and territories (Figure 3.2). Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. FEMA requires state, local, tribal and territorial governments to develop and adopt hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for hazard mitigation assistance projects. Example projects include but are not limited to; property acquisition, structure demolition/relocation, structure elevation, dry floodproofing of historical residential structures or non-residential structures, non-structural retrofitting of existing buildings and facilities, mitigation reconstruction, and structural retrofitting of existing buildings. Funding is only available for NFIP-insured buildings in communities that participate in NFIP[45] and have current FEMA-approved Local Hazard Mitigation Plans (LHMP).

Hazard Mitigation Grant Program (HMGP) [Disaster]

HMGP provides funding to state agencies, local governments, private non-profit organizations, and federally recognized tribes so they can rebuild in a way that reduces, or mitigates, future natural disaster losses in their communities. The program is authorized by Section 404 of the Stafford Act.

HMGP funding is authorized with a Presidential Major Disaster Declaration. A governor or tribal chief executive may request HMGP funding throughout the state, tribe or territory when submitting a disaster declaration. The amount of funding made available to the applicant is based on the estimated total Federal assistance. The formula generally gives 15% of the total federal assistance amount provided for recovery from the presidentially declared disaster and is determined by the FEMA-approved Hazard Mitigation Plan.

Through HMGP, FEMA allows states to access up to 10% and local governments up to 5% of their HMGP award for management and administration costs, there is a lot of opportunity to access funding for mitigation planning and management. Management costs are any indirect costs and administrative expenses that are reasonably incurred by a Grantee or subgrantee in administering a grant or subgrant award.

Maine currently has several HMGP projects including updating local hazard mitigation plans, advance assistance (similar to project scoping), permanent generators, beach erosion and public infrastructure replacements, wastewater treatment facility improvements, culvert replacements, and more. Funding is only available to those with current FEMA-approved Local Hazard Mitigation Plans (LHMP).

[45] FEMA Disaster Assistance for non-participating communities: https://www.fema.gov/sites/default/files/documents/fema_non-participating-communities-fact-sheet.pdf

Public Assistance (PA) Program [Disaster]

FEMA's Public Assistance Program provides supplemental grants to state, tribal, territorial, and local governments, and certain types of private non-profits so communities can quickly respond to and recover from major disasters or emergencies. Section 406 of the Stafford Act is the portion of Public Assistance providing financial support for mitigation efforts. Unlike HMGP, the 406 funding provides discretionary authority to fund mitigation measures in conjunction with the repair of the disaster-damaged facilities, so is limited to declared counties and eligible damaged facilities.

Section 406 is applied on the parts of the facility that were damaged by the disaster and the mitigation measure is intended to directly reduce the potential of future, similar disaster damages to the eligible facility.

Authorization of Section 404 and Section 406 has occurred six times between May 2018 and July 2023 under the following Presidential Disaster Declarations for Maine:

- June 29, 2023 incident: Maine Severe Storm and Flooding (DR-4736-ME)[46]
- Apr 30-May 1, 2023 incident: Maine Severe Storm and Flooding (DR-4719-ME)[47]
- December 23-24, 2022 incident: Maine Severe Storm and Flooding (DR-4696-ME)[48]
- October 30-31, 2021 incident: Maine Severe Storm and Flooding (DR-4647-ME)[49]
- January 20, 2020 to May 11, 2023 incident: Maine Covid-19 Pandemic (DR-4522-ME)[50]
- March 2-8, 2018 incident: Maine Severe Storm and Flooding (DR-4367-ME)[51]

HMGP Post Fire [Disaster]

The Hazard Mitigation Grant Program Post Fire (HMGP Post Fire) program provides funding to help communities implement hazard mitigation measures focused on reducing the risk of harm from wildfire. HMGP Post Fire funding is authorized under Sections 404 and 420 of the Stafford Act, and provides hazard mitigation grant funding to state agencies, local governments, tribes, private non-profit organizations, and municipalities in areas receiving a Fire Management Assistance Grant (FMAG) declaration. Funding under HMGP Post Fire is not limited to wildfire mitigation only and can be used for other hazard mitigation projects.

A Presidential Disaster Declaration is not required to activate funding. The funding amounts are determined by FEMA and are based on a national aggregate calculation of the historical expenditures for FMAG declarations from the past 10 years. This amount is recalculated at the beginning of each fiscal year (October 1-September 30). HMGP Post Fire awards are provided for each FMAG declaration but are aggregated under one award for each Recipient for the fiscal year to lessen the administrative burden and provide all available funding for that fiscal year under one award.

Maine does not currently have an FMAG declaration and therefore does not have any HMGP Post Fire funding available. If FMAG disaster is declared, a NOFO will be released by FEMA. Funding is only available to those with current FEMA-approved Local Hazard Mitigation Plans (LHMP).

[46] DR-4736-ME: https://www.fema.gov/disaster/4736
[47] DR-4719-ME: https://www.fema.gov/disaster/4719
[48] DR-4696-ME: https://www.fema.gov/disaster/4696
[49] DR-4647-ME: https://www.fema.gov/disaster/4647
[50] DR-4522-ME: https://www.fema.gov/disaster/4522
[51] DR-4367-ME: https://www.fema.gov/disaster/4367

Rehabilitation of High Hazard Potential Dams (HHPD) [Pre-Disaster]

HHPD awards technical, planning, design and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams. A state or territory with an enacted dam safety program, the State Administrative Agency or an equivalent state agency is eligible for the grant. In Maine, 25 dams are eligible for HHPD, however the program has never been used in the state.

Note that, though HHPD covers projects that directly cover dam mitigation, other programs may cover hazard dam breach and dam-related flood mitigation for communities below a high hazard or other dam. These programs may include BRIC, HMGP, Community Resilience Partnership, or the Coastal Community Grant Program, among others.

Safeguarding Tomorrow Revolving Loan Fund Program/Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) [Pre-Disaster]

Safeguarding Tomorrow RLF Program/Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act is a revolving loan fund for projects and activities that mitigate the impacts of drought, intense heat, severe storms (including hurricanes, tornadoes, windstorms, cyclones, and severe winter storms), wildfires, floods, earthquakes, and other natural hazards.

Funding is only available to those with current FEMA-approved Local Hazard Mitigation Plans (LHMP). The STORM loan funding is a new program and currently Maine is not participating, however, plans are in place to implement this program.

Legislative Pre-Disaster Mitigation (LPDM) [Pre-Disaster]

The Legislative Pre-Disaster Mitigation Program was established through the Consolidated Appropriations Act of 2023, which authorizes funding for 100 projects for states, federally recognized tribes, and local communities. These funds allow governments to plan for and implement sustainable cost-effective measures designed to reduce the risk to individuals and property from future natural hazards, while also reducing reliance on federal funding from future disasters. Funding is offered in addition to funds provided through other FEMA grant programs for projects that will support growing mitigation needs.

This funding is only available to state agencies, federally recognized tribes, local governments, and municipalities who have connected with a Maine Senator about Congressionally Directed Spending (CDS), or House Representative about Community Project Funding (CPF), and applied through their office. Funding is only available to those with current FEMA-approved Local Hazard Mitigation Plans (LHMP). CDS/CPF applications are moved through the House of Representatives and Senate Appropriations for final approval. Funding that is approved for Legislative Pre-Disaster Mitigation is earmarked to the Department of Homeland Security (DHS) and passed through to FEMA. Those CDS/CPF projects that were earmarked are required to complete the FEMA LPDM application for FEMA when the annual Notice of Funding Opportunity (NOFO) is released.

4.2.3 Other Resources [S8.b.3.]

Refer to Table 4.1 for a list of funding sources supporting Hazard Mitigation Capabilities in Maine, and Table 4.2 for a list of non-funding resources.

There are several effective mitigation programs in place to deal with the impacts of flooding and wildland fires. Additionally, hurricane pre-disaster mitigation and coastal landslide hazard mitigation are handled directly by the Floodplain Management Program via floodplain management ordinance development standards for coastal construction and the adoption of the *FEMA Coastal Construction Manual*[52]. There has been and continues to be a concerted effort to deal with these hazard events. Conversely, there is little mitigation effort in terms of dealing with the impacts of severe winter weather, erosion, severe summer weather, drought and earthquakes. These are dealt with in the all-hazard mitigation programs and efforts shown in the State Mitigation Capability Assessment Matrix.

Through the development of the State Hazard Mitigation Plan, the State of Maine seeks to review and assess the state's financial, legal and programmatic ability to initiate and complete the mitigation efforts which will reduce the impacts of its identified natural disaster hazard events. This assessment of state capabilities is defined by the natural disaster hazard events expected to have the greatest impact on the State of Maine.

[52] FEMA Coastal Construction Manual: https://www.fema.gov/sites/default/files/2020-08/fema55_voli_combined.pdf

4.3 State Mitigation Challenges and Proposed Solutions [S8.c.1]

Despite recent advances in state and local understanding of climate change risks, natural hazard mitigation, and potential funding opportunities, challenges still remain to accomplish mitigation goals. Due to insufficient agency staffing, more technical assistance is needed by county and municipal governments in order for local officials to have a better awareness and understanding of hazard mitigation policies, plans and programs.

The completion and regular update of 16 county hazard mitigation plans and one University of Maine System plan have made it clear that hazard mitigation needs far exceed available resources. These plans have collectively identified over $205,800,000 in hazard mitigation needs, and the majority of projects have been deferred until funding becomes available. Most of these projects will ultimately be paid for through municipal capital improvement budgets. A proposed solution to this funding issue is to further promote FEMA Hazard Mitigation Assistance grants at the municipal level and to ensure that high priority projects are included in the Mitigation Strategy of Local Hazard Mitigation Plans to take better advantage of Section 404 and 406 funding. There is also further potential for MEMA to work collaboratively with other state agencies to promote the benefits of and encourage more state funding for hazard mitigation actions. There have been recent improvements in resilience funding as noted above, but municipalities still require a large amount of communication, training, and technical assistance to take advantage of them.

4.3.1 Natural hazard-specific challenges and proposed solutions

Flooding – In Maine, the greatest amount of damage from flooding events occurs to the roadway system, both state and municipal roads, bridges, culverts and ditches. This is followed in severity and probability with damage to homes and businesses located in inland and coastal floodplains. Many of the capabilities listed in this Plan relate directly or indirectly to mitigating flood hazards.

Severe Summer Weather – The types of severe summer weather in Maine include extreme heat, thunderstorms, and tornadoes. There are no mitigation programs in the State of Maine dedicated solely to lessening the impacts of severe summer weather, excluding that of all-hazards emergency management planning and emergency response agencies.

Tropical Cyclones – Historically, hurricanes either reach Maine as a Category 1 or are downgraded to a Tropical Storm prior to landfall. The damaging effects of hurricane storm surge and flooding have caused major damage in the past. As such, state programs that work to mitigate the effects of flooding have already been described in a preceding section. New building codes make structures more resilient to wind damages. There are no mitigation programs in the State of Maine dedicated solely to lessening the impacts of hurricanes.

Severe Fall/Winter Weather – The second greatest amount of damage caused by a natural disaster hazard event is severe winter weather. Winter storm damages typically involve downed overhead utility lines, flooding from ice jams and melt runoff, and debris in the roads. Currently there is one major state program that works to mitigate the effects of severe winter storms. The Maine DOT is responsible for snow and debris removal on all state highways. Maine DOT garages are well placed around the state to complete this task in a timely manner. Maine DOT also provides technical assistance to municipalities for road debris clearance with the Maine Local Roads Center. At times, the Maine DOT will even assist with the actual debris clearance on select local roads. However, in many cases, a bad winter storm can overwhelm the financial and equipment capabilities of many municipalities.

Wildfire – Although Wildfires normally do not cause a great deal of destruction in Maine, they have a terrible potential, as evidenced in the forest fires of 1947. Land use planning, regulation and building codes in Maine do not deal at all with the wildland-urban interface issues. Mitigation efforts in the state are limited to the Maine Forest Service which performs forest health and monitoring, oversees forest firefighting efforts, and provides financial and equipment grants to local fire departments. Within the past eight years or so, the Maine Forest Service has initiated a community assessment program aimed at helping communities and rural homeowners at the wildland/urban interface better protect their properties from the threat of wildfire. The assessment is a voluntary program that relies on public education to reach its intended audience.

Drought – In response to drought conditions, the River Flow Advisory Commission[53] transitions into the Drought Task Force[54] and convenes to assess drought impacts and report on drought conditions. Due to Maine's nature as a home rule state, and because a large percentage of the population relies on private wells for water supply, the State has limited capability to mitigate drought. A proposed solution is to communicate the benefits of mitigation assistance to local governments and public water suppliers. The Maine Public Utilities Commission oversees that each water supplier has an Emergency Action Plan for times of water shortages, and Maine State Housing Authority can provide emergency assistance in times of drought.

Erosion – Some inland areas and about half of the Maine coast, including many of its beaches, are slowly eroding. Unfortunately, erosion generally goes unnoticed until a home or other structure is threatened or destroyed. Eroding bluffs can be "armored" by the use of sea walls, rocks, riprap or other engineered solutions, but there is no state program to support such efforts. Many individuals cannot afford to pay for the protection needed to save their properties. Unfortunately, federal rules governing Mitigation Assistance are such that municipal applications aimed at helping individuals protect their properties are very competitive. Erosion is increasingly recognized as a major issue by local governments, and there are several capabilities listed in this Plan to plan for mitigation erosion hazards. Municipalities hold permitting requirements regarding the stabilization of eroded areas and protecting structures from erosion. Projects need to be assessed as permitting will depend on the details and circumstances of the situation.

Mass Wasting – Coastal landslides can occur in areas of chronic bluff erosion in areas with mud banks that exceed 20 feet in height. The only mitigation program in the state that deals with landslides is the Shoreland Zoning Program which prohibits development near areas where the landslide hazard is great. There are no mitigation programs for homeowners already located in a landslide hazard area.

Earthquake – The 2006 magnitude 4.3 earthquake in Bar Harbor demonstrates that earthquakes of this size can cause damage. Although the statistical estimate for return time of a magnitude 6.0 earthquake in Maine is approximately 363 years, little monitoring and research have been done to substantiate this estimate. Continued instrumental earthquake monitoring in New England is funded entirely by the federal government, with some in-kind contribution by state agencies. There are no mitigation programs in the State of Maine dedicated solely to lessening the impacts of earthquakes, excluding that of all-hazards emergency management planning and emergency response agencies.

Tier 2 Hazards – These hazards are identified as a growing challenge in Maine that will require further expansion of capabilities. However, programs are in place to monitor each hazard and mitigate or prevent expansion of risk. For example, Maine has emergency orders banning import of out of state firewood and restrictions for transporting firewood within the state to reduce the spread of invasive forest pests[55]. Maine Department of Environmental Protection and Department of Marine Resources[56] monitor freshwater and marine water, respectively, for potential onset of harmful algal blooms (HABs), and there are water quality regulations set in place to mitigate against human-caused sources of HABs[57]. Air quality measures mitigate against hazards associated with poor air quality in Maine[58].

[53] Maine River Flow Advisory Commission: https://www.maine.gov/mema/hazards/river-flow-advisory-commission
[54] Maine Drought Task Force: https://www.maine.gov/mema/hazards/drought-task-force
[55] Maine Firewood Restrictions: https://www.maine.gov/dacf/mfs/forest_health/invasive_threats/firewood.shtml
[56] Marine Biotoxin monitoring in Maine: https://www.maine.gov/dmr/fisheries/shellfish/bureau-of-public-health-programs/biotoxins-in-maine
[57] Maine DEP Lakes program: https://www.maine.gov/dep/water/lakes/index.html
[58] Maine air quality: https://www.maine.gov/dep/air/

4.3.2 Hazard Management Capabilities of the State that have Changed [S8.c.2]

The following depict improvements from the last plan to the State's hazard management capabilities. Other updates are documented throughout the Capabilities Section.

- Staff with GIS mapping, data analytics, and research capabilities brought onto staff;
- Streamlined Public Assistance and Mitigation through combined briefings;
- Revised and streamlined the state HMGP application to make it easier for towns to apply and for the State and FEMA to review;
- Revised and streamlined grant workshops for applicants;
- Utilized, and continue to utilize, the FEMA 406 Program to a far greater extent than it did just a few years ago to implement hazard mitigation projects at less cost to the towns; and
- Partnered with the Local Roads Center to sponsor a series of ongoing workshops throughout the state on the use of geo-synthetics to mitigate flood damages to local transportation systems by stabilizing banks, fill, rip-rap, road surfaces and other structures.
- Other changes that were not related to specific disaster events included:
- Governor's Office of Policy Innovation and the Future has established Community Resilience Partnership with associated mitigation capabilities listed in this section
- State agency hazard mitigation partnerships have been strengthened through the update process for this Plan
- Maine Hurricane Evacuation Study published in 2020 and distributed to coastal counties
- Maine Risk Map[59] developed by MEMA to assist local planning needs
- Shoreland Zoning regulations were strengthened to protect against mass wasting hazards
- Many more resources are now available to support hazard mitigation planning, as shown in the Risk Assessment
- Office of the State Fire Marshal is anticipating adoption of new International Building, Residential, and Energy Conservation Codes. All state code officers are required to be retrained and recertified before they can inspect using the new standards
- New LIDAR data has been gathered along the coast of Maine and for portions of Androscoggin, Oxford and Kennebec Counties
- Coastal bluff erosion and landslide maps were completed for virtually the entire Maine coast as well as some inland areas
- The Maine Geological Survey has studied the potential impacts on Maine from coastal beach/bluff erosion, inland landslides, and tsunamis
- 15 county hazard mitigation plans have been updated and one university system plan has been approved
- More county directors continue to be heavily involved in hazard mitigation work

[59] Maine Risk Map: https://experience.arcgis.com/experience/202cb7e1444c4881b44b7586136ef9e7/

Table 4.1. State Mitigation Funding Capabilities Matrix in Alphabetical Order by Source Agency

Funding Program Name	Source Agency	Description	Hazard/Use
Underserved and Indigenous Microgrids (UIM)	Department of Energy	This funding will support multi-year research, development and demonstration (RD&D) of tools and technologies to enhance the reliability and resilience of the nation's energy infrastructure.	All hazards impacting energy grid
Maintaining and Enhancing Hydroelectricity Incentives	Energy Programs	To make incentive payments to the owners or operators of qualified hydroelectric facilities for capital improvements.	Flood, erosion
Brownfields Projects	Environmental Protection Agency	The Environmental Protection Agency provides technical and financial assistance for brownfields activities that protect human health and the environment, encourage sustainable reuse, promote partnerships, strengthen local economies, and create jobs.	Brownfield sites in hazard areas
Brownfields State & Tribal Response Programs	Environmental Protection Agency	The primary goal of this funding is to ensure that State and Tribal response programs include, or are taking reasonable steps to include, certain elements of an environmental response program and that the program establishes and maintains a public record of sites addressed.	Brownfield sites in hazard areas
Clean Water State Revolving Fund	Environmental Protection Agency	Under the Bipartisan Infrastructure Law, 49 percent of Clean Water State Revolving Fund funds shall be eligible to be grants or 100 percent principal forgiveness loans. The Clean Water State Revolving Fund program provides capitalization grants to States, which will provide a long-term source of State financing for construction of wastewater treatment facilities and implementation of other water quality management activities.	Flood, erosion, HABs/water quality
Clean Water State Revolving Fund- Emerging Contaminants	Environmental Protection Agency	Clean Water State Revolving Fund funding as described in the Clean Water State Revolving Fund program, with eligible projects limited to those that address emerging contaminants, such as PFAS.	Flood, erosion, HABs/water quality
Drinking Water State Revolving Fund	Environmental Protection Agency	States are required to give priority for the use of Drinking Water State Revolving Fund project funds to: Address the most serious risks to human health, ensure compliance with the requirements of the Safe Drinking Water Act, and assist systems most in need on a per household basis according to State affordability criteria. Under the Bipartisan Infrastructure Law, 49 percent of funds shall be eligible to be grants or 100 percent principal forgiveness loans.	Flood, erosion, HABs/water quality
Drinking Water State Revolving Fund Emerging Contaminants (incl. PFAS)	Environmental Protection Agency	Drinking Water State Revolving Fund funding as described in the Drinking Water State Revolving Fund program, with eligible projects limited to those that address emerging contaminants, such as PFAS.	Flood, erosion, HABs/water quality
Drinking Water State Revolving Fund Lead Service Lines Replacement	Environmental Protection Agency	Drinking Water State Revolving Fund funding as described in the Drinking Water State Revolving Fund program, below, with eligible projects limited to lead service line replacement and associated activities related to identification, planning, design, and removal. Under the Bipartisan Infrastructure Law, 49 percent of funds shall be eligible to be grants or 100 percent principal forgiveness loans.	Hazardous materials in natural hazard areas
National Estuary Program Grants	Environmental Protection Agency	Estuary specific needs.	Coastal hazards
Reduce, Reuse, Recycling Education and Outreach Grants	Environmental Protection Agency	Communities across the country are burdened by pollution impacts from inefficient waste management systems. This historic investment will transform public education and outreach regarding how to reduce, reuse, and recycle right.	Flood, erosion, HAB Water quality issues

Funding Program Name	Source Agency	Description	Hazard/Use
Solid Waste Infrastructure for Recycling Infrastructure Grants	Environmental Protection Agency	Communities across the country are burdened by pollution impacts from inefficient waste management systems. This historic investment will transform recycling and solid waste management across the country while creating jobs.	Flood, erosion, HABs/water quality
Superfund	Environmental Protection Agency	Contract, Cooperative Agreement, Interagency. To protect public health and the environment the Superfund program focuses on making a visible and lasting difference in communities, ensuring that people can live and work in healthy, vibrant places.	Superfund sites in hazard areas
Water Infrastructure Improvements for the Nation, Small and Underserved Communities Emerging Contaminants Grant Program	Environmental Protection Agency	This grant program provides grants to public water systems in small and underserved/disadvantaged communities that are unable to finance activities needed to comply with drinking water regulations. Bipartisan Infrastructure Law prioritizes the funding to focus on small and disadvantaged communities in addressing emerging contaminants, including PFAS.	Flood, erosion, HABs/water quality
Fire Management Assistance Grants	Federal Emergency Management Agency	Fire Management Assistance Grant (FMAG) Program is available to states, local and tribal governments, for the mitigation, management, and control of fires on publicly or privately owned forests or grasslands, which threaten such destruction as would constitute a major disaster.	Wildfire
Hazard Mitigation Grant Program Post Fire (Disaster Funding)	Federal Emergency Management Agency	The Hazard Mitigation Grant Program (HMGP) Post Fire assistance is available to help communities implement hazard mitigation measures after wildfire disasters in any area that receives a Fire Management Assistance Grant (FMAG) declaration. Funding is only available to state agencies, federally recognized tribes, counties, private non-profits, and municipal partners with a current FEMA-approved Local Hazard Mitigation Plans (LHMP).	All hazards
Hazard Mitigation Grant Program, 404 Program (Disaster Funding)	Federal Emergency Management Agency	The Hazard Mitigation Grant Program (HMGP), 404 Program, is dependent on a Presidentially declared major disaster. HMGP seeks to plan for and implement mitigation measures that reduce the risk of loss of life and property from future natural disasters during the reconstruction process following a disaster. Funding is only available to state agencies, federally recognized tribes, counties, private non-profits, and municipal partners with a current FEMA-approved Local Hazard Mitigation Plans (LHMP)	All hazards, dam breach hazards
Individuals and Households Program	Federal Emergency Management Agency	FEMA's Individuals and Households Program (IHP) may provide those who qualify with Housing Assistance. This may include direct or financial assistance to help with disaster-caused housing needs. Needs that are not covered by insurance or other sources.	All hazards
Legislative Pre-Disaster Mitigation Grant Program (Robert T Stafford Act Section 203) (Non-Disaster Funding)	Federal Emergency Management Agency	Legislative Pre-Disaster Mitigation (LPDM) Program was established through the Consolidated Appropriations Act of 2023, which authorizes funding for 100 national projects for States, Federally Recognized Tribes, and Local Communities. These funds allow governments to plan for and implement sustainable cost-effective measures designed to reduce the risk to individuals and property from future natural hazards, while also reducing reliance on federal funding from future disasters.	All hazards, dam breach flood
Public Assistance Program	Federal Emergency Management Agency	FEMA's Public Assistance Program provides supplemental grants to state, tribal, territorial, and local governments, and certain types of private non-profits so communities can quickly respond to and recover from major disasters or emergencies. FEMA also encourages protecting these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process (Section 406 Funding).	All hazards

Funding Program Name	Source Agency	Description	Hazard/Use
Safeguarding Tomorrow RLF Program/Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act (Robert T Stafford Act, Sec 205)	Federal Emergency Management Agency	Safeguarding Tomorrow RLF Program/Safeguarding Tomorrow through Ongoing Risk Mitigation (STORM) Act is a revolving loan fund for projects and activities that mitigate the impacts of drought, intense heat, severe storms (including hurricanes, tornadoes, windstorms, cyclones, and severe winter storms), wildfires, floods, earthquakes, and other natural hazards. Funding is only available to those with current FEMA-approved Local Hazard Mitigation Plans (LHMP). Must establish a dedicated source for repayment within their Intended Use Plan. Currently the State of Maine is not participating in this opportunity, only the State of New York and Rhode Island.	All hazards affected by climate change
BRIC Direct Technical Assistance	Federal Emergency Management Agency	The Building Resilient Infrastructure and Communities (BRIC) Direct Technical Assistance (DTA) is a no-cost opportunity that gives full support to counties, federally recognized tribes, and municipal partners that may not have the resources to begin climate resilience planning and project solution design on their own. FEMA provides communities climate risk assessments, community engagement, partnership building, mitigation and climate adaptation planning, and BRIC program requests throughout the grant lifecycle. Support for BRIC DTA communities will be given from pre-application activities to grant closeout.	All hazards, Dams
Building Resilient Infrastructure and Communities (Robert T Stafford Act Section 203(i)) (Non-Disaster Funding)	Federal Emergency Management Agency	FEMA provides federal funds for the Building Resilient Infrastructure and Communities (BRIC) grant program to state agencies, federally recognized tribes, counties, and municipal partners for hazard mitigation activities, including capacity and capability activity types and hazard mitigation projects. BRIC is funded by a 6% set-aside from federal post-disaster grant funding each year. Funding is set aside for States and Tribal communities, while the remainder is left for national competition. Funding is only available to those with current FEMA-approved Local Hazard Mitigation Plans (LHMP)	All hazards, dam breach hazards
Emergency Management Performance Grant Program	Federal Emergency Management Agency	The Emergency Management Performance Grant (EMPG) provides state, local, tribal, and territorial emergency management agencies with the resources required for implementation of the National Preparedness System and works toward the National Preparedness Goal of a secure and resilient nation. The EMPG's allowable costs support efforts to build and sustain core capabilities across the prevention, protection, mitigation, response and recovery mission areas.	All hazards affected by climate change
Flood Mitigation Assistance Grants (National Flood Insurance Act Sec 1366) (Non-Disaster Funding)	Federal Emergency Management Agency	Flood Mitigation Assistance (FMA) is a nationally competitive grant program that provides funding to state agencies, federally recognized tribes, counties, and municipal partners. Funds can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program (NFIP). Funding is only available to those with current FEMA-approved Local Hazard Mitigation Plans (LHMP)	Flood, Dam breach flood
Homeland Security Grant Program	Federal Emergency Management Agency	Though not typically used for hazard mitigation specifically, The Homeland Security Grant Program (HSGP) plays an important role in the implementation of the National Preparedness System (NPS) by supporting the building, sustainment, and delivery of core capabilities essential to achieving the National Preparedness Goal (NPG) of a secure and resilient Nation. The HSGP's allowable costs support efforts to build and sustain core capabilities across the Prevention, Protection, Mitigation, Response, and Recovery mission areas.	All hazards affected by climate change
National Dam Safety Program	Federal Emergency Management Agency	The National Dam Safety Program (NDSP) is a partnership of states, federal agencies, and other stakeholders to encourage and promote the establishment and maintenance of effective federal and state dam safety programs to reduce the risk to human life, property, and the environment from dam related hazards. NDSP provides partial funding to staff the State Dam Safety Engineer and assistant position in Maine.	All hazards affected by climate change

Funding Program Name	Source Agency	Description	Hazard/Use
Rehabilitation Of High Hazard Potential Dam Grant Program	Federal Emergency Management Agency	Rehabilitation of High Hazard Potential Dams provides technical, planning, design, and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams.	Dams
Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) - Discretionary	Federal Highway Administration	PROTECT Grants will support planning, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure.	All hazards affecting transportation
Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation (PROTECT) - Formula	Federal Highway Administration	The PROTECT Formula Program will support planning, resilience improvements, community resilience and evacuation routes, and at-risk coastal infrastructure.	All hazards affecting transportation
Wildlife Crossings Pilot Program	Federal Highway Administration	The Wildlife Crossings Pilot program will support projects that seek to reduce the number of wildlife-vehicle collisions, and in carrying out that purpose, improve habitat connectivity	All hazards affecting transportation
Grid Resilience Program	Governor's Energy Office	Section 40101(d) of the Bipartisan Infrastructure Law (BIL) established the Grid Resilience Formula Grant Program, which will provide a total of $459 million each year for five years to States and Indian Tribes. The funds available under this program are intended to improve the resilience of the electric grid against disruptive events, such as reducing shut offs due to extreme weather or natural disaster. The Governor's Energy Office (GEO) has submitted an application for the State of Maine's combined 2022 and 2023 funding allocations, for a total allocation of $4,364,534. It is currently anticipated that approximately $2.2 million will be allocated to the State of Maine in each of the remaining three program years. Maine tribes will also separately be allocated their own funding amount.	all hazards impacting energy grid
Community Resilience Partnership: Community Action Grants	Governor's Office of Policy Innovation and the Future	Municipal and tribal governments and unorganized territories in Maine who have joined the Partnership may apply directly for funds to support projects that reduce energy use and costs and/or make their community more resilient to climate change effects, such as flooding, extreme weather, drought, and public health impacts.	Coastal hazards
Community Resilience Partnership: Service Provider Grants	Governor's Office of Policy Innovation and the Future	Regional service provider organizations may apply for funds to recruit groups of two to five communities to complete the enrollment activities, join the Partnership, and apply for Community Action Grants.	Natural hazards impacting grid
Community Block Development Grant Disaster Recovery	Housing and Urban Development	In response to Presidentially declared disasters, Congress may appropriate funding for the CDBG Program as Disaster Recovery (CDBG-DR) grants to support cities, counties, U.S. states, and U.S. territories in rebuilding and recovering from disasters. CDBG-DR grants provide housing, infrastructure, and economic revitalization assistance to impacted areas.	All Hazards
Community Block Development Grant - Mitigation	Housing and Urban Development	The CDBG-Mitigation (CDBG-MIT) program is available through the Community Development Block Grant Disaster Recovery Program when a disaster has been Presidentially declared. CDBG-MIT provides additional funding to increase resilience to disasters by lessening the impact of future disasters.	All Hazards
Coastal Community Grant program	Maine Coastal Program	The Coastal Community Grant program is a competitive grant program that provides federal funds for projects in Maine's coastal zone with a focus on priority coastal issues, as identified by the Maine Coastal Program and the Maine Climate Council's Maine Won't Wait: A Four-Year Plan for Climate Action.	Coastal hazards

Funding Program Name	Source Agency	Description	Hazard/Use
Coastal Community Planning Grant	Maine Coastal Program (Marine Resources)	Provides technical assistance to municipalities, advises the legislature, coordinates with other state agencies, and advocates for sound land use planning in Maine coastal areas. The Grant Program (awarded through MPAP) supports implementation of projects that will restore commercial fisheries habitat, mitigate pollution from stormwater run-off, provide data to plan cost-effective storm drainage infrastructure improvements, and vulnerability and adaptation options for historic coastal downtowns subject to flooding from storm surge and sea level rise.	Flooding
Farmer Drought Relief Program	Maine Department of Agriculture, Conservation & Forestry	In August of 2022, Governor Mills signed legislation establishing the Maine Farmer Drought Relief Grant Program to support Maine farmers in identifying and accessing new water sources to overcome the adverse effects of drought conditions. The program is currently not funded. DACF will develop the rules governing this grant in 2023 to be prepared to launch the program when funding is made available.	Drought
Municipal Stream Crossing Upgrade Grant Program	Maine Department of Environmental Protection	Since 2015, Maine voters have approved a total of four bonds that fund the upgrade and replacement of stream crossings throughout Maine. These monies support the DEP's competitive grant program that matches local funding for the upgrade of municipal culverts at stream crossings to cost-effectively improve fish and wildlife habitats, reduce flooding, and increase community safety.	Flood, erosion
Boating Infrastructure Grant	Maine Department of Transportation	This program is administered in Maine by the MaineDOT and funded through the US Fish and Wildlife Service. The BIG program provides grant funds to construct, renovate, and maintain tie-up facilities with features for transient boaters in vessels 26 feet or more in length. The MaineDOT may partner with local governments, private marinas, and others to fund eligible projects.	Sea level rise
Maine Highway Fund	Maine Department of Transportation	Provides funding for highway road maintenance and capital improvements	Flood, erosion
MaineDOT Bicycle and Pedestrian Program Funding	Maine Department of Transportation	This program assists with funding sidewalks, pedestrian crossing improvements, off-road transportation- related trails, downtown transportation improvements, etc. The goal of this program is to improve transportation and safety and promote economic development.	Flood, erosion
Municipal Partnership Initiative	Maine Department of Transportation	This program is intended to help develop, fund, and build projects of municipal interest on the state infrastructure system with MaineDOT as a partner. This program will respond to municipal interests, leverage economic opportunities, and improve safety whenever possible while ensuring the public gets good value for their tax dollars.	All hazards
Small Harbor Improvement Program	Maine Department of Transportation	This program promotes economic development, public access, improved commercial fishing opportunities and works to preserve, and create infrastructure at facilities in tidewater and coastal municipalities. The SHIP program assists municipalities in improving or creating facilities, such as public wharves, piers, landings, and boat ramps. Proposed projects must be on current or proposed public access facilities.	Sea level rise
Maine Infrastructure Adaptation Fund	Maine Jobs and Recovery Plan; ARPA	Climate change poses a serious risk to Maine infrastructure, with damage estimates in the billions of dollars unless action is taken. The Maine Infrastructure Adaptation Fund, administered through the Maine Department of Transportation, will provide grants to municipalities, tribal governments, and others to improve stormwater, drinking water, and wastewater infrastructure from flooding, rising sea levels, and extreme weather. These grants will help protect vital infrastructure most at risk from the effects of climate change, support natural resources, and benefit public safety and emergency management efforts.	All hazards

Funding Program Name	Source Agency	Description	Hazard/Use
Disaster Assistance and Home Repair Loan Programs (HRLP)	MaineHousing	MaineHousing offers low-interest home-repair loans and home-replacement mortgages to homeowners whose homes have been damaged or destroyed in a declared natural disaster. Home repair loans: Eligible homeowners may borrow funds for disaster-related home repairs. Loans are typically offered at low interest rates no payments due and no interest accrual for the first 12 months. Home replacement mortgages: For home replacements, interest rates and terms are typically the same as MaineHousing's First Home program, except of course that you do not need to be a first-time homebuyer.	All-hazards
Land Use Impact Fees	Municipalities	Impact fees are charges assessed against new development that attempt to cover the cost of providing capital facilities needed to serve the development. Their use has been promoted as a way for growth to “pay its own way” by charging at the beginning for infrastructure needed by new development. Impact fees provide one way to help ensure that existing residents will not bear the cost of new facilities necessitated by the new development.	All hazards
Municipal tax dollars	Municipalities	Tax money raised by municipalities to support capital improvement plans	All hazards
Coastal Habitat Restoration and Resilience Grants for Underserved Communities, Under the IIJA	National Oceanic and Atmospheric Administration	Specific set aside from program above for underserved communities	Coastal hazards
Coastal Zone Management (Habitat Restoration and Resiliency)	National Oceanic and Atmospheric Administration	This funding will enable approved coastal programs to protect and restore ecologically significant habitats, including conserving lands that play a critical role in helping communities become more resilient to natural hazards such as storms, flooding, inundation, erosion, tsunamis, sea level rise, and lake level changes.	Coastal hazards
Community-Based Habitat Restoration	National Oceanic and Atmospheric Administration	NOAA’s Community-based Restoration Program provides technical and financial assistance to develop high-quality habitat restoration projects that support our nation’s fisheries, including dam removals and floodplain restoration.	Dams, flood, erosion
National Estuarine Research Reserve System	National Oceanic and Atmospheric Administration	Coastal habitat restoration; coastal habitat restoration planning, engineering and design; land conservation	Coastal hazards
National Oceans and Coastal Security Fund (National Coastal Resilience Fund)	National Oceanic and Atmospheric Administration	National Coastal Resilience Fund invests in conservation projects that restore or expand natural features such as coastal marshes and wetlands, dune and beach systems, oyster and coral reefs, forests, coastal rivers and floodplains, and barrier islands that minimize the impacts of storms and other naturally occurring events on nearby communities. Administered through NFWF.	Coastal hazards
Restoring Fish Passage through Barrier Removal Grants	National Oceanic and Atmospheric Administration	Restoring fish passage by removing in-stream barriers and providing technical assistance pursuant to section 117 of the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 (16 U.S.C. 1891a).	Dams, flood, erosion
Transformational Habitat Restoration and Community Resilience	National Oceanic and Atmospheric Administration	habitat restoration funds through a competitive grants process with the purpose of restoring marine, estuarine, coastal, and Great Lakes ecosystem habitat as well as constructing or protecting ecological features that protect coastal communities from flooding or coastal storms.	Dams, flood, erosion

Funding Program Name	Source Agency	Description	Hazard/Use
Restoring Tribal Priority Fish Passage through Barrier Removal	National Oceanic and Atmospheric Administration	Federal financial and technical assistance to Indian tribes and organizations that represent Indian tribes through formal legal agreements to remove barriers to fish passage for native migratory or sea-run fish. Funding will be used for fish passage that rebuilds productive and sustainable fisheries, contributes to recovery and conservation of threatened and endangered species, enhance watershed health, promotes resilient ecosystems and communities, and increases tribal commercial, recreational, subsistence and cultural practice opportunities.	Dams, flood
National Historic Preservation Fund	National Park Service	The Historic Preservation Fund (HPF) was established in 1977 to provide financial assistance to carry out activities related to preservation. Awards from the HPF are made to States, Tribes, Territories, local governments, and non-profits. The National Park Service's State, Tribal, Local, Plans & Grants Division manages the programs and grant awards funded by the HPF. Today, the fund is the primary Federal funding source for matching grants to State and Tribal historic preservation offices and other eligible recipients to pay for such things as surveys and repair of historic resources, training, nominations to the National Register of Historic Places, and grants to local jurisdictions for their preservation priorities.	All hazards
Save America's Treasures Grants	National Park Service	The Save America's Treasures grant program was established in 1998 to celebrate America's premier cultural resources in the new millennium. The National Park Service administers Save America's Treasures grants in partnership with the National Endowment for the Arts, the National Endowment for the Humanities, and the Institute of Museum and Library Services.	All hazards
Watershed And Flood Prevention Operations	Natural Resources Conservation Services	Provides planning, design and construction of measures that address resource concerns in a watershed.	Flood, erosion
Northern Border Regional Commission	Northern Border Regional Commission	The Northern Border Regional Commission catalyzes regional, collaborative, and transformative community economic development approaches that alleviate economic distress and position the region for economic growth.	Flood, erosion
National Culvert Removal, Replacement, & Restoration Grant (Culvert Aquatic Organism Passage (AOP) Program)	Office of the Secretary (FHWA)	National Culvert Removal, Replacement and Restoration program provides supplemental funding for grants to a State, local government, or an Tribe on a competitive basis for projects that replace, remove, and/or repair culverts or weirs. From MaineDOT: FHWA culvert aquatic organism passage program (sea-run fish), MaineDOT has been working with Maine Department of Marine Resources to identify priority culverts (municipal and state)– The expected award size for projects is $100,000 to $2M per project and a batch of projects could be awarded up to $20 M.	Flood, erosion
Disaster Loans Program	Small Business Administration	The SBA offers disaster assistance in the form of low interest loans to businesses, nonprofit organizations, homeowners, and renters located in regions affected by declared disasters. SBA also provides eligible small businesses and nonprofit organizations with working capital to help overcome the economic injury of a declared disaster.	All hazards
Water Resources Research Act Program 104b state institute grant	State Water Resources Research Institute (University of Maine); USGS	With funding from the U.S. Geological Survey's 104b program, the Maine Water Resources Research Institute (WRRI) in the Mitchell Center for Sustainability Solutions supports research and outreach to enhance the capacity for the sustainable management of water resources across the state. We request proposals for solutions-driven projects in which interdisciplinary research teams collaborate closely with stakeholders and provide support for student training.	Flood, drought, water quality- and quantity-related hazards

Funding Program Name	Source Agency	Description	Hazard/Use
Flood Plain Management Services	U.S. Army Corps of Engineers	Under the authority provided by Section 206 of the 1960 Flood Control Act (PL 86-645), as amended, the U.S. Army Corps of Engineers can provide the full range of technical services and planning guidance that is needed to support effective flood plain management. General technical assistance efforts under this program includes determining site-specific data on obstructions to flood flows, flood formation, and timing; flood depths, stages, or floodwater velocities; the extent, duration, and frequency of flooding; information on natural and cultural flood plain resources; and flood loss potentials before and after the use of flood plain management measures. Types of studies have been conducted under the FPMS program include flood plain delineation/hazard, dam failure analyses, hurricane evacuation, flood warning, floodway, flood damage reduction, storm water management, flood proofing, and inventories of flood prone structures.	Flood
Interagency Nonstructural Flood Risk Management	U.S. Army Corps of Engineers	Under the Floodplain Management Services (FPMS) Program, the Corps provides a wide range of technical services and planning guidance to support effective management of the floodplains associated with the rivers of the United States. Interagency nonstructural efforts that focus on flood risk reduction activities are services that can be provided through FPMS and support non-federal governments while promoting a collaborative approach.	Flood
Corps Water Infrastructure Financing Program	U.S. Army Corps of Engineers	The Corps Water Infrastructure Financing Program (CWIFP) enables local investment in infrastructure projects that enhance community resilience to flooding, promote economic prosperity, and improve environmental quality. Through CWIFP, the U.S. Army Corps of Engineers (USACE) will accelerate non-federal investments in water resources infrastructure by providing long-term, low-cost loans to creditworthy borrowers.	Dams
Community Wildfire Defense Grant Program For At-Risk Communities	U.S. Forest Service	legislative Pre-Disaster Mitigation (LPDM) Program was established through the Consolidated Appropriations Act of 2023, which authorizes funding for 100 national projects for States, Federally Recognized Tribes, and Local Communities. These funds allow go	Wildfire
Firewood Banks	U.S. Forest Service	Financial assistance delivered through Alliance for Green Heat for existing firewood banks.	Severe fall/winter weather
State Fire Assistance	U.S. Forest Service	Through the State Fire Assistance program, the Forest Service supports and assists State Foresters and local communities in building capacity for wildfire prevention, mitigation, control, and suppression on non-Federal lands.	Wildfire
State Forest Action Plans	U.S. Forest Service	To implement State Forest Action Plans. State plans were revised in 2020 for all 59 States and territories—they offer practical and comprehensive roadmaps for investing Federal, State, local, and private resources where they can be most effective in achieving national conservation goals.	Wildfire, forest pests
Volunteer Fire Assistance Program	U.S. Forest Service	The Volunteer Fire Assistance program focuses on increasing the capacity of local fire departments to provide initial attack on wildfires by providing additional firefighter training and assistance to departments with purchasing equipment. Recipients match grants dollar-for-dollar.	Wildfire
Community Development Block Grant	U.S. Maine Department of Environmental Protection Department of Housing and Urban Development	Each year the State of Maine receives a formula allocation of funding from the Department of Housing and Urban Development to be distributed to eligible Maine communities under the Community Development Block Grant Program. In 1982 the State of Maine began administering the CDBG Program to assist units of local government in various community projects in areas ranging from infrastructure, housing, downtown revitalization to public facilities and economic development.	Flood, drought, water quality- and quantity-related hazards

Funding Program Name	Source Agency	Description	Hazard/Use
National Fish Passage Program	United States Fish and Wildlife Service	For the removal of barriers and for technical assistance under the National Fish Passage Program.	Dams, flood, erosion
Earth Mapping Resources Initiative	United States Geological Survey	To accelerate the U.S. Geological Survey topographic, geologic, geochemical, and geophysical mapping; accelerating the integration and consolidation of geospatial and resource data; and providing an interpretation of both critical mineral resources still in the ground and critical mineral resources that may be reprocessed from mine wastes.	General risk mapping
National Geological And Geophysical Data Preservation Program	United States Geological Survey	Implementation provides competitive grants to State Geological Surveys and funds projects executed by U.S. Geological Survey and other Department of the Interior bureaus to preserve, modernize, and make publicly available geological and geophysical data and assets.	General risk assessment
National Resources Conservation Service Watershed Rehabilitation Program	United States Maine Department of Environmental Protection Department of Agriculture	This program authorizes the USDA to assist watershed project sponsors (local governments and soil conservation districts) with technical and financial assistance to plan, design, and rehabilitate aging watershed dams originally built by NRCS.	Dams
Farm Service Agency	US Department of Agriculture	USDA's Farm Service Agency (FSA) offers disaster assistance and low-interest loan programs to assist farmers experiencing drought. Available programs and loans include the Non-Insured Crop Disaster Assistance Program, Livestock Forage Disaster Program, Tree Assistance Program, Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program, Emergency Loan Program, and the Emergency Conservation Program.	Drought
Rural Development Agency	US Department of Agriculture	USDA Rural Development supports rural prosperity in Maine by investing in modern infrastructure such as high-speed internet and water and waste treatment systems. We help eligible rural Mainers buy or rent affordable housing, and we can partner to build or improve essential community facilities such as hospitals, libraries, and schools.	All hazards
Conservation Innovation Grants	US Department of Agriculture National Resources Conservation Service	Conservation Innovation Grants (CIG) is a competitive program that supports the development of new tools, approaches, practices, and technologies to further natural resource conservation on private lands.	All hazards

Table 4.2. State Mitigation Non-Funding Capabilities Matrix in Alphabetical Order

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Application Guide for the 2022 Sea Level Rise Technical Report	Plan	National Oceanic and Atmospheric Administration	Provides guidance for planning efforts in response to NOAA's 2022 SLR tech report	Sea level rise
Aquatic Resources Umbrella Mitigation Banking Instrument	Program	Maine Department of Transportation; Bureau of Maintenance and Operations	Directs and coordinates compensatory mitigation for impacts to wetland resources caused by state transportation projects. This mitigates the loss of wetlands but is not mitigation of a hazardous area.	N/A
Bureau of Public Health Programs	Program	Maine Department of Marine Resources	DMR reduces risk from HABs and other marine water quality/sanitation hazards through administration of public health programs, including marine biotoxin monitoring, shellfish dealer certification, shellfish growing area classification, the Nearshore Marine Resources Program, water quality volunteer monitoring, and environmental permit review.	HABs
Capital Improvement Projects (MaineDOT work plan)	Program	Maine Department of Transportation; Bureau of Maintenance and Operations	Potential to incorporate mitigation principles based on scope of capital improvement project and funds available to project.	All-hazards
Clean Air Act, air quality programs	Program	US EPA, Maine Department of Environmental Protection	The Maine Department of Environmental Protection implements air quality programs under the Clean Air Act and state law. The Department monitors air quality across the state, licenses emissions from larger facilities, and conducts compliance assistance and inspection visits. The Department collaborates with local, state, and federal agencies to plan and implement strategies to protect Maine's air quality.	Air Quality
CoastWise	Program	Maine Department of Marine Resources, Maine Coastal Program	CoastWise provides a voluntary set of best practices, decision-making tools, and path for designing safe, cost-effective, ecologically supportive, and climate-resilient tidal crossings.	Coastal
Community Resilience Partnership	Program	Governor's Office of Policy Innovation and the Future	Through grants and direct support to municipal and tribal governments and unorganized territories, the Community Resilience Partnership assists communities to reduce carbon emissions, transition to clean energy, and become more resilient to climate change effects such as to extreme weather, flooding, rising sea levels, public health impacts, and more.	All hazards influenced by climate change
Dam Safety Program (Law 37-B, Chapter 24)	Program	Maine Emergency Management Agency (Department of Defense, Veterans, and Emergency Management)	Inspects existing dams and reservoirs to rate their hazard potential based on downstream vulnerabilities. Assists dam owners develop EAPs to minimize the impacts of dam failure.	Flooding

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Defensible Space Chipping Program	Program	Maine Forest Service	The Maine Forest Service is offering a FREE "Hazardous Fuels Reduction Chipping Program" to communities who have initiated wildfire risk assessments and are working towards completing a Community Wildfire Protection Plan. For more information, please contact their local Forest Ranger or call 2874989.	Wildfire
DEP Performance Partnership Agreement and Priorities and Commitments	Program	Maine Department of Environmental Protection	This agreement is the detailed three-year plan that the Department and the US Environmental Protection Agency (EPA) negotiate to accomplish mutual long-term goals for environmental protection. Annual progress reports are submitted by the Department to EPA, and when necessary the work plan is adjusted to address emerging issues.	All-hazards
Digital Coast	Map/Tool	National Oceanic and Atmospheric Administration	Provides data, tools, and training recommended for communities to address coastal issues.	Sea level rise
Disaster Management Program	Program	American Red Cross	Provides emergency relief immediately following disasters. Not directly applicable to mitigation.	All-hazards
Disaster Preparedness Information & Education	Practice	Maine Emergency Management Agency (Department of Defense, Veterans, and Emergency Management)	Provides educational materials to support the four phases of emergency management: mitigation, preparedness, response, and recovery. Coordinates the protection of Maine citizens from All-Hazards emergencies; coordinates disaster mitigation, preparedness, response, and recovery actions; and assists county and local governments in protecting life and property. MEMA has been effective in building hazard mitigation partnerships with other agencies, counties, and towns.	All-hazards
Drought Task Force	Program	Maine Emergency Management Agency (Department of Defense, Veterans, and Emergency Management)	Convenes when drought conditions emerge to assess water conditions and their impacts statewide. Focus points are on drought impact monitoring, promoting assistance programs, and encouraging drought mitigation grants. Co-chaired by MEMA and USGS, the DTF is composed of representatives from state and federal agencies and the University of Maine.	Drought
Enhanced 911	Program	Emergency Services Communication Bureau (Public Utilities Commission)	Allows for the location identification of mobile users resulting in a more efficient and effective response effort. The enhanced system directly relates to reducing negative impact associated with natural hazards to people.	All-hazards
Erosion & Sediment Control	Policy	Land and Water Programs (Environmental Protection)	Requires anyone filling, displacing, or exposing soil or other earthen materials to take measures to prevent unreasonable erosion of soil or sediment beyond the project site or into a protected natural resource.	Erosion

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Executive Order dated March 4, 1968	Policy	Governor’s Office (Executive Branch)	Executive Order dated March 4, 1968, precluding the uneconomic, hazardous, or unnecessary use of flood plains in connection with state facilities. Prohibits new state facilities from being located in flood plains.	Flooding
Federal Excess Property Program	Program	Maine Forest Service (Agriculture, Conservation, and Forestry)	Allows MFS to acquire federal surplus property and loan or transfer it to Maine fire departments, thereby encouraging state-supported land use/development practices.	Wildfire
FireWise USA	Program	Maine Forest Service	Goals of FireWise UAS: Reduce loss of lives, property, and resources to wildland fire, maintain communities in a way that is compatible with our natural surroundings, emphasize community responsibility and involvement.	Wildfire
Forest health and Monitoring	Program	Maine Forest Service	The Division of Forest Health & Monitoring was established in 1921 to protect the forest, shade and ornamental tree resources of the state from significant insect and disease damage and to provide pest management and damage prevention for homeowners, municipalities, and forest landowners and managers, thereby preserving the overall health of Maine's forest resources.	Forest Pests
Forest Protection Division	Program	Maine Forest Service (Agriculture, Conservation, and Forestry)	Manages Maine’s forests to protect homes and forest resources from wildfire and to respond to disasters and emergencies. Oversees the pre-suppression, suppression, and investigation of Maine forest fires. Provides trained and equipped Forest Rangers. MFS has been very effective in its wildfire prevention efforts as noted in the Wildfire hazard profile.	Wildfire
GeoLibrary Data Catalog	Program	Maine Office of GIS and Maine Geolibrary Board	Provides public access to numerous GIS resources useful for hazard mitigation planning	All-hazards
Guidelines on Flood Adaptation for Rehabilitation Historic Buildings	Guidance	National Park Service	These Guidelines are designed to provide information on adapting historic buildings to be more resilient to flooding in a manner that will preserve their historic character and meet The Secretary of the Interior's Standards for Rehabilitation.	Flood
Hazard Mitigation Planning	Program	County and local Emergency Management Agencies	In Maine, emergency management is coordinated regionally by Emergency Management Agencies (EMAs) in each of our 16 Counties. County Directors are appointed by their respective County Commissioners, and funded in part by County, and in part by federal funds provided through MEMA. County EMAs provide an invaluable link between the almost 500 cities and towns in Maine, and the State. They provide support and leadership in preparedness, response, recovery, and mitigation to their local, business and volunteer partners.	All-hazards

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
High Hazard Potential Dams		Maine Emergency Management Agency (Department of Defense, Veterans, and Emergency Management)	The Rehabilitation of High Hazard Potential Dams Grant (HHPD) awards provide technical, planning, design, and construction assistance in the form of grants for rehabilitation of eligible high hazard potential dams. A state or territory with an enacted dam safety program, the State Administrative Agency, or an equivalent state agency, is eligible for the grant. Maine has not yet taken advantage of this program.	Dam-related hazards
Historic Properties and Climate Change Planning in Maine	Plan	Maine Historic Preservation Commission	The future of historic properties is often overlooked in the complex process of planning for the effects of climate change, yet they are also subject to the effects of erosion, high water, intense storms, high winds, and wildfire. Much like parks or schools or town buildings, a community's historic properties help create a unique sense of place. Community members, municipal officials, planners, preservationists, scientists, and visionaries all need to be part of the discussion of how - and which – historic properties can be protected. Local values, demographics, culture, and economics underlay the available and feasible options.	All-hazards
Historic Properties Toolkit	Map/Tool	Maine Historic Preservation Commission	This GIS map depicts the locations of properties in Maine listed in the National Register of Historic Places, National Historic Landmarks, or museums/archives along with layers depicting potential threats to these properties including flood, fire, sea-level rise, storm surge. The map also shows current NOAA hazards and watches. The MHPC has developed this web application so that as communities, regions, officials, and citizens create plans to deal with changing climate, storms, erosion, or other physical threats, historic properties, museums, or archives within the subject areas can be identified, evaluated, and their futures contemplated. As irreplaceable, authentic touchstones to our past, these properties merit specialized consideration in the planning processes in order to protect the historic characteristics and associations that give them meaning.	Flood
Home Fire Risk Assessment	Program	US Forest Service and Maine Forest Service	Residential Fire Risk Assessment offered by Maine Forest Rangers	Wildfire
Hydropower & Dams	Policy	Maine Department of Environmental Protection, Land and Water Programs	Federal and State processes may permit construction, reconstruction, or structural alteration of new or existing hydropower projects to ensure water quality standards are met.	Flooding

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Land Use Planning Commission (LUPC)	Program	Maine Department of Agriculture, Conservation & Forestry, Bureau of Resource Information and Land Use Planning	Planning and zoning authority for the 10.4 million acres of unorganized territory in Maine. By regulating development in the Unorganized Territory (UT), the LUPC ensures that development is either directed away from hazard areas or that proposed activities in hazard areas meet applicable development standards. LUPC continues to enforce strong standards for development in the UT, including inappropriate floodplain development. However, the agency's work is hamstrung by the lack of detailed flood data throughout the UT.	Flooding
Maine Climate Council (MCC)	Program	Governor's Office of Policy Innovation and the Future; Department of Environmental Protection Co-Chairs	On June 26, 2019, the Governor and Legislature created the Maine Climate Council, an assembly of scientists, industry leaders, bipartisan local and state officials, and engaged citizens. The goal of MCC is to reduce carbon emissions, build climate-resilient communities, enhance economic opportunity, and advance equity in Maine. The guiding principles relate directly to goals within the State Hazard Mitigation Plan.	All hazards influenced by climate change
Maine Climate Hub and Maine Adaptation Toolkit	Program	Maine Department of Environmental Protection, Sustainability Programs	A centralized climate directory providing decision makers and assistance providers with the resources needed to become more resilient in the face of a changing climate.	All hazards influenced by climate change
Maine Coastal Mapping Initiative (MCMI)	Program	Maine Department of Marine Resources, Maine Coastal Program	Acquires data about the sea floor and oceanic environment to increase Maine's ability to model hazards and environmental changes relevant to mitigation planning among other initiatives not related to hazard mitigation.	Coastal
Maine Coastal Program	Program	Maine Department of Marine Resources, Maine Coastal Program	Partnership among local, regional, and state agencies for the purpose of managing Maine's coastal resources for the public benefit.	Coastal
Maine Community Resilience Workbook	Guidance	Maine Climate Council	The workbook is intended for municipalities and service providers contracted by municipalities/communities for climate change and climate change-related projects. This workbook assists in the efficacy of people, communities, and networks in Maine that are taking climate actions and supports timely information sharing across those actors.	Climate change hazards
Maine Cooperative Snow Survey	Program	Maine Department of Agriculture, Conservation & Forestry, Bureau of Resource Information and Land Use Planning	The Snow Survey collects, interprets, and distributes information on the depth and water content of Maine's snowpack in the late winter and early spring to assess the extent/location of annual spring flood risk. MGS prepares maps showing the water content and snowpack across the state; USGS and MGS analyze the data collected by private organizations as well as state and federal partners.	Flooding

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Maine Floodplain Management Program (includes Risk MAP Program)	Program	Maine Department of Agriculture, Conservation & Forestry, Bureau of Resource Information and Land Use Planning	Works with individuals, communities, and professionals to reduce the risk of flooding. Administers the NFIP in Maine. Provides technical information including flood risk maps and model ordinances, and inventories vulnerable structures statewide. Provides training on reading and using flood maps, ordinance interpretation, and floodplain management. Provides interagency reviews of proposals in the floodplain for state and federal agencies. Reviews local ordinances for compliance with the NFIP standards. This program has been effective, as evidenced by the high rate of municipal participation and the relatively low number of repetitive loss properties.	Flooding
Maine Forest Action Plan	Plan	Maine Forest Service	A comprehensive analysis of forest-related conditions, trends, threats, opportunities, and strategies to achieve Maine's forest policy goals	All-hazards
Maine Geological Survey maps and planning assistance	Program	Maine Department of Agriculture, Conservation & Forestry, Bureau of Resource Information and Land Use Planning	The Maine Geological Survey collects data and produces reports about groundwater, mineral resources, surface deposits and bedrock materials, stability of coastal properties, and geologic hazards such as storm surge, sea level rise, floods, landslides, erosion, earthquakes, and tsunamis. By researching past geologic events and mapping Maine's geology, MGS's efforts support risk assessments for the purposes of this Plan as well as for local jurisdictions and the private sector which are the basis for recurrence interval estimates. The MGS website has been effective in providing accessible relevant information regarding geologic hazards. MGS's hazard maps effectively help communities and stakeholders understand their vulnerability to the hazards, including storm surge, sea level rise, erosion, earthquakes, and erosion.	Geologic Hazards
Maine Housing Characteristics	Practice	MaineHousing	Housing Characteristics is an interactive tool that provides the reader with Census data on the financial and structural characteristics of residential housing in Maine, counties and towns. Affordability indexes provide a statewide, county, and local breakdown of home buying and rental affordability. The affordability calculation is based on the ratio of area median home prices and median two-bedroom rent costs to area median household and rental household incomes. These data can provide the reader with some basic understanding of housing equity in the selected community: its availability, affordability, and need.	All-hazards: equity
Maine Interagency Climate Adaptation (MICA) Work Group	Program	Sustainability Programs (Environmental Protection)	No longer active, but hosts reports from its active period. Established an interagency effort to coordinate state climate change adaptation activities. Coordinated by DEP with representatives from eight state agencies, whose efforts led to establishment of the Maine Climate Council. Members consolidated resources for adaptation, resilience, and mitigation, and collaborate on opportunities for cross-agency projects.	All hazards

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Maine Local Roads Center	Program	Maine Department of Transportation, Bureau of Maintenance and Operations	Provides training, technical assistance, and information to municipalities for constructing, maintaining, and managing local roads & bridges. Training brings to local officials the most up-to-date information on managing local infrastructure.	All-hazards
Maine Municipal Infrastructure Planning Toolbox	Plan	Maine Department of Transportation, Environmental Office	This tool brings together resources to inform local road stream crossing decisions using information gathered by state and federal agencies, conservation organizations, and educational institutions. It is available to anyone considering a culvert, bridge, or road project.	Flood; erosion
Maine Natural Areas Program	Program	Maine Department of Agriculture, Conservation & Forestry, Bureau of Resource Information and Land Use Planning	While the Natural Areas Program's priority is not hazard mitigation, their efforts to preserve wetlands and prevent floodplain development lessens susceptibility to sea level rise and flooding and mitigates the impacts of those events. Inventories lands that support rare and endangered plants and rare natural communities and ecosystems. Inventories and maps Maine's tidal marshes. Models' marsh migration and susceptibility to sea level rise and storm surge to support coastal resilience.	Flooding
Maine Risk Map	Practice	Maine Emergency Management Agency (Department of Defense, Veterans, and Emergency Management)	This map provides information on natural hazard locations and overlays with identified basic critical infrastructure/community asset data for the State of Maine. These GIS resources provide the basis for the Risk Assessment for this Hazard Mitigation Plan. The map was developed by the Maine Emergency Management Agency for use in updating the 2023 State Hazard Mitigation Plan. Follow the link to access source data used in this Risk Assessment.	All-hazards
Maine Won't Wait: a Four-Year Plan for Climate Action	Plan	Governor's Office of Policy Innovation and the Future; Department of Environmental Protection Co-Chairs	In June 2019, Governor Janet Mills signed LD 1679 into law, with strong support from the Maine Legislature, to create the Maine Climate Council. The Council — an assembly of scientists, industry leaders, bipartisan local and state officials, and engaged citizens — was charged with developing this four-year Climate Action Plan to put Maine on a trajectory to decrease greenhouse gas emissions by 45% by 2030 and 80% by 2050 and achieve carbon neutrality by 2045. The Plan also addresses actions to mitigate against climate change hazards.	Climate change hazards
MaineDOT Family of Plans	Program	Maine Department of Transportation	MaineDOT's Family of Plans is a set of multimodal and modal transportation planning documents that lay out the department's vision for Maine's transportation system, present recommendations for how to achieve the vision, and lay out the path to implementing them.	All-hazards

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
MaineDOT's Climate Initiative	Program	Maine Department of Transportation, Environmental Office	To lower the risk of future damage to infrastructure, MaineDOT has taken a number of steps to reduce vulnerability to climate change for transportation assets and other infrastructure. These include design guidance for bridges and culverts, adaptation projects, design mased on sea level rise models, and an ongoing vulnerability assessment.	All-hazards
Maine's Climate Future - 2020 Update	Report	University of Maine Climate Change Institute	Maine's Climate Future 2020 builds on the Maine's Climate Future 2009 and Maine's Climate Future 2015 reports and the Coastal Maine Climate Futures report. This update demonstrates the progression of accelerating change in the climate in Maine and its effects, reflecting dramatic evidence for accelerating climate change around the globe with the often dire consequences of those changes. This report looks at examples of evidence of effects in Maine drawn from the scientific literature and news media accounts of Maine people and their experiences.	Climate change hazards
Manufactured Housing Board	Program	Maine Office of Professional & Financial Regulation	Manufactured Housing Act: To provide and enforce, with respect to its licensees and political subdivisions, uniform performance standards for construction and installation of manufactured housing that ensure durability and safety of manufactured housing	All-hazards
Model Coastal Resilience Ordinance Language	Guidance	Southern Maine Planning and Development Commission	The overall objective of the project is to develop a model coastal resilience ordinance that offers Maine's coastal municipalities and their residents increased protection from threats posed by climate change such as sea level rise, flooding, coastal erosion, and storm surge. The ordinance will focus not only on built infrastructure, but also natural resources and the environment in order to increase the overall resiliency of coastal municipalities.	Coastal hazards
Model Ordinance Language for Stormwater Management: Erosion and Sedimentation Control Standards	Guidance	Southern Maine Planning and Development Commission	The purpose of the project is to develop a regional checklist and standards document for Sediment and Erosion Control Plans for development sites to comply with requirements of the new, forthcoming municipal MS4 (Municipal Separate Storm Sewer Systems) permit and inform municipal ordinance revisions to ensure sound stormwater management, minimize soil pollution, and protect the region's water quality. Project goals include standardizing ordinances in different communities to ensure MS4-required sediment and erosion control plans in the region are consistently protective of water quality; integration of climate change and coastal resilience considerations in standards; and conducting of training workshops on standards for municipal planners in MS4 communities.	Flood, erosion
Model Ordinance Language for Stormwater Management: Low Impact Development	Guidance	Southern Maine Planning and Development Commission	SMPDC partnered with Cumberland County Soil and Water Conservation District and Integrated Environmental Engineering, Inc. to develop a model ordinance for low impact development (LID) to assist communities protect water quality, integrate climate resilience into stormwater management, and comply with the new 2022 MS4 permit.	Flood

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Municipal Code Enforcement Training and Certification Program (State Fire Marshal)	Program	Maine Department of Economic and Community Development, Office of Community Development	Trained, testing, and certifying in all land use codes, including building, shoreland zoning, and floodplain management. This is not directly a mitigation activity, but it has resulted in better trained and better-informed code enforcement officers who contribute to safer development and code practices supporting hazard mitigation.	All-hazards
Municipal Planning Assistance Program (MPAP)	Program	Maine Department of Agriculture, Conservation & Forestry, Bureau of Resource Information and Land Use Planning	Provides land use planning expertise by way of technical and financial assistance to municipalities, citizens, regional planning organizations, and the Legislature to support development of comprehensive plans and zoning ordinances. Under the Growth Management Act, MPAP grants jurisdictions the authority to enact local land use ordinance on the condition they have a comprehensive plan. Advocates for sound holistic planning, covering the topic areas of community development, transportation planning, hazard mitigation planning, growth management, and smart growth / low impact development. While not directly hazard mitigation, the program has effectively helped many municipalities prepare comprehensive plans. Sound planning has helped communities enact ordinances to better guide growth.	All-hazards
National Building code adoption tracking portal	Practice	FEMA BCAT	Jurisdictional building code adoption status organized by hazard and presented in GIS format	All-hazards: code compliance
Natural and Beneficial Functions of Floodplains Report	Guidance	Task Force on the Natural and Beneficial Functions of the Floodplain	The task force concluded that protecting and restoring the natural and beneficial functions of floodplains will not only reduce flood damages, but also contribute to a community's social and economic well-being. Preservation and restoration of the natural and beneficial functions and values of floodplains depends on preventative floodplain management policies, programs, and initiatives outlined in this report.	Flood, erosion
Natural Resources Protection Act	Policy	Land and Water Programs (Environmental Protection)	Requires a permit for any activity located in a protected natural resource or is adjacent to a wetland, great pond, river or brook, sand dune systems, or significant wildlife habitat. Residents must contact their municipality regarding permitting requirements in or adjacent to protected areas.	All-hazards
Nonprofit organizations involved in regional planning efforts	Program	Regional Planning Organizations (Commissions, Councils of Governments)	RPOs offer planning assistance to local governments and regional organizations, several of which support Local Hazard Mitigation Plan updates in Maine. Typical funding for RPOs to support mitigation planning is sought by local government sub-applicants through FEMA mitigation assistance grants.	All-hazards

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Planning, Design, & Construction	Program	Maine Department of Administrative and Financial Services, Bureau of General Services	Responsible for the planning, design and construction administration of all State public improvements and public-school projects.	All-hazards
Property Management	Program	Maine Department of Administrative and Financial Services, Bureau of General Services	Provides operation, maintenance and building control services to 73 state-owned structures located on 5 campuses.	All-hazards
Risk Management	Program	Maine Department of Administrative and Financial Services, Bureau of General Services	Insures state assets.	All-hazards
River Flow Advisory Commission (RFAC) (Law 37-B, Chapter 24)	Program	Maine Emergency Management Agency (Department of Defense, Veterans, and Emergency Management)	Facilitates coordination of hydrological information between dam operators, river basin managers, state agencies, USGS, and NWS to communicate flood risk. Co-chaired by MEMA and USGS, the RFAC is composed of representatives from eight major river basin management operations, seven state agencies, two federal agencies, and the University of Maine. Statute requires Commission to convene each March following the largest statewide snow survey; Commission may convene throughout the spring during seasons of high flood risk.	Flooding
Shoreland Zoning	Policy	Maine Department of Environmental Protection, Land and Water Programs	Requires municipalities to adopt, administer, and enforce local ordinances that regulate land use activities in the shoreland zone (land area within 250 feet of river, pond, wetland, or outer limits of the intertidal zone). Residents must contact their municipality regarding permitting requirements in the shoreland zone.	Flooding, erosion
Single Family Housing Repair Loans	Loan Program	U.S. Department of Agriculture	Also known as the Section 504 Home Repair program, this provides loans to very-low-income homeowners to repair, improve or modernize their homes or grants to elderly very-low-income homeowners to remove health and safety hazards. Projects such as well drilling due to drought-related issues are eligible as reported by Drought Task Force.	Drought; all-hazards
State of the Air	Program	American Lung Association	For 24 years, the American Lung Association has analyzed data from official air quality monitors to compile the State of the Air report. The more you learn about the air you breathe, the more you can protect your health and take steps to make the air cleaner and healthier.	Air Quality

Capability Name	Type	Responsible agency	Evaluation of Effect on Mitigation Initiatives	Hazard
Stormwater Management	Program	Maine Department of Environmental Protection, Land and Water Programs	Works to protect and restore surface and groundwater impacted by stormwater flows and reduce impacts from floodwaters and erosion.	Flooding
Stream Smart Program	Program	Maine Audubon	Stream Smart works with contractors, landowners, and other professionals responsible for road-stream crossings to construct culverts that maintain fish and wildlife habitat while protecting roads and public safety.	Flood, erosion
The Nature Conservancy land conservation and environmental resilience projects in Maine	Program	The Nature Conservancy	With a mission to protect the lands and waters on which all life depends, The Nature Conservancy in Maine is taking action to protect land and water, work toward a healthy and sustainable ocean, address and mitigate the effects of climate change, and connect people and nature, in Maine and around the world.	All-hazards
TNC Maine Mapping Portal: Culvert Flood Risk Explorer and Coastal Risk Explorer	Map/Tool	The Nature Conservancy	The Culvert Flood Risk Explorer shows the risk level of a flood event in the next 30 years at crossings across the state. This analysis was performed on public and select private crossings; however, it is not exhaustive and only addresses the flood risk of culverts caused by potential flow restriction. Use the Coastal Risk Explorer to explore how rising sea levels will affect roads in coastal cities and towns, see where road networks will be inaccessible to emergency responders, and how that relates to the overall social vulnerability of the community.	Flood, erosion
Transportation Risk Assessment for Planning and Project Delivery (TRAPPD)	Program	Maine Department of Transportation, Environmental Office	Tool to predict when transportation infrastructure project schedules and budgets would be at risk due to the presence of Atlantic salmon.	N/A
Watershed Management	Program	Maine Department of Environmental Protection	Provides education grants to local schools for educating students about watershed protection. This is not a direct mitigation activity, but well-informed students may become more responsible adults.	Flooding

Section 5 – Local Capabilities

Stafford Act 44 CFR §201.4(c)(3)(ii)[60]

5.1 Local Mitigation Authorities and their Effectiveness [S13]

Maine has been considered a strong "home rule" state since November 1969, when an amendment to the state constitution delegated broad "home rule" ordinance powers to cities and towns. Cities and towns have the right to enact laws that are municipal in nature and that do not frustrate or run counter to a state law or a law which the state has not prohibited it from passing.

The concept of home rule is very important to local government because without this authority, cities and towns would depend on specific acts of the State Legislature for their governing authority. Home rule therefore allows local governments to be more effective in responding to local needs for regulations that fit their specific community, rather than relying on the generally slower and more generalized process state legislation.

In practice, home rule authority can be challenging for staff- resource-deficient communities who, for example, may not have the capacity to draft new ordinances in response to growing risks associated with unchecked development and climate change. Regional Planning Organizations can support local governments in these situations so long as the need for assistance is communicated. At least from the perspective of hazard mitigation, home rule authority requires very strong communication ties among local, county, and state government to be effective and responsive to changes in natural hazard risks. However, because of home rule, Maine is capable of developing and implementing custom tailored mitigation actions that serve the needs of individual communities.

5.1.1 Current Capabilities [S13.a]

Municipal Ordinances

Maine's Home Rule statute affords municipalities with the authority to establish and enforce ordinances that regulate land use and land development practices relevant to hazard mitigation. The University of Maine School of Law Garbrecht Law Library compiles links for each municipality that hosts ordinances online[61], as does the Maine Municipal Association[62]. Multiple types of ordinances exist, but the ones most relevant to hazard mitigation involve management of floodplains, coastal zones, and zoning/development practices. These local ordinances, combined with state and federal capabilities identified above (such as the Community Resilience Partnership), provide a strong basis for expanding hazard mitigation capabilities in Maine.

Municipal floodplain ordinances are a very effective approach for implementing community flood risk reduction. Virtually all municipal floodplain ordinances in Maine are based on FEMA flood insurance rate maps, and as noted above, 97% of Maine communities participate in NFIP, including the unorganized territories. Local regulation by floodplain ordinances has led to substantial reductions in flood risk for communities by directly avoiding development in flood-prone areas. Development audits by the Maine Emergency Management Agency (see SECTION 3 – RISK ASSESSMENT) confirm that land use/development changes have been minimal within the lifespan of the last State Hazard Mitigation Plan.

Subdivision ordinances vary by municipality, though they are relevant in hazard mitigation due to their influence over private development practices including structures and roads. The unorganized territory has a uniform ordinance with little variation in requirements. Generally, a local planning board will review a proposed

[60] Stafford Act 44 CFR §201.4: https://www.law.cornell.edu/cfr/text/44/201.4
[61] Maine Town Ordinances: https://mainelaw.maine.edu/library/collections/maine-town-ordinances
[62] MMA Ordinances and Home Rule: https://www.memun.org/Training-Resources/Local-Government/Ordinances-Home-Rule

subdivision to see if it conforms with the ordinance, followed by public notice. Subdivision ordinances may impact the location and density of residential areas relative to hazardous areas, therefore findings from a local risk assessment should be incorporated into the subdivision review process. This has been acknowledged by regional planning organizations who provide model ordinance guidance[63].

Municipalities with 4,000 residents or more are required to adopt MUBEC building and energy codes. Smaller municipalities may adopt MUBEC or different components of the state code, or they may choose to have no code. Refer above to the state building code law.

Many municipalities do not have the capacity to directly undertake much in the way of hazard mitigation planning. Fortunately, County Emergency Management Agencies and Regional Planning Organizations can provide the planning and coordination services necessary to address local hazard mitigation.

Code Enforcement Officers

A Code Enforcement Officer (CEO) is defined under 30-A M.R.S. § 4451[64] as a person employed by a municipality to enforce all enabling state laws and local ordinances in the following areas: shoreland zoning, land use regulation, internal plumbing, subsurface waste water disposal, and building standards. CEOs must be certified in each area for which they have responsibility within 12 months of their initial appointment date or of the date they assume responsibility for a given area. The Maine Code Enforcement Training and Certification Program provides the basic courses needed for certification. The statute also requires code officers to maintain their certification and be recertified every six years.

In 1988, the Legislature was concerned that many small towns did not have code officers and many more did not have the training and knowledge to effectively administer state and local codes and land use regulations. The Legislature decided that, if state goals were to be achieved, there was a need to not only train, but to test and certify code officers for specific competencies. It established, as part of the Growth Management Act, a state-administered program to train and certify code officers. Today, the purpose of the program remains to build and strengthen local capabilities to administer and enforce land use and building ordinances[65].

Code enforcement officers have proven to be effective at mitigating risks by avoiding development in hazard prone areas and implementing modern building codes.

Hazard Insurance

Several options for hazard insurance are available for Maine residents and business owners, the most popular of which is flood insurance since homeowners and commercial property insurance policies exclude coverage for flood. This section provides as summary of these opportunities. According to the national Association of Insurance Commissioners, Maine had the 11th lowest average homeowners premiums in 2020 and is traditionally lower than other New England states, making it one of the most affordable states in the nation[66].

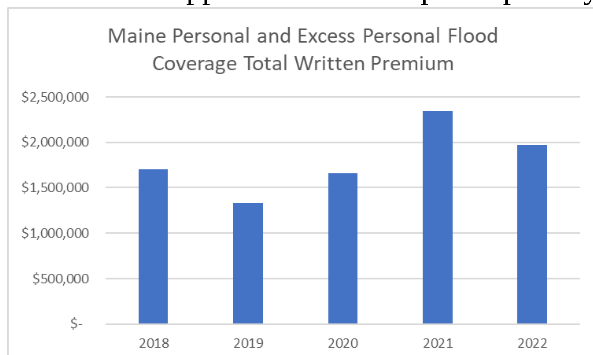
The type of policy determines which perils are covered by the insurance[67]. Each covers your belongings and your personal liability, and provides medical payments and loss of use coverage. Basic for insurance may only cover fire and lightning damage, while for an additional premium extended perils can be added (such as windstorms, hail, frozen pipes, explosions, smoke, and volcanic eruption). Special form insurance is a common policy that

[63] Model Subdivision Regulations: https://www.maine.gov/dacf/municipalplanning/docs/SMRPC%20(SMPDC)%20Model%20Subdivision%20Regulations%202006.pdf
[64] Training and certification for code enforcement officers: https://www.mainelegislature.org/legis/statutes/30-a/title30-Asec4451.html
[65] Office of the State Fire Marshall Code Enforcement: https://www.maine.gov/dps/fmo/building-codes/code-enforcement
[66] Maine Bureau of Insurance report: https://www.maine.gov/pfr/sites/maine.gov.pfr/files/inline-files/2023_pc_availability_report.pdf
[67] Bureau of Insurance covered perils: https://www.maine.gov/pfr/insurance/consumers/homeowners-or-renters-insurance/covered-perils

covers all perils except those that the policy excludes. Flood and earthquake hazards are typically excluded. An endorsement can be purchased to cover earthquake perils.

Flood Insurance: Most Maine communities (94.5 percent) participate in the National Flood Insurance Program and have received technical assistance and guidance from the Department of Agriculture, Conservation and Forestry's Floodplain Management Program, have floodplain ordinances and are members of the National Flood Insurance Program (NFIP). In addition, there are 17 communities in the CRS Program. This represents a higher level of floodplain management than the federal minimums. This program has probably had the greatest effect on loss reduction on real property in the state. FEMA's Risk Map Program will allow more municipalities to better manage their floodplains, especially where local flood insurance rate maps are based on LIDAR topographic mapping. Many Maine communities did not receive an updated map within the time frame originally envisioned by Congress (2009). Moreover, there are still a number of smaller communities in Maine that have not ever received a Flood Insurance Rate Map. Most of LUPC's jurisdiction is not mapped but citizens participate by virtue of LUPC's permit review process.

The Maine Bureau of Insurance has provided data on private insurance trends for flood insurance. Personal flood is first dollar coverage for flood while excess flood is a layer of coverage over personal flood or NFIP coverage. This premium remains steady in recent years. There is a slight uptick in 2021 and 2022. We haven't had rate increases filed so we can assume this is an increase in consumers purchasing this coverage.



Dam breach insurance [HHPD5.a]: According to FEMA grants specialists, there is no insurance specific to dam breach or failure, however the private surplus lines market may provide insurance to cover flooding caused by a dam breach. The NFIP policy would cover a dam failure by key definition of the Standard Flood Insurance Policy and because it is not an exclusion.

The Maine Bureau of Insurance reports that Dam Breach Risk insurance from flooding has not shown up in the admitted market. This coverage may be available in surplus lines but those aren't required to be filed here at the Bureau. "Admitted market" refers to insurance carriers authorized to do business in Maine. Carriers file rates and forms for approval with the Bureau of Insurance. Surplus lines companies consist of non-admitted specialized insurers covering risks not available within the admitted market and they do not file these coverages at the Bureau of Insurance.

Mass wasting and erosion insurance: losses from mudflows, land subsidence, and erosion resulting from flooding may be covered by NFIP, but other forms unrelated to flooding are not covered.

Hurricane and wildfire coverage are covered under property insurance.

Drought coverage is not a separate line and is most applicable to crop insurance.

Coastal hazards insurance: Due to the increased frequency and severity of storms, the affordability of property insurance for coastal and island property remains problematic. Windstorm damage is a major concern for such properties, and new coastal property applicants have some difficulty finding coverage in the admitted market. In 2014, the Bureau held public hearings and developed a Rule pursuant to 24-A M.R.S. section 3061 to establish standards for the use of a Hurricane Deductible. This regulation, which took effect April 1, 2015, addresses this issue by allowing a higher deductible to apply for hurricanes, yet it also protects policyholders by limiting its applicability to the time period during which the location is actively under a hurricane warning from the National

Weather Service and ending 24 hours after the last warning for that forecast area expires. The rule also requires notification to the policyholder when the policy is issued that a hurricane deductible applies to the coverage.

Earthquake insurance: the Maine Bureau of Insurance has identified a slight uptick in the earthquake coverage total written premium. There are no rate increases filed so this can be interpreted as an increase in consumers purchasing coverage.

The Maine Bureau of Insurance also notes that it can be difficult to obtain insurance coverage for high-risk homes, such as mobile homes or manufactured homes, homes with a history of prior claims, or homes that are vacant, unoccupied, or poorly maintained.

County Emergency Management Agencies

Since 2003, the Maine Emergency Management Agency has worked with county emergency management agencies[68] on the development of county multi-jurisdictional Hazard Mitigation Plans. These multi-jurisdictional plans involve participation by municipal officials and the public to identify local vulnerabilities, capabilities, and strategies to reduce their risk from a natural disaster. Based on the knowledge and experience gained throughout the course of this effort, this section describes and analyzes the effectiveness of existing local mitigation capabilities and the expected effectiveness of the general trend of future local mitigation activities.

Strong ties between state, county, and local emergency managers makes for effective development of local and multi-jurisdictional hazard mitigation plans. Thanks to county leadership, many more communities have the capacity to participate in hazard mitigation planning and take advantage of their eligibility to apply for mitigation assistance funds. County-led planning provides a detailed list of mitigation actions to be implemented by local governments. However, the ability of local governments to implement these actions depends on their ability to raise funds through capital improvement or apply for assistance through other capabilities shared in this section.

Regional Planning Organizations

Regional Planning Organizations (Commissions and Councils of Governments) receive funds from the Maine Legislature and Maine Coastal Program to provide general planning assistance to municipalities within their respective regions. This assistance is available upon request to the extent that the funding allows. At a minimum, this assistance will include answering general questions, advising on committee formation, explaining the Growth Management Act and the Comprehensive Plan Review Criteria Rule, and providing presentations on interlocal resource planning. Most but not all communities are within jurisdiction of Regional Planning Organizations[69].

Regional planning organizations have a very strong potential to assist local communities with hazard mitigation planning needs. Currently, only a minority of local hazard mitigation plans call upon these organizations to assist them with local planning. To be more effective in this role, MEMA will need to provide more information and training on mitigation assistance, as well as facilitate more meetings between planning organizations, county agencies, and local governments. Relationships between regional planning organizations and county emergency management agencies differ across the state.

[68] County EMAs: http://www.maine.gov/mema/ema-community/county-local/county-emergency-management-agencies
[69] Regional Planning Organizations: https://www.maine.gov/dacf/municipalplanning/technical/regional_council.shtml

Capital Improvement Plans

A capital improvement plan[70] is a community planning and fiscal management tool used to coordinate the location, timing and financing of capital improvements over a period of time similar to the 5-year lifespan of a hazard mitigation plan update. In Maine, capital improvement budgets are the most common approach to fund mitigation actions raised by local governments. Unfortunately, there are often many competing initiatives funded by capital improvement and budgets are often very limited. Capital improvement plans have been somewhat effective at implementing mitigation actions on a local level where they clearly align with other community needs/priorities, but other assistance programs will be necessary to increase the effectiveness of Maine's hazard mitigation program.

Maine Municipal Association

The Maine Municipal Association[71] (MMA) is a voluntary membership organization offering an array of professional services to municipalities and other local governmental entities in Maine. MMA is a non-profit, non-partisan organization governed by an Executive Committee elected from its member municipalities. Founded in 1936, MMA is one of 49 state municipal leagues that, together with the National League of Cities, are recognized at all governmental levels for providing valuable services and advocating for collective municipal interests.

The Maine Municipal Association has a core belief that local government is a fundamental component of a democratic system of government. MMA is dedicated to assisting local governments, and the people who serve in local government, in meeting the needs of their citizens and serving as responsible partners in the intergovernmental system.

MMA's services include advocacy, education and information, professional legal and personnel advisory services, and group insurance self-funded programs. These services will make MMA a strong partner in hazard mitigation planning with further training in hazard mitigation planning and assistance programs.

Community Action Partnership

Maine Community Action Partnership is a statewide organization dedicated to improving the quality of life of Maine people by advocating for, promoting and supporting the work of local community action agencies. These local agencies provide many services[72] in a way that encourages greater equity and engagement of a diversity of community members in Maine. Though MEMA has strong connections to community action agencies for response and recovery needs, stronger collaborative ties are needed to advance the effectiveness of Maine's mitigation program.

5.1.2 Effectiveness of Local Capabilities [S13.b]

The effectiveness of local government mitigation capabilities is best determined by studying each hazard. Table 4.3 provides a general summary of local capabilities and their relevance to different natural hazards and common damages as profiled in the Risk Assessment. In summary, local mitigation capabilities have improved since the last plan update, but challenges continue to exist at the municipal scale due to frequent turnover and a lack of understanding or interest in hazard mitigation. The most effective local mitigation capabilities stem from state or federal programs that municipal officials enforce, such as land use/development laws, NFIP managed through floodplain ordinance, Mandatory Shoreland Zoning, and State standards for building codes.

[70] GPCOG Developing a Capital Improvement Program: https://www.maine.gov/dacf/municipalplanning/docs/DevelopingCIP_GPCOG.pdf
[71] MMA: https://www.memun.org/About-Us
[72] MaineCAP local services: https://mecap.org/member-agency-services/

Wildfire

Forest fires have the potential for causing a huge loss of residential structures in Maine communities, due to the very high percentage of Maine homes located in the wildland-urban interface. A major wildfire that destroys trees and ground cover in a previously forested river basin could result in increased runoff from storms, thereby increasing downstream flooding potential. Land use planning and regulation and building codes in Maine seldom deal with the wildland-urban interface issues. Mitigation efforts at the local level are limited to the forest firefighting efforts of local volunteer or municipal fire departments.

The Maine Forest Service has initiated a community assessment program for communities with a history of wildfire. The program, which is voluntary, is aimed at educating local officials and homeowners about inexpensive steps (such as the removal of overhanging tree limbs) they can take to protect their structures. Local officials in a number of communities have formally agreed to take the steps recommended in their community assessments.

Flooding

Some Maine communities have taken advantage of the Maine Department of Transportation's Maine DOT Maine Local Roads Center and have acquired technical assistance and training on maintenance and upgrades to local roads, especially in terms of storm water management. MEMA has partnered with the Local Roads Center to sponsor a series of workshops for local officials on the use of geo-synthetics to mitigate damages from future flooding/storm events. MEMA expects that in the future, more communities will use geo-synthetics to reduce repetitive losses to local roads, bridges, culverts and ditches. After education, road maintenance and upgrades are usually the second largest municipal budget item.

Flood insurance is a primary source of flood hazard mitigation for policyholders in NFIP-compliant communities. Please refer to the Hazard Insurance section above for more information.

Some municipalities have received hazard mitigation grants for structural mitigation projects, usually road upgrades. Over time, those communities that have participated have eliminated their road washout problems. One such community is the town of Searsmont, which has received several mitigation grants and has effectively protected all of its local roads from flooding damage. In Franklin County, many of the projects identified in their 2005 plan have been implemented, primarily with the help of FEMA PA funds. Unfortunately, the mitigation needs documented in the 16 County plans, and one University of Maine System Plan, far outweigh available funding. Just the approved county mitigation plans include 2,058 mitigation projects. Assuming an average of about $100,000 per project (some are less, but some are a lot more), the total need is $205,800,000. Over the past three years, Maine received about $300,000 annually in HMGP funding. Even if no new projects were added to the list, it would take over 100 years to address all of the previously identified needs!

Every municipality in the State of Maine is required to have a state-certified Code Enforcement Officer (CEO). Most municipalities also have a local comprehensive plan and a set of land use ordinances. The CEO enforces not only the local ordinances but provides advice and a second set of eyes for state environmental permit programs in stormwater management and shoreland zoning. However, state law does not make local comprehensive plans and ordinances mandatory, and many smaller towns do not have these mitigation tools.

Severe Summer Weather

A number of communities, including larger cities such as Portland and Lewiston, have enacted local stormwater regulations that mirror those of the Department of Environmental Protection. Tornadoes are too rare and lightning affects too few people (an occasional home fire somewhere in the state). Thunderstorms can cause localized power outages and leave storm debris in the roads, but these will only take a few hours to repair and clean up. Occasionally a severe summer storm will result in a road washout which may take several weeks to repair.

Severe Winter Weather

The biggest impact to many municipal budgets from severe winter weather is the expense of unplanned debris removal and extra snow and ice removal costs. In many cases, a bad winter storm can overwhelm the financial and equipment capabilities of many smaller municipalities. Many communities will spread calcium chloride on roads prior to a storm to help reduce the amount of icing, and some communities will cut back trees within the municipal road easement. However, a majority of communities do not have the extra budget or resources to accomplish these pre-disaster mitigation activities.

Tropical Cyclones

Coastal Maine communities are typically the only ones to experience most hurricane damages and much of this is from storm surge flooding. Based on a review of the Storm Surge Inundation Maps, there are more areas subject to flooding than what are shown on the FIRM maps. Unfortunately, Maine communities have used the FIRM maps for their floodplain ordinances, but a full-blown Category 1 hurricane could exceed the 1 percent return frequency and consequently cause flooding beyond the National Flood Insurance Program’s 1 percent or regulatory “100-year” flood event.

While higher category storms are more frequent in other parts of the country, one of the natural mitigating factors for hurricanes in Maine is the fact that Maine’s coastal waters are colder and cannot support higher category hurricanes. As the flooding history in Maine continues to expand and as the ocean’s temperatures continue to rise there may be an increase in more severe hurricanes. Major structures have been built on the coast recently that were outside the FIRM Special Flood Hazard Areas, that could possibly be endangered by the storm surge flooding from even a Category 1 Hurricane. MEMA has sent a digital copy of the hurricane surge inundation maps to every affected community along Maine’s coast.

Drought

Maine communities are impacted by drought by the increase in possibility of forest fires, dry wells and poor crops. Forest fires and poor crops were discussed in other paragraphs of this section. Individuals and public water suppliers typically deal with dry wells through their own investment in new wells. There are no mitigation programs at the local level in Maine dedicated solely to lessening the impacts of drought, though the recent passing of LD 1998 will provide competitive funding support for agricultural irrigation improvements in the near future.

Earthquake

The recent magnitude 4.3 earthquake in Bar Harbor demonstrates that earthquakes of this size can cause damage. Although the statistical estimate for return time of a magnitude 6.0 earthquake in Maine is approximately 363 years, little monitoring and research have been done to substantiate this estimate. Although earthquake probability in Maine is relatively low compared to other areas of the country, the risk to property is moderate to high because of inadequately designed and aging structures. Continued instrumental earthquake monitoring in New England is funded entirely by the federal government, with some in-kind contribution by state agencies. There are no mitigation programs at the local level in Maine dedicated solely to lessening the impacts of earthquakes, excluding that of all-hazards emergency management planning and emergency response agencies.

Erosion

The Maine Geological Survey (MGS) has completed coastal bluff erosion maps for Maine's coast. The covered area extends from York County in Southern Maine to Washington County (Maine's eastern-most county). The information provided on these maps is available on the MGS web site, and copies of the maps have been provided to the affected municipalities. Many communities are beginning to use this information to mitigate the impacts of erosion and sedimentation. The Maine Department of Environmental Protection has incorporated MGS Coastal Bluffs Maps into its Shoreland Zoning rules. There is now a requirement that municipal shoreland zoning ordinances include greater setbacks for development near unstable bluff areas.

Mass Wasting
MGS has prepared a parallel set of Landslide Hazard Maps that details historical and potential landslide areas along the coast. MGS is also mapping landslides in non-coastal areas. A pilot project in 2006 developed the method of identifying historical landslide areas, and also established methods of terrain analysis for landslide susceptibility. About one third of the state has geological sediments that make the land potentially vulnerable to landslides. In addition to earth materials, slopes, regional geomorphology and ground and surface water affect landslide hazards.

Tier 2 Hazards
These hazards are a growing concern in Maine, though they generally have not had the level of impact felt from many Tier 1 hazards. Currently most mitigation capabilities for Tier 2 hazards involve monitoring conditions at a state or federal agency level rather than a local level. However, there are educational programs presented by state agencies that improve awareness of risk mitigation at local levels.

Local governments have the power to help ensure that city and county operations are zero-emission and that residents can choose zero-emission forms of transportation and electricity. These actions must benefit the communities most impacted by unhealthy air. For example, a municipality may adopt a climate action plan to reduce city- and county-wide emissions by supporting walking, biking and transit and zero-emission-vehicle infrastructure and ensuring that building and parking policies support these goals. Towns can include measures to address the impacts of climate change on residents, including health impacts. Under the Inflation Reduction Act, municipalities can opt in to get planning grant funding to reduce climate pollution. Municipalities may purchase zero-emission fleet vehicles and commit to purchasing zero-emission garbage and recycling trucks, transit buses, school buses and other vehicles. Establish purchasing goals for renewable, non-combustion electricity. Power city and county operations with truly clean sources of electricity like wind, solar, geothermal, or tidal.

State, Territorial and Tribal Governments may set a clean or renewable electricity standard or clean peak standard that phases out the use of coal, oil, methane gas (often called natural gas) and other combustion energy sources and replace with wind, solar, geothermal, and tidal and other non-combustion forms of electricity. Do not allow for the increased use of biomass or municipal solid waste for electricity because of their contributions to particle pollution. States may also leverage Inflation Reduction Act funding available to state, territorial and Tribal governments to reduce emissions, including reducing air pollution at ports, investing in zero-emission heavy-duty vehicles and infrastructure, and improving air quality monitoring. Ensure that environmental justice communities that have long borne the brunt of pollution impacts are prioritized. States may also use the Clean Air Act authority to adopt the California zero-emissions standards for cars and trucks. These include California's Low-Emission Vehicle criteria pollutant and greenhouse gas regulations; Zero-Emission Vehicle regulations; and Advanced Clean Trucks regulations.

High Hazard Potential Dams [S13.c; HHPD6]

Few local mitigation capabilities exist at the local scale for reducing fam failure risks. However, there are some regulations that exist to help clarify dam ownership, and this may relate to the effectiveness of local hazard mitigation by enforcing some level of accountability of safety risks. State policymakers and local landowners have long been concerned with how these dams have been maintained and operated. Various laws have been passed over the years to regulate dams in one way or another. These laws have dealt with issues of registration, abandonment, water level and flow control, dam safety, and permitting of construction and repair activities[73].

Currently, dams can no longer be legally abandoned, and they will continue to be the responsibility of owners. Effective July 4, 1996, a dam owner may petition DEP for release from dam ownership or water level maintenance. The owner must then consult with shorefront property owners, town and Indian officials, and others to see if anyone wants to take ownership of the dam. If no new owner is found, ownership may be assumed by one of several state agencies based on an assessment of the public value of the dam. Otherwise, the DEP is required to order the dam owner to release the water from the dam. State law concludes that if no one is willing to own a dam, then the dam should no longer be operated to hold back water.

There is no law requiring that a dam be maintained in good condition. If a water level order or permit has been issued, it will be necessary to maintain the dam to comply with the permit or order. MEMA can require that a dam be maintained or operated in a certain way if necessary to protect public safety. Otherwise, a dam can fall into disuse and disrepair until it either breached or is rebuilt by the owner. A private owner may be liable for property damage or loss of life due to dam failure.

Municipal capabilities to mitigate hazards associated with high hazard potential dams are limited. Many High Hazard dams in Maine are privately owned, the majority of which are part of FERC-licensed hydropower projects. For privately owned high hazard dams not regulated by FERC, a strong collaborative relationship needs to be established between the owner and the municipality to ensure that risks are identified and mitigated. The authority to designate a dam as a high hazard is a state responsibility held by the Dam Safety Engineer.

Of the 25 high hazard dams eligible for the HHPD program, 14 of these are owned either by the host municipality or municipal water district. By home rule authority, these municipalities may have direct authority over their dams but are required to maintain certain safety, water height, and environmental flow conditions based on state/federal regulations and agreements with local conservation and shorefront homeowner organizations. Application of the HHPD program, much like other effective mitigation assistance programs, would have local governments apply for and serve as sub-applicants for grants.

[73] Maine dam regulation: https://www.maine.gov/dep/land/dams-hydro/documents/ip-dams.html

TABLE 4.3: General Summary: local mitigation capabilities by hazard matrix

HAZARD	TYPICAL DAMAGES or LOSSES	ACTIVITY TASKED	PROGRAMS	PRE- OR POST-DISASTER
Flooding	All Structures	Code Enforcement Officer or Municipal Planning Board	Floodplain Ordinance	Pre-disaster
	Local Roads	Road Commissioner or Public Works Director	Maine Local Roads Center Municipal Capital Improvement Projects	Pre-disaster
	Environment	Code Enforcement Officer	Municipal land use ordinances Erosion & sedimentation control Natural Resources Protection Act Shoreland Zoning & Stormwater Program Wildland Firefighting Program	Pre-disaster
Severe Winter Weather	Roads	Road Commissioner or Public Works Director	Winter Road Maintenance program.	Post-disaster
Severe Summer Weather/ Hurricanes	Environment	Code Enforcement Officer	Shoreland Zoning & Stormwater Program	Pre-disaster
Wildfires	Residential Structures	Municipal/Volunteer Fire Department	Wildland Firefighting program	Post-disaster
Drought	Agricultural, Residential	MEMA/USGS	Drought Task Force/River flow Commission	Pre-disaster
Erosion/ Landslides	All structures	Maine Geological Survey	Costal bluffs/coastal landslide hazard maps Inland landslide hazard mapping	Pre-disaster
All-Hazards	All Types	Municipal Emergency Management Director	Public education & information	Pre-disaster
	All types	Municipal Elected Officials	Hazard Mitigation Program Grants	Post-disaster

5.2 Support of Local Hazard Mitigation Plans [S14]

As noted above, county emergency management agencies led the development of Local Hazard Mitigation Plans LHMPs starting in 2003, and currently many still take on the responsibility of updating the local plans. The one exception is the University of Maine System Hazard mitigation Plan that was developed and is updated by the University of Maine Facilities Management Office. Currently, all LHMPs are multi-jurisdictional.

MEMA provides training and technical assistance for LHMPs. The Natural Hazards Planner for MEMA also conducts the state review of LHMPs prior to submission for review by FEMA. MEMA also facilitates communication between planners and various subject matter experts to ensure that the best available information is incorporated into all elements of the plan. Refer to the Planning Process section of the State Hazard Mitigation Plan for a list of planning participants who are also contacted for input in LHMPs.

5.2.1 Training [S14.a.1]

MEMA promotes and advertises LHMP, and mitigation assistance training opportunities hosted by FEMA Region 1 to local governments and the five tribal nations located in Maine. These training opportunities are reviewed by all Region 1 states prior to the event, and states are permitted to contribute to presentations. FEMA Region 1 LHMP trainings and mitigation assistance trainings are typically held once per year, but there are additional trainings, smaller in scale, that present on certain useful details of LHMPs. Region 1 trainings are virtual, while MEMA trainings are often hybrid or in-person. Other entities such as regional planning organizations have hosted mitigation assistance trainings, in coordination with MEMA and FEMA Region 1, for their local governments.

MEMA's Mitigation, Planning, and Recovery Division hosts one-on-one trainings between state and county emergency managers (or regional planning organizations) as well as trainings with municipal emergency managers, to identify the significance of the mitigation program and the process for applying for mitigation assistance. In 2021-2023, MEMA began to kick off several county mitigation assistance trainings across the state in concordance with LHMP update schedules.

MEMA is also responsible for communicating to local officials about LHMP expiration dates, the consequences of not having a FEMA-approved LHMP, and the availability of funding to support plan updates.

5.2.2 Technical Assistance [S14.a.2, S16]

MEMA's Natural Hazards Planner is responsible for providing technical assistance to LHMP planners and coordinating additional assistance where needed (Figure 3.3). The State Hazard mitigation Officer provides technical assistance when applying for Plan Update grants provided through FEMA's Hazard Mitigation Assistance program. Planners may include county employees, regional planners, consultants, local governments, interested citizens, or others.

Process and Schedule for Approvable LHMPs

Technical assistance is provided in coordination with training because there are several plan elements and guidelines that must be described and understood before they are successfully addressed. MEMA provides expert guidance on how best to address Stafford Act Guidelines and FEMA's LHMP Planning Policy Guide under the context and capacity of the planning area. Guidance includes scheduling, detailed descriptions of planning requirements, examples and best practices from other planning entities, GIS and data support, research support for risk assessment and capabilities, facilitation of planning partners such as subject matter experts, and guidance on best practices for engaging local governments and community members in the update of LHMPs.

State review of LHMPs is an iterative process involving multiple meetings between MEMA, the planning team, and participating communities. The review is completed to ensure that Stafford Act/FEMA guidelines are met and that the plan is consistent with the SHMP. The state reviewer takes note of new findings in the LHMP and incorporates the new information into the SHMP update. Conversely, the state reviewer also encourages the planning team to review the SHMP and incorporate new information into their plan. In this way information about risk, capabilities, and mitigation strategies are integrated across all levels of the mitigation program. MEMA prefers to review plan sections as they become available to better address potential discrepancies early in the update process, and MEMA will facilitate discussions with FEMA Community Planners when requested. The timeframe of MEMA mitigation assistance covers all facets of planning, from applying for a MEMA/HMGP Plan Update grant to confirmation of the last adoption letter for multi-jurisdictional LHMPs. Given the schedule of assistance programs and the number of tasks required to complete an update, assistance to any individual planning group may cover 36 or more months, as noted in Figure 3.3.

All public resources used to update the Maine State Hazard Mitigation Plan are presented to LHMP planners for use in their own update, and in this way the state plan is offered as the standard for mitigation planning at the local level. As noted previously, the responsibilities of monitoring, evaluating, and updating LHMPs is often taken on by the county, but municipalities are responsible for participating in the planning process, implementing mitigation actions, and providing the county with new information regarding risk assessment, capabilities, and the mitigation strategy.

Assistance for Tribal Nations

The five tribal nations in Maine may choose to receive MEMA and county planning assistance or work directly with FEMA on their own LHMP update. In past updates, some tribal nations have chosen to work collaboratively with county planners, participate in a county LHMP update, and provide an additional tribal annex to fulfill the additional tribal nation guidelines provided by FEMA. If this tribal-county approach is used, the schedule for assisting, reviewing, and approving the plan is the same as MEMA's typical LHMP schedule.

Process for LHMP-SHMP integration [S16.b., S10.d.]

MEMA plays a direct role in the update and review of LHMPs and the SHMP, providing a straightforward process for plan integration. MEMA assures that the best available data are incorporated into local risk assessments and are combined with local observations of specific damages and examples of community and infrastructure vulnerabilities from past events. At the state level this information is combined and presented in the SHMP. Further, the process used in the SHMP is reflected by County EMAs as they update their local plans, ensuring that the best available information is used and shared at multiple levels, particularly important when new information becomes available.

Municipal mitigation actions give a source of direction for state-level actions. The state actions are designed to help facilitate the completion of local mitigation actions to further advance resilience in Maine. This being said, local mitigation actions are too location-specific to be included in the list of State mitigation actions. A recent addition to the list of state mitigation actions is to document local projects and determine their eligibility for the many new funding programs described in the Capabilities section. Please refer to the Mitigation Strategy section for more details and examples of local and state planning integration. Refer to Appendix – Local Mitigation Actions for a complete list of local actions provided by participating jurisdictions.

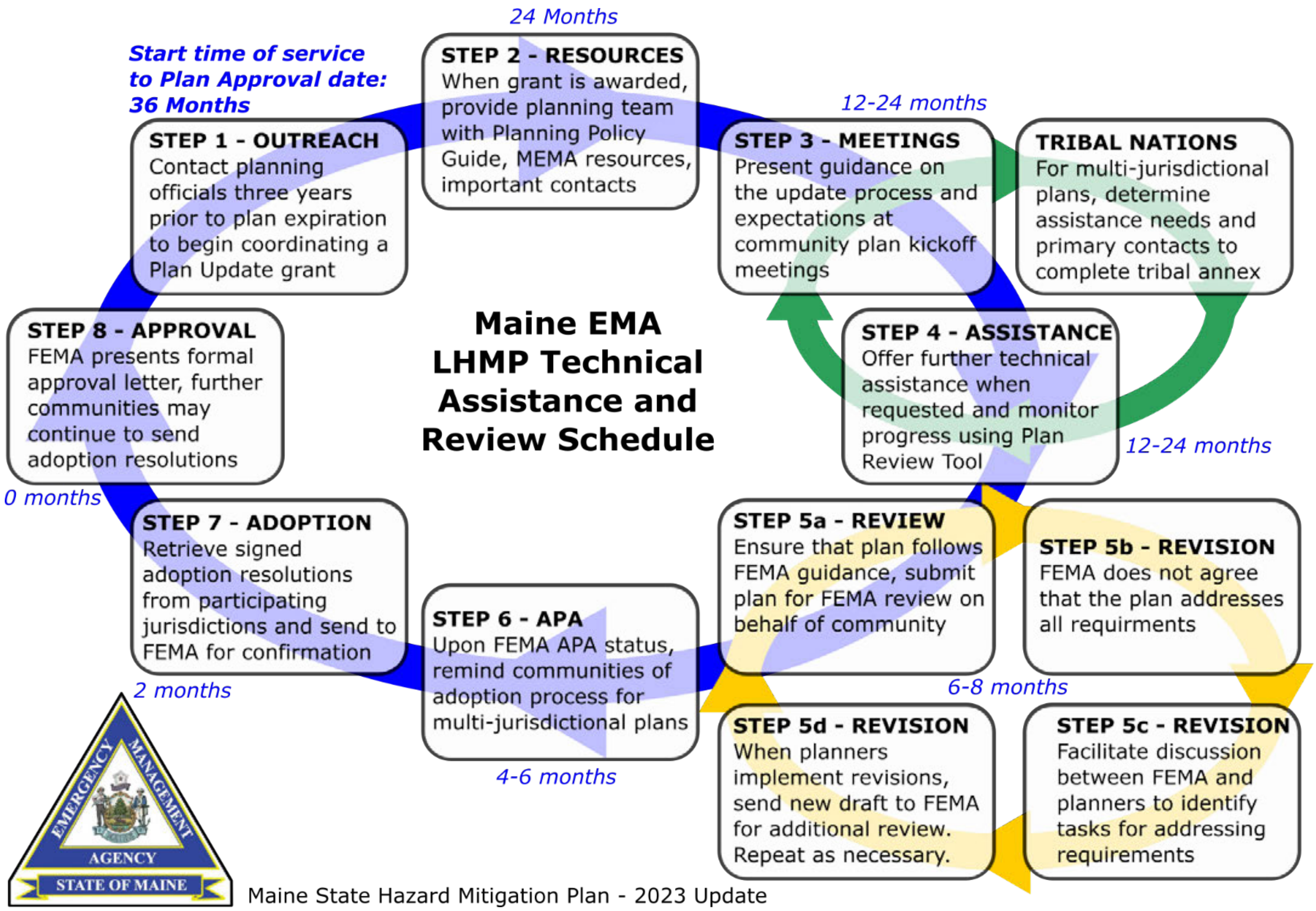


Figure 3.3: MEMA LHMP technical assistance service plan.

Local Hazard Mitigation Plan Coverage

In August 2023, a total of 14 multijurisdictional LHMP updates and two Tribal Hazard mitigation Plans are formally approved by FEMA. Another two multijurisdictional LHMP updates are under initial review by FEMA and one more is Approvable Pending Adoption (APA). Of the approved and APA plans, a total of 296 jurisdictions have formally signed resolutions to adopt their LHMP, 69 jurisdictions are in the process of adopting an approved or APA plan, and 42 jurisdictions within the planning regions have chosen to not participate in the planning process (no plan). A total of 80 jurisdictions have expired plans with updates in review by FEMA and will adopt their updated LHMP once they meet APA status. Finally, a total of 13 jurisdictions within one county have an expired plan and at this time have not proceeded with an update process.

Of the five federally recognized tribal nations in Maine, one has adopted a Tribal Annex and one has adopted a full Tribal Plan. One more tribal nation is in the process of updating and adopting a new tribal annex.

For the communities that currently have an expired plan and have not begun an update process, there is interest in working with a Regional Planning Organization to complete an update of an older Multijurisdictional Hazard Mitigation Plan.

There are a total of 500 jurisdictions in Maine, including municipalities, tribal nations, sections of unorganized territories under management by nine of the sixteen counties, and university campuses. Currently 59% of jurisdictions have adopted approved plans and a further 14% can adopt an approved or APA plan. The total proportion of jurisdictions waiting on FEMA review is 16%, 3% of jurisdictions are expired with no plan update in progress, and 8% have not participated.

Approximately 89% of Maine's population resides in jurisdictions with approved or APA plans, a further 8% with updates that are currently under review with FEMA, and a final 3% either with an expired plan with no update or with no intent to participate.

During the last SHMP update, Maine had no expired plans, indicating a downtrend in plan approvals from 2018 to 2023. The COVID-19 pandemic has been noted as a major hurdle to mitigation planning efforts. However, more focused grant and planning technical assistance have provided overall more effective plans and more opportunities to fund and implement mitigation actions. In the future, MEMA intends to encourage all county EMAs to apply for Plan Update funds well in advance of plan expiration to ensure greater resources are used to support these important plans and to encourage greater overall plan adoption rates.

5.2.3 State Funding Prioritization [S15, S14.a.3]

Hazard Mitigation Assistance

The State of Maine Hazard Mitigation Program has developed review ranking criteria for state allotments of FEMA HMA program funds. In addition to eligibility requirements, the criteria are implemented in cases where total requested funds exceed the state allotment. The state review panel ensures that applicants propose an eligible use of funds for natural hazard mitigation. The criteria closely reflects FEMA HMA grant criteria and guidance.

The sub-applicant must fulfill these eligibility criteria pre-application:

- Be a State Agency, Federally Recognized Tribe, County, Municipal Partner, or Private Non-Profit (HMGP 404 Program Only).
- Have participated in and received formal approval of their LHMP
- Have a BCA of 1.0 or higher (shovel ready project only)
- Cost Match Commitment Letter (not eligibility criteria however must be provided)
- Must have an active Unique Entity Identifier (UEI) (not eligibility criteria however must be provided)
- Must have National Flood Insurance Policy (NFIP) (FMA Only)

The additional scoring criteria are used to rank applications when total requests exceed the state allotment:

- Does the sub-application have a well-defined and clear scope of work that ties cleanly to natural hazard risk reduction?
- Does the sub-application improve community lifelines?
- Does the sub-application mitigate for future natural hazards events?
- Does the sub-application positively contribute to climate change?
- Does the sub-application promote long term resiliency benefits?
- Does the sub-application provide supporting documentation of reoccurring natural hazard events?
- Is this an impoverished community (as per Sec. 203. Pre-disaster Hazard Mitigation (42 U.S.C. 5133) Stafford Act)?
- Does this sub-applicant meet the criteria for EO14008, the Justice40 Initiative?
- Does the sub-applicant have a score of .6 or greater per the social vulnerability index (SVI)?
- Does the sub-application promote partnerships and outreach?
- Additional points based on number of presidentially declared disasters in last 10 years

Refer to Appendix – State Review Ranking Criteria for a copy of the scoring rubric.

Community Resilience Partnership

Participation in the Community Resilience Partnership is open to all municipalities and federally recognized tribes and unorganized territories in Maine[74]. To join, a community must meet three criteria: adopting a resolution of commitment, completing a pair of self-assessments, and holding a community workshop to prioritize initial climate resilience and clean energy actions.

Communities with a record of climate action may join the Partnership by reviewing past activities, completing self-assessments, providing proof of a qualifying community workshop, and passing or amending a resolution. Communities yet to begin climate action can choose to complete these steps on their own but may find greater benefit in working with a service provider and neighboring communities to join the Partnership as a group. The program funds projects that implement the 72 resiliency actions[75].

[74] Community Resilience Partnership eligibility criteria: https://www.maine.gov/future/climate/community-resilience-partnership/join
[75] Resiliency actions: https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/List%20of%20Community%20Actions_2021-12-01_4.xlsx

Municipal Stream Crossing Upgrade Grant Program

Proposed projects must be located on municipal roads and involve upgrades of culverts at stream crossings to improve public safety and minimize flooding, improve habitat for fish and wildlife, and represent a cost effective and efficient investment. Eligible project applicants include local governments, municipal conservation commissions, soil and water conservation districts, and private nonprofit organizations[76].

HHPD Program [S15.b., HHPD5, HHPD6, HHPD7]

HHPD grants have never been awarded in Maine as of this plan update. There is currently no process for project prioritization other than the general state rubric for all other mitigation projects shared above. As a result, it is necessary to establish criteria for HHPD prioritization should the program ever be utilized by Maine jurisdictions. Greater capacity in the Dam Safety Program will first need to be built in order to advance the criteria. This need takes the form of a new mitigation action. Refer to the Mitigation Strategy section for more information.

The Dam Safety Program prioritizes technical assistance for high hazard dams requiring new EAP information based on their update schedule. The dam safety inspector designates dam hazard levels based on the criteria presented in Section 3- Risk Assessment.

Outside of the HHPD program, there are some grant programs listed in this plan that fund dam removal[77]. Dam removal projects are typically coordinated at a local level and so these funds can improve local capabilities for reducing dam failure risks. The criteria for these resources typically prioritize environmental/fish passage benefits with less consideration of safety concerns, and as a result they often target smaller, low hazard dams. For example, US Fish and Wildlife Service's National Fish Passage Program and NOAA's Community-Based Restoration Program. However, these programs are only very marginally related to dam safety. One exception is the US Department of Agriculture's Watershed Rehabilitation Program that provides assistance to plan, design, and rehabilitate aging dams built by the National Resources Conservation Service. The Nature Conservancy has also raised funds to support dam removals in Maine primarily for environmental benefits and secondarily for safety benefits.

Many flood mitigation funding programs also consider mitigation in dam breach inundation zones as eligible projects. This opens a number of opportunities to reduce risks related to dam failure or breach, though in many cases, such as for HMA funding programs, there must be evidence that dam breach flooding has been a historically recurring issue. The Congressional Research Service reports "Dam Safety Overview and the Federal Role"[78] and "Flood Resilience and Risk Reduction: Federal Assistance and Programs"[79] provide a list of viable resources that could be used to manage downstream dam inundation risks. These are also included in Table 4.1.

[76] Stream Crossing Applicability: https://www.maine.gov/dep/land/grants/stream-crossing-upgrade.html
[77] Funding sources for dam removal: https://www.rff.org/publications/issue-briefs/federal-funding-dam-removal-united-states/
[78] CRS report: https://crsreports.congress.gov/product/pdf/R/R45981
[79] CRS report: https://crsreports.congress.gov/product/pdf/R/R45017

5.2.4 Challenges and Solutions for Local Planning [S14.b, S16.a]

Communication is a frequent challenge for LHMP development and updates. Though communication between MEMA and county emergency management agencies is sufficient and the terms of state technical assistance and review are clear, communication with local governments is often less effective. A major reason for this issue is frequent turnover of elected and appointed local officials resulting in yet another challenge: a lack of understanding of mitigation concepts and who should be involved in mitigation planning. As a result, local communities may not prioritize mitigation planning when they address community needs, and very little is understood about the benefits of mitigation assistance. Ultimately this leads to challenges with communities participating in LHMPs, receiving signed resolutions to adopt the LHMP, and a consecutively low level of interest in mitigation grants or an assumption that they are not worth the effort.

A potential solution for challenges related to communication and mitigation literacy is to simply provide more frequent mitigation training. However, this is hindered by a third major challenge: MEMA, the county and regional entities, and local governments all have limited capacity to accomplish these training goals. There is a need to increase staff and to encourage retainment in the profession of emergency management at all levels of government to address this gap in capacity.

A fourth major challenge, also related to a lack of local capacity, is that communities are often not prepared for the effort required to finalize an application for FEMA's Hazard Mitigation Assistance programs. As a result, there may be several communities who become interested in mitigation assistance but eventually choose not to follow through on a full application.

The following are some additional challenges faced by mitigation planners and the State NFIP coordinator in Maine. These issues have arisen from MEMA's experience managing FEMA programs (PDM, HMGP, and FMA), working with Joint Field Offices when available, and assisting counties and municipalities with the preparation of hazard mitigation plans.

With a relatively small population dispersed throughout 492 jurisdictions, most communities have a population under 4,000. As a result, staff in town offices often have many responsibilities where nearly all local emergency managers wear several hats. While they understand the importance of mitigation and planning activities, more immediate responsibilities often take priority over long term planning. Regional multi-jurisdictional planning is challenging with the rural nature of Maine because attendance at meetings often requires commutes of significant time and distance to attend meetings. The challenge of time and distance is exasperated in the most rural parts of Maine because many of them do not have reliable communication infrastructure to support remote meetings.

With a small economy, Maine's greatest resource is its people. However, Maine has the oldest median age in the country, and many employees and volunteers across the state are within retiring age. This means a significant number of state employees, whose decades of institutional knowledge contribute to this Plan, will retire in the coming years. Maine continues to have a high rate of volunteerism, which is critical to the operation of local fire departments and shelters. However, volunteer participation rates are in decline as Maine's population continues to age.

Mitigation needs in Maine still exceed the availability of mitigation resources. The 16 county mitigation plans include over 2,000 local mitigation actions. The funding need for these projects collectively is hundreds of millions of dollars. By comparison, Tropical Storm Irene produced only $297,000 in HMGP funds for Maine. The largest HMGP available to the state since 2000 was $3,800,000. The PDM program offered a federal share of $3,000,000 per project, and Maine won several PDM grants. However, Congress continually reduced the funding, and most communities do not have the resources for a nationally competitive process. Resource constraints for the vast majority of the towns prevent most communities from applying for either. It has become clear to state officials that the 406 Program must be better utilized to meet mitigation needs.

Approximately 56% of Maine's 492 local jurisdictions have populations under 2,500. None are known to have the engineering, planning or other staff expertise needed to prepare nationally competitive applications for FEMA's HMA program. Most of the projects identified by smaller towns are road-related mitigation projects that probably would not compete well against more pressing national needs.

With construction material and labor costs increasing due to inflation, towns are severely limited in how much they can accomplish purely through capital improvement budgets.

NFIP challenges are primarily caused by a lack of capacity at the local level to ensure compliance with the program and to request and participate in Community Assistance Visits (CAVs) and Community Assistance Contacts (CACs). This limits local and state coordination for NFIP. Also, both for NFIP and MUBEC, there is limited local capacity to track and engage in trainings for these programs covering a large number of NFIP-compliant communities. In terms of flood mitigation, there are challenges associated with communication between federal grants and planning specialists, and state agencies. MEMA identifies a need for joint workshops between FEMA grants specialists, FEMA planning specialists, the NFIP program, and other federal agencies to improve federal, state, and local coordination.

Proposed Solutions to Improve Local Planning Capacity

MEMA has now established a long-term 36+ month technical assistance schedule to ensure that LHMPs are approved prior to plan expiration. MEMA now plays a more active role in ensuring that planners either apply for assistance funds or show that they have the capabilities required to update their LHMP to new FEMA guidelines. All planners are notified of funding opportunities that support completion of LHMP updates, particularly BRIC or other opportunities that provide regularly scheduled application periods. Grant funds would go towards consulting fees or other assistance fees that directly lead to updates to LHMPs or establishment of new LHMPs.

Currently MEMA is also implementing university grants that provide support for interns who will assist with planning technical assistance and community outreach. There is also a growing partnership with Volunteer Maine to apply funds that would support volunteers to work directly with rural counties and local governments through funding from the Northern Border Regional Commission. Longer term plans include use of BRIC funds to establish a multi-year internship program that will give students first-hand experience in government work and allow them to apply their skills to find solutions to real-world challenges at local levels, offering a stronger partnership with counties and local governments and improve their confidence in mitigation programs.

These actions aim to improve state and local planning capacity by increasing the number of staff involved in planning tasks. With a greater level of assistance, MEMA will be able to focus more effort on improving training resources that support mitigation literacy, prioritization of mitigation actions, and utilization of funds at the community level. MEMA is also encouraging use of new technology and online tools to streamline the process for LHMP updates, such as online survey platforms, risk assessment maps, and all resources listed, referenced, and otherwise provided in this SHMP update.

MEMA is required by FEMA to perform a statewide capability assessment (Stakeholder Preparedness Review SPR) every year and a risk assessment (Threat and Hazard Identification and Risk Assessment THIRA) every three years to receive FEMA Emergency Management Performance Grant funding. These assessments cover all hazards including the natural hazards analyzed in the SHMP, they help standardize MEMA's process for sharing and receiving risk assessment data and hazard mitigation priorities, and there are obvious ways in which the all-hazard risk/capability assessments are integrated into this plan. Communication issues pose a further challenge to accomplishing these assessments because they require technical input from many state, county, and local stakeholders. To streamline the process for risk and capability assessment completion, MEMA is proposing a new spreadsheet-based approach that promises to better capture the county and local context of community risk and capabilities to mitigate against, prepare for, respond to, and recover from any disaster. The new format also clarifies the link to their LHMP risk/capability assessments that they accomplish every five years.

Finally, communication challenges also suggest a fundamental issue with the equitable provision of mitigation technical assistance to the whole community. Currently, MEMA is first identifying gaps in equity by collaborating with community assistance partners listed in Section 1 – Planning Process and using geographic indices such as the Social Vulnerability Index[80], Climate & Economic Justice Screening Tool[81], FEMA RAPT[82], the National Risk Index[83], and other products. To address equity gaps, MEMA will encourage use of resources listed in this section that conform with the Justice40 Initiative or provide clear support for equitable, whole community outcomes.

[80] SVI: https://www.atsdr.cdc.gov/placeandhealth/svi/index.html
[81] CEJST: https://screeningtool.geoplatform.gov/en
[82] FEMA RAPT: https://www.fema.gov/emergency-managers/practitioners/resilience-analysis-and-planning-tool
[83] NRI: https://www.fema.gov/flood-maps/products-tools/national-risk-index

5.3 Problem Statements

The Planning Team has defined a series of problem statements based on vulnerabilities found in the Risk Assessment and capability gaps identified from State and Local Capabilities. These problem statements represent current needs for improvement in Maine's hazard mitigation program and they have been used to restructure the Mitigation Strategy.

- Regional, tribal, and local hazard mitigation planning capabilities are limited, posing challenges for completing approvable LHMPs.
- Sub-applicants of the FEMA Hazard Mitigation Assistance grant program often find the application, review, and reporting process difficult to timely complete.
- NFIP policy trends indicate that Maine residents in flood risk areas are likely underinsured, with an insurance deficit also anticipated for other natural hazards.
- There is uncertainty about how climate change will influence the location, extent, and occurrence of natural hazards, and how development impacts community vulnerability to these hazards.
- Sea level rise and other climate change impacts have increased coastal hazard impacts to unprecedented levels.
- Numerous state assets are identified as vulnerable to flooding, coastal storms, erosion, wind damage, and other natural hazards identified in this plan, requiring complex, expensive, and long-term solutions
- Public water supplier problem statements: Sea level rise will likely increase contamination of coastal freshwater aquifers with seawater, increases in nuisance flooding increases public health risks from water supply contamination, and recent prolonged episodes of drought put public water suppliers at risk of water shortages.
- The future threat of Tier 2 hazards and their sensitivity to climate change is underestimated by emergency managers but has increased in concern for our Towns and Communities and State Agencies due to preparing for the hazard is unrealistic and could become a disaster for Maine.
- Maine's dam infrastructure is aging, and the Dam Safety Program is currently understaffed, facing significant challenges with implementing dam risk reduction. [HHPD3]
- The Forest Protection Division is under-resourced for large wildfire events with limited capacity for hazard mitigation, and Maine's administrative plan for the FMAG and HMGP Post Fire requires updates. [FMAG2]
- Maine SHMP products are underutilized for informing other planning efforts that would benefit from the natural hazard risk/capability assessments and mitigation strategy. State agencies are proactive in plan integration.
- Though current technical assistance and administration needs are met, a growing interest in the HMA program has led to an unprecedented number of grant applications with potential future capacity issues.
- State mitigation/resilience grant programs have limited cross-agency coordination, posing challenges for applicants wishing to pursue the most eligible and least competitive funding sources.
- Plan integration is limited by a lack of collaborative map and data production and sharing.
- Maine needs stronger standards for evaluating the effectiveness of mitigation projects to keep pace with greater investment in hazard mitigation assistance.
- The HHPD program is unused in Maine. [HHPD3]
- Though there have been gradual improvements in mitigation literacy, frequent turnover in local government, creation of new programs, and other challenges reduce awareness of and interest in the hazard mitigation program.
- Previous SHMP Risk assessment products lack accessibility and are underutilized as an educational tool.

- Future changes in risk will require new, effective mitigation actions informed by a diversity of subject matter experts.
- More engagement is needed with local businesses for a comprehensive hazard mitigation planning process.
- Land use planning and development practices do not necessarily incorporate the comprehensive range of natural hazard impacts present in Maine.
- Traditional mitigation actions tend to rely on built infrastructure with less prioritization for natural solutions.
- Hazard mitigation planning lacks integration with management practices for vulnerable natural systems, cultural historic sites, and other assets valuable to Maine's tourism and resource-based economies.
- Maine lacks implementation of a common equity protocol.
- Many knowledge gaps remain regarding the diversity of Maine’s hazard mitigation equity landscape.
- Many community action agencies are focused on immediate housing/vulnerability challenges and lack capacity to plan for long-term equitable hazard mitigation.

In Section 6 – Mitigation Strategy, the Planning Team assigns updated mitigation goals to help define solutions to these problems. Mitigation Partners have provided specific actions that will help address the problem statements and fulfill the goals.

Mitigation Strategy

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Section 6 – Mitigation Strategy

Stafford Act 44 CFR §201.4(c)(3)(iii)[1]

6.1 Hazard Mitigation Goals [S9]

6.1.1 Introduction

The State of Maine Hazard Mitigation Plan includes a mitigation strategy that provides the State of Maine with a blueprint for reducing the losses identified in the risk assessment. The strategy includes goals, problem statements, and actions that are based on gaps identified from the risk and capabilities assessments and are consistent with other state and local plan and policy goals. The goals, problem statements, and actions contained in this section are aimed at achieving long-term hazard mitigation. The state and local capability assessments identify the capacity for state, county, and local governments to implement the mitigation goals.

These goals have been revised since the previous plan update to remain consistent with Maine's ever-changing mitigation landscape. In summary, though the nature and frequency of many natural hazards have begun shifting due to global climate change, new vulnerabilities and the introduction of new mitigation capabilities have required a transition to mitigation goals that address all natural hazards, encourage greater cooperation among SHMP partners, an increase in visibility of the state mitigation program, an increase in FEMA Hazard Mitigation Assistance funding and to foster equitable and environmentally conscious practices.

6.1.2 Goals

Mitigation Goal 1: Protect lives, property, and the environment from all natural hazard risks and associated impacts of climate change now and in the future.

Mitigation Goal 2: Enhance state natural hazard mitigation capabilities through greater coordination among federal, state, county, and local partners.

Mitigation Goal 3: Improve hazard mitigation literacy and awareness among the public, business owners, academic institutions, and state, county, and local officials.

Mitigation Goal 4: Implement mitigation actions that preserve or restore the functions of natural systems and emphasize sustainable development.

Mitigation Goal 5: Build equity into all facets of the State Hazard Mitigation Program.

6.1.3 Addressing mitigation goals [S10.c.]

Each mitigation goal is based on several problem statements targeting capability gaps. Capability gaps are identified by comparing findings of the Risk Assessment against the lists of capabilities meant to address risk. Mitigation actions are designed to address the problem statements, thereby implementing the mitigation goals. In this way, implementation of mitigation actions equal progress towards mitigation goals through reduction of capability gaps. Below is a description of how the Mitigation Goals integrate the goals, problem statements, and actions of influential planning partners where they relate to mitigation.

[1] Stafford Act 44 CFR §201.4: https://www.law.cornell.edu/cfr/text/44/201.4

Assessment of Goals [S9.b.]

These goals are consistent with the hazards and vulnerabilities identified in Section 3 – Risk Assessment. These goals encompass high hazard potential dams and mitigating the vulnerabilities of dam failure identified in problem statements and mitigation actions that address the HHPD program, as described in detail below. Similarly, goals address the FMAG program through problem statements and specific mitigation actions to improve agency coordination and wildfire mitigation capabilities.

Each of the goals were assessed during individual meetings with planning partners (see Section 2 – Planning Process for a more complete description of this process). The goals in this plan update were changed from the previous update to reflect broader climate resilience and multi-agency coordination initiatives promoted by the planning partners. The Mitigation Goals integrate these shared concepts as described in greater detail below.

Goal Updates Since the Last Mitigation Strategy [S12]

This new Mitigation Strategy reflects updates to mitigation goals, objectives, and actions that reflect shifts in priorities that encourage greater resilience and coordination across state agencies and other involved partners. For example, the previous plan update focused primarily on the individual physical impacts of hazards profiled in the plan. In this current version, MEMA requested greater input from a wider range of Mitigation Partners, leading to a greater emphasis on collaboration, plan integration, education on programs, the connections among natural hazards, effective implementation of funds and resources, natural solutions, and building equity into hazard mitigation. This process has led to more opportunities for plan integration, as described below. Refer to the "status" field of the list of mitigation actions for progress updates.

Integration with Maine Climate Council Goals

The goals in this plan integrate many of the needs identified by the Maine Climate Council. Published in December 2020, "Maine Won't Wait" establishes Maine Climate Council's goals for implementing a four-year plan for climate action:

Climate Goal 1: Reduce Maine's Greenhouse Gas Emissions
Climate Goal 2: Avoid the Impacts and Costs of Inaction
Climate Goal 3: Foster Economic Opportunity and Prosperity
Climate Goal 4: Advance Equity through Maine's Climate Response

These Climate Goals relate directly with hazard mitigation and have been used to better inform the State Mitigation Goals. Conversely, MEMA's participation has ensured that hazard mitigation concepts remained central to the mission of the Maine Climate Council and the development of these goals. For example, Climate Goal 1 is related directly to mitigating climate change as GHGs are the source of climate change and pertain to each Mitigation Goal. Climate Goal 2 relates to each Mitigation Goal because the intent of the mitigation program is to avoid impacts through sustained, long-term risk reduction of natural hazards and the amplification of impacts caused by climate change. Climate Goal 3 relates to the objective of Mitigation Goal 1 to encourage economic stability and growth through the reduction of natural hazard risks to the State of Maine. Finally, Climate Goal 4 has helped to inform the SHMP of equity objectives listed in Mitigation Goal 5.

MEMA's Mitigation Program has also incorporated mitigation concepts into Maine Climate Council's evaluation criteria for establishing goals and recommending Community Resilience Subcommittee strategy recommendations and tasks.

Integration with Goals in LHMPs [S10.d.]

The previous SHMP provided mitigation goals focused on individual natural hazards. A broader stance has been taken in this SHMP update to incorporate all natural hazards and to emphasize improvements in hazard mitigation policy, practices, equity, and integration with other planning mechanisms. As of this plan update, all LHMPs for Maine jurisdictions continue to follow the traditional approach of providing goals for each natural hazard profiled in the plan. This SHMP incorporates these important, hazard-specific considerations with the inclusion of mitigation actions that directly address each profiled hazard. Further, the SHMP emphasizes objectives that would strengthen coordination between local, county, and state emergency managers.

Like previous plan updates, this Plan reflects the priorities and thinking that went into the preparation of 16 county plans and the University of Maine System plan, in large part because of MEMA's extensive involvement with the planning processes of these various jurisdictions. Inclusion of each goal, objective, and action from local plans would therefore be cumbersome and redundant. Copies of these plans are on file with MEMA and some are available online on county websites. MEMA has prepared a guide for use in the preparation of county plans to encourage a consistent format as well as similar actions where appropriate. The counties used this guidance during the preparation of their most recent updates.

6.2 State Mitigation Actions [S10]

The actions set forth on the following pages (Table 6.1) are informed by the risk and capabilities assessment of this Plan and evaluated/updated by the Planning Team and Mitigation Partners. As a result, these actions reflect the role of MEMA in hazard mitigation with the new addition of actions by Mitigation Partners involved in resilience planning and implementation. Additional partners may have an interest in hazard mitigation plan integration within the statutory limits of their own programs and staff.

6.2.1 Evaluation and Prioritization of Actions [S10.b.]

Each of the preceding goals, objectives and actions were analyzed, evaluated and prioritized by the Planning Team and Mitigation Partners to encourage actions that are cost-effective, environmentally sound, and are technically, politically, and financially feasible. The same prioritization strategy was used for all natural hazards including high hazard potential dams. Most importantly, actions were crafted to reduce vulnerabilities posed by hazards profiled in the Risk Assessment section of the Plan. In Table 6.1, these prioritizations are reported under the "Impact" and "Feasibility" columns. Prioritization follows these criteria:

Mitigation Impact Criteria

- Benefit of the action relative to its cost
- Environmental benefit and soundness
- Equitable distribution of benefits

Mitigation Feasibility Criteria

- Likelihood of acceptance by affected population
- Availability of funding/resources
- Technical feasibility
- Timeframe for implementation

Mitigation actions are rated for impact and feasibility as either HIGH or MODERATE based on whether these criteria are met. A HIGH rating means all criteria for impact or feasibility are met, while a MODERATE rating means the majority of criteria are met. Any actions that meet a LOW rating (when a minority of criteria are met) are excluded from the list as they would unlikely be a focus during the 5-year plan cycle. A high priority project would have HIGH for both impact and feasibility criteria. This prioritization system ensures that the mitigation actions address risks identified in the Plan and fulfill the mitigation strategy goals. New prioritizations may be calculated in the event of a natural disaster, as part of regular evaluation of Plan effectiveness, and/or at the end of the five-year plan update cycle. All mitigation actions are assessed using this prioritization, and actions carried over from the previous plan are re-evaluated using this approach.

In the case of high hazard potential dams, these prioritization criteria all apply, with the addition of the State Dam Safety Inspector's designation of hazard level to prioritize high hazard dams.

6.2.2 Current and Potential Sources of Federal, State, Local or Private funding for Mitigation [S11]

The State of Maine and local jurisdictions use several funding sources to implement hazard mitigation activities. In Table 6.1, these are reported under the "Potential Resources" column. Most of the funding comes from federal, state, and municipal programs. Federal funds are typically managed by the state. Refer to Section 5 – Capabilities for a list of mitigation funding sources. The state is always interested in pursuing other sources of funds and encouraging municipalities, Maine residents and local businesses to invest in hazard mitigation measures as well. The majority of these funding sources are highly competitive and the amounts can differ greatly by program and from year to year. In general, mitigation funding has substantially increased since the last plan update. Some funding sources (Community Development Block Grants, Maine Highway Fund, Land Use Impact Fees) are only marginally related to hazard mitigation.

Under the "Potential Resources" column, HMA refers to all Hazard Mitigation Assistance programs including BRIC, BRIC DTA, FMA, HMGP, HMGP Post Fire, and LPDM. These programs are often reported together as a potential resource for actions that have not yet applied for funding because their eligibility requirements are similar. Though not part of the HMA programs, 406 Mitigation Program may be eligible if critical infrastructure is damaged during a disaster. Any reference to "Staff" in this column indicates that staff hours are a primary resource for implementing the action. Any reference to a funding program is not necessarily final, as many of these mitigation actions have yet to be included in funding applications/requests. Potential resources are not limited to the list of grant opportunities in Table 4.1 from Section 4 – State Capabilities.

6.2.3 Mitigation Action Prioritization and Status Updates [S12]

Each mitigation action contains a status description updated in 2023. Status updates are provided in the white box under each mitigation action in Table 6.1. Many new mitigation actions have been included in the 2023 update to reflect the expanded scope of mitigation goals, an increase in new Mitigation Partners, and the updated analysis of risks, capabilities, and progress. Mitigation actions from the previous plan update were given a new status based on whether they were completed or carried over into the new plan with documented progress.

Most actions from the last plan update relate to continued efforts that have changed to better serve Maine's mitigation program. The reasons for these changes are typically because policy has changed, requiring new strategies for program training or implementation, or there are new resources to help advance risk assessment-based mitigation actions. Other actions with a clear completion date prior to this plan update are listed at the bottom of the mitigation actions list as "completed." Still others were removed because they are not considered to be mitigation actions.

All mitigation actions, including new actions, underwent a new prioritization process to reflect newly identified risks, capabilities, progress in the last five years, and any changes in Mitigation Partner objectives or policies. As a result, all prioritizations are new for the plan update based on new rankings for each action's impact and feasibility.

6.2.4 Project Category/Gap

Mitigation actions consist of many different project types that address gaps in mitigation capabilities. In Table 6.1 these are addressed in the column "Category/Gap". These project categories include Knowledge Gaps that require training or education, Infrastructure projects that directly address vulnerabilities to state assets, Policy Gaps that implement strategies to integrate and improve Maine's mitigation program, Partnership Gaps that establish cross-agency mitigation support, closing Funding Gaps to improve the success rate of mitigation grant applications, closing Energy Gaps to improve grid resilience in Maine, closing Staffing Gaps to ensure there is adequate technical assistance, Outreach to improve visibility and understanding of Maine's mitigation program, and closing Equity Gaps to ensure that mitigation efforts serve all Mainers as needed.

Infrastructure Projects

Several state assets were identified as vulnerable to natural hazards in the Risk Assessment. Maine is currently in the process of project scoping to address these issues and improve state asset resilience. For this reason, state infrastructure mitigation actions are fewer in number than planning or policy actions, and most of the infrastructure projects are provided by MaineDOT's most vulnerable infrastructure. The Governor's Office of Policy Innovation and the Future intends to build from the Risk Assessment, survey assets in greater detail, and identify infrastructure/physical projects that would then seek mitigation funding within the next few years.

6.2.5 Responsible Entities and Source

Partners responsible for managing and implementing each mitigation action are reported in the "Responsible Entities" column of Table 6.1. Meetings and other resources where these projects were identified are listed under the "Source" column – refer to Section 2 – Planning Process for more information on the plan meeting schedule and roster of the Planning Team and Mitigation Partners.

6.2.6 Hazards Addressed

Every Mitigation Action is created to provide a sustained reduction of long-term risk to the natural hazards reported in the "Hazards Addressed" column. Refer to Section 3 – Risk Assessment for more information on these natural hazards.

6.2.7 List of Mitigation Actions [S10]

Table 6.1: List of state-level mitigation goals, problem statements, and mitigation actions. For each action, there is a 2023 status update in the following white row in italics.

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
Goal 1:	**Protect lives, property, and the environment from all natural hazard risks and associated impacts of climate change now and in the future**								
1.1.	**Regional, tribal, and local hazard mitigation planning capabilities are limited, posing challenges for completing approvable LHMPs.**								
1.1.1.	Prioritize further evaluation of risk for state assets identified within hazard-prone areas from the SHMP Risk Assessment.	SHMP 2019	Knowledge	All-hazards	MEMA	Staff, HMA, EMPG	2023-2025	MODERATE	HIGH
	Carryover SHMP utilizing new GIS resources								
1.1.2.	Provide training and technical/GIS assistance to County EMAs and others whose responsibility is to monitor, evaluate, and update local plans.	SHMP 2019	Training	All-hazards	MEMA	Staff, HMA, EMPG	2023-2025, 2028	HIGH	HIGH
	Carryover SHMP; MEMA has established new process for updating LHMPs in compliance with new FEMA guidelines for all 16 counties.								
1.1.3.	Build and strengthen partnerships with the five tribal nations of Maine to better serve their hazard mitigation planning efforts.	PT 5-2021	Partnership	All-hazards	MEMA, TN	Staff, HMA, EMPG	2023-2028	HIGH	HIGH
	Coordination has begun with some tribal nations interested in developing a tribal annex to pre-existing county plans. MEMA is prepared to provide assistance to tribal nations (if requested) who are interested in applying for Plan Update grants.								
1.1.4.	Create a state and local mitigation actions database, coordinated with SHMP/LHMP updates, with determination of eligibility for mitigation funding.	PT 7-2021	Knowledge	All-hazards	MEMA	Staff, HMA, EMPG	2023-2024	HIGH	HIGH
	Key demonstration of SHMP-LHMP integration using standard practices. Database was assembled in 2022; requires updates as local plans are approved; looking into streamlining update process								
1.1.5.	Provide regional, tribal, and communities technical assistance on FEMA HMA grant sub applications for funding LHMPs.	Expert review	Knowledge	All-hazards	MEMA	Staff, HMA, EMPG	2023-2028	HIGH	HIGH
	Technical Assistance has begun and momentum for increased FEMA HMA sub applications for LHMP has occurred.								
1.2.	**Sub applicants of the FEMA Hazard Mitigation Assistance grant program often find the application, review, and reporting process difficult to timely complete.**								
1.2.1.	Provide technical assistance to state agencies, federally-recognized tribes, county, and municipal partners interested in applying for Hazard Mitigation Assistance grants.	PT 4-2022	Training	All-hazards	MEMA	Staff, HMA, EMPG	2023-2028	HIGH	HIGH
	Carryover SHMP updated to comply with new SHMP and LHMP guidelines								
1.2.2.	Assist county and municipal partners with FEMA local hazard mitigation plan update applications and potential eligible projects.	SHMP 2019	Partnership	All-hazards	MEMA	Staff, HMA, EMPG	2023-2028	HIGH	HIGH
	Carryover SHMP to manage new mitigation projects								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.2.3.	Restructure state review panel's scoring rubric to support the Justice40 Initiative, social vulnerability index and equity.	PT 5-2023	Policy	All-hazards	MEMA	Staff, HMA	2023-2028	MODERATE	MODERATE
	Restructuring will occur when FEMA signals need for programs to comply with Justice40								
1.2.4.	Provide natural hazard mitigation training including preparing applications, benefit cost analysis, and individual FEMA grant criterias.	PT 5-2023	Training	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	This is an ongoing service of SHMO, adapting to new programmatic changes								
1.2.5.	Manage FEMA hazard mitigation assistance funding from sub applicant initial inquiry to sub application submission to grant closeout.	Expert review	Capability	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	This is an ongoing service of SHMO, adapting to new programmatic changes								
1.2.6.	Prioritize assistance for jurisdictions located in high natural hazard areas and in conjunction with Justice40 disadvantaged status, EDRCs, areas with an SVI of .60 or greater, and other relevant measures of vulnerability.	Expert review	Policy	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	New action based on equity and Justice40 FEMA guidance								
1.3.	**NFIP policy trends indicate that Maine residents in flood risk areas are likely underinsured, with an insurance deficit also anticipated for other natural hazards.**								
1.3.1.	Encourage all communities to participate in NFIP and encourage FEMA to produce digital FIRMs for parts of Maine lacking digital flood risk resources.	PT 5-2023	Capability	Flood	DACF, MEMA	Staff, HMA	2023, 2026	HIGH	MODERATE
	Fy23, planning for outreach letter to all non-participating communities and continue once every three years								
1.3.2.	Monitor and assist communities with maintaining compliance with the NFIP, which allows federally backed flood insurance to be sold in their communities.	SHMP 2019	Capability	Flood	FMP, MEMA, County EMA	Staff	2023-2028	HIGH	HIGH
	Community assistance contacts/visits are scheduled, some of these are chosen based on SVI, some are requested by the municipality								
1.3.3.	Sponsor NFIP training workshops for local officials to help them properly administer and enforce local floodplain management regulations, completed annually.	SHMP 2019	Training	Flood	FMP	Staff, HMA	2023-2028	HIGH	HIGH
	Carryover SHMP; Completed annually for new interested communities								
1.3.4.	Provide new public outreach and educational resources on the benefits of flood insurance and general hazard insurance.	PT 5-2023	Training	All-hazards	FMP, BI	Staff, HMA	2023-2024	HIGH	MODERATE
	This is an ongoing service of FMP, though coordination is new with Bureau of Insurance								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.3.5.	Prioritize Repetitive Loss and Severe Repetitive Loss mitigation actions where applicable.	SHMP 2019	Policy	Flood	FMP, MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	Carryover SHMP; 2009 MEMA developed guidance including recommended strategies; this guidance continues to be in effect as planned.								
1.3.6.	Monitor NFIP's exploration of installment/payment plans for flood insurance and promote the opportunity if it becomes available to focus on equitable flood insurance coverage in disadvantaged and impoverished Maine communities.	Expert Review	Equity	Flood	NFIP, MEMA, FMP	NFIP policy holders	2025	HIGH	HIGH
	New action based on news that NFIP may update their insurance program.								
1.3.7.	Collaborate with Maine Bureau of Insurance on proactive messaging regarding insurance implications in disasters.	Expert review	Outreach	All-hazards	MEMA	Staff, HMA, IA	2023-2028	HIGH	HIGH
	New action expanding on work done for recovery by IA Program								
1.3.8.	Provide technical assistance to NFIP holders on the FEMA Flood Mitigation Assistance Grant.	Expert review	Knowledge	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	Continued work to Towns and Communities, Maine is interested in bolstering interest in FMA								
1.3.9.	Provide education and training to non NFIP policy holders on benefits of NFIP/ FEMA HMA FMA grant.	Expert review	Training	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	New action to educate and training non NFIP holders of benefits.								
1.3.10	Provide training to insurance providers, partnered with the State's Bureau of Insurance, State's NFIP Coordinator, and FEMA.	Expert review	Training	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	New action to educate and training providers on current NFIP opportunities.								
1.4.	**There is uncertainty about how climate change will influence the location, extent, and occurrence of natural hazards, and how development impacts community vulnerability to these hazards.**								
1.4.1.	All-hazards: Educate and inform the public and other state and local stakeholders of newly identified natural hazard and climate change vulnerabilities, capabilities, and mitigation strategies for an ever-changing landscape of risk.	SHMP 2019, Expert review	Training	All-hazards	MEMA	Staff, EMPG, HMA, IA	2023-2028	HIGH	HIGH
	Carryover SHMP, educate and inform on new risks, new hazards								
1.4.2.	All-hazards: Install back-up power, microgrid systems, and/or battery storage at critical facilities as appropriate and as resources become available.	ESP 8-2022	Energy	All-hazards	MEMA, GEO	HMA, EMPG, CRP, GRP, DOE (UIM)	2023-2026	HIGH	HIGH
	Carryover SHMP but updated with input from GEO								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.4.3.	All-hazards: Prioritize mitigation actions that fulfill equity objectives for serving community members facing poverty, lack of housing, language and communication issues, mobility issues, lack social networks, or other challenges compounding vulnerability in Maine.	IA 3-2023	Equity	All-hazards	MEMA, County EMA	Staff, HMA, IA, IHP, EMPG, USDA-RD, NBRC, HRLP, CDBG, CDBG-DR	2023-2028	HIGH	MODERATE
	New action established based on feedback from MCC Equity Subcommittee								
1.4.4.	Weather hazards: Obtain critical severe weather information to understand the location, intensity, and probability of occurrence of weather hazards by implementing the SKYWARN trained volunteer weather spotter program.	NOAA Interview 5-2022	Training	Weather hazards	NOAA	SKYWARN program	2023-2028	MODERATE	HIGH
	This is an ongoing service of NOAA adapted to new hazards and monitoring approaches								
1.4.5.	Flooding: Support efforts to improve floodplain mapping and FEMA's Risk Map Program.	SHMP 2019	Policy	Flood	FMP, USGS	NFIP	2023-2025	HIGH	MODERATE
	Carryover SHMP, exploratory mapping is occurring in new sections of the state with preliminary maps anticipated in 2025								
1.4.6.	Flooding: Support improvements to the state's early warning capabilities, such as river gauges and NOAA alerting systems, giving priority to areas with the most serious hazard issues. Provide technical assistance for FEMA HMA grant programs and trainings on NFIP.	SHMP 2019	Capability	Flood	MEMA, USGS, NOAA	HMA, CRP, FPMS	2023-2028	HIGH	HIGH
	Carryover SHMP; support funding for new gages								
1.4.7.	Flooding: As time and resources permit, use LiDAR data, DSS-WISE, and Hazus to support dam failure and flood risk mapping efforts for the Dam Safety Program and for communities without DFIRMs, and support MEGIS with LiDAR acquisition.	SHMP 2019	Knowledge	Flood	USGS, FMP, DSP, MEMA	NFIP, FPMS,	2023-2025	HIGH	MODERATE
	Carryover SHMP; York and Cumberland counties have preliminary FIRMs expected to become effective in 2024								
1.4.8.	Flooding: Invest in upgraded culverts and road systems to better mitigate flood damages to local roads, bridges, culverts, and ditches managed by local governments.	SHMP 2019	Infrastructure	Flood	FMP	HMA, AOP, MSCU, DOT (MHF), DOT (BPP)	2023-2028	MODERATE	MODERATE
	Carryover SHMP but utilizing new resources and new culvert projects								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.4.9.	Severe fall/winter weather: Encourage use of consistent severe fall/winter weather mitigation planning in SHMP and LHMPs. Provide technical assistance for FEMA HMA grant programs and trainings.	SHMP 2019	Knowledge	Severe fall/winter weather	MEMA	Staff, HMA	2023-2025, 2028	MODERATE	MODERATE
	Carryover SHMP, climate change has driven new winter weather risks including elevated ice storm and flooding risks								
1.4.10.	Severe summer weather: Encourage use of consistent severe summer weather mitigation planning in SHMP and LHMPs. Provide technical assistance for FEMA HMA grant programs and trainings.	SHMP 2019	Knowledge	Severe summer weather	MEMA	Staff, HMA	2023-2025, 2028	MODERATE	MODERATE
	Carryover SHMP, climate change has driven new summer weather risks including extreme heat								
1.4.11.	Severe summer weather: Develop state and county Extreme Temperature Response Plans, an Extreme Temperature Community Resilience Guidebook, and an extreme temperature communication campaign.	CDC Interview 7-2022	Policy	Severe summer weather	CDC	State funds, CDC	2023-2025	HIGH	HIGH
	CDC Contracted with Partnerships For Health (PFH) to provide evaluation services to help us assess these projects. PFH currently has four (4) extreme temperature-related evaluations planned								
1.4.12.	Tropical cyclone: Establish inland flooding evacuation study and protocol for inland tropical cyclone scenarios. Provide technical assistance for FEMA HMA grant programs and trainings.	HES 2020	Knowledge	Tropical Cyclone	MEMA	Staff, FEMA, PROTECT	2023-2028	HIGH	HIGH
	MEMA was selected for potential FEMA Contract Support for Evacuation Planning to update the evacuation Incident Annex								
1.4.13.	Drought: Advise the Governor, as needed, on actions the Governor may take to mitigate the impacts of drought.	DTF AAR 2021	Policy	Drought	MEMA, USGS	Staff, EMPG	2023-2028	HIGH	HIGH
	Updated during 2020-2023 drought; ongoing task as part of Drought Task Force responsibilities								
1.4.14.	Wind hazards: Support efforts to bury power lines in the City of Portland and other urban locations with weak energy grid resilience.	Cumberland County LHMP 2021	Infrastructure	Wind hazards	MEMA, CMP, County, Municipal	Staff, HMA, CRP, GRP	2023-2026	HIGH	HIGH
	New action provided by County LHMP covering the greatest population in the state								
1.4.15.	Finalize County EMA Extreme Temperature Plans.	CDC Interview 1-2023	Policy	Severe Summer Weather	CDC, County, MEMA	Staff, EMPG	2023-2028	MODERATE	MODERATE
	New action presented by Maine CDC. Sagadahoc County has finalized an extreme heat plan, and Piscataquis and Aroostook Counties are in development.								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.4.16.	Maine Coast Heritage Trust to complete resilience assessment of coastal communities to determine mitigation projects including living shorelines, aquaculture, coastal storm and flood resilience.	Expert Review	Infrastructure	Coastal hazards	MCHT, GOPIF	CRP, GRP	2023-2028	HIGH	HIGH
	New action provided by Maine Coast Heritage Trust; GOPIF grant awarded								
1.4.17.	Complete Popham Beach and Beyond project, revitalization of state park complex and surrounding community in Phippsburg	Expert Review	Infrastructure	Coastal hazards	GOPIF, Municipal	CRP	2023-2028	HIGH	HIGH
	New action provided by GOPIF; $70M fund awarded								
1.5.	**Sea level rise and other climate change impacts have increased coastal hazard impacts to unprecedented levels.**								
1.5.1.	Sea Level Rise: Track changes in sea level, evaluate future projections, provide recommendations to FEMA regarding flood map updates, and seek funding to support these efforts.	SHMP 2019	Policy	Flood	MGS, GMRI, NOAA	Staff, CRP, CCGP	2023-2028	MODERATE	HIGH
	Carryover SHMP; MGS continues to monitor sea level rise; information including maps and presentations continues to be provided to towns and public. The re-introduction of the Maine Interagency Climate Adaptation Workgroup has better coordinated monitoring resources as they pertain to sea level rise.								
1.5.2.	Sea Level Rise: Provide information to municipalities, utilities, and the public on sea level rise projections, implications, and mitigation opportunities.	SHMP 2019	Knowledge	Flood	MGS, GMRI, NOAA, MEMA	Staff, CCGP, HMA, DOT (MIAF), CZM, CRP	2023-2028	MODERATE	HIGH
	Carryover SHMP responding to new projections implemented in new state policy								
1.5.3.	Erosion: Update geological boundaries of the coastal sand dune system, beach profiles, and unstable coastal bluffs in GIS and release the update via web products. Provide DEP with digital data.	MGS Interview 5-2022	Knowledge	Erosion	MGS	Staff, NGGDPP	2023-2028	HIGH	HIGH
	Carryover SHMP; updates completed when staff time and resources are available								
1.5.4.	Erosion: Maine Beach Monitoring Project: Continue to monitor the change in beach profiles and dune edge along the southern and mid-coast regions, calculate beach erosion rates and map erosion hazard areas for short- and long-term processes and sea level rise.	MGS Interview 5-2022	Knowledge	Erosion	MGS	Staff, NGGDPP	2023-2028	MODERATE	HIGH
	Carryover SHMP; updates completed when staff time and resources are available. Beach erosion documented, but updates are unfunded.								
1.5.5.	Erosion: Support the Maine Beach Monitoring Project: calculate beach erosion rates and map erosion hazard areas for short- and long-term processes and sea level rise.	MGS Interview 5-2022	Knowledge	Erosion	MGS	Staff, NGGDPP	2023-2028	MODERATE	HIGH
	Carryover SHMP; Beach monitoring funds have lapsed, seeking funding								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.5.6.	Mass wasting: Map inland landslide risk areas to infer location, extent, and recurrence of risk.	MGS Interview 5-2022	Knowledge	Mass wasting	MGS	Staff, NGGDPP	2023-2028	MODERATE	HIGH
	The landslides database has been established and is typically updated on an annual basis, with data covering most of the state. Susceptibility models are a new undertaking								
1.5.7.	Earthquake: Conduct instrumental monitoring of earthquake occurrences and collection of intensity reports to infer event location, extent, and recurrence. Communicate with regional seismologists.	MGS Interview 5-2022	Knowledge	Earthquake	MGS, MEMA	Staff, NGGDPP	2023-2028	MODERATE	MODERATE
	Carryover SHMP; MGS monitors seismic activity throughout the state.								
1.5.8.	Sea level rise: Implement National Park Service Guidelines on Flood Adaptation for Rehabilitating Historic Buildings	Expert review	Infrastructure	Flood, erosion	MHPC, MEMA	Staff, HMA, CRP, EMPG	2021-2028	HIGH	HIGH
	New action based on MHPC Weathering Maine report and the following guidelines: https://www.nps.gov/orgs/1739/upload/flood-adaptation-guidelines-2021.pdf								
1.5.9.	Sea level rise: Implement MHPC's property owner's guide for mitigating coastal flood risk for historic landmarks in the City of Portland, including Bayside and Ferry Village case studies	Expert review	Infrastructure	Flood, erosion	MHPC, MEMA	Staff, HMA, CRP, EMPG	2021-2028	HIGH	HIGH
	New action based on MHPC Weathering Maine report and the following guidelines: https://www.maine.gov/mhpc/sites/maine.gov.mhpc/files/inline-files/GPLPropertyOwnersGuideFINAL_WEB9.8.pdf								
1.6.	**Public water supplier problem statements: Sea level rise will likely increase contamination of coastal freshwater aquifers with seawater, increases in nuisance flooding increases public health risks from water supply contamination, and recent prolonged episodes of drought put public water suppliers at risk of water shortages.**								
1.6.1.	Sea level rise: Provide technical assistance with modeling and upgrade wells to detect and respond to saltwater intrusion if appropriate.	DWP Interview 9-2022	Infrastructure	Flood	PWS, DWP	Staff, HMA	2023-2028	HIGH	HIGH
	New action, begun preliminary conversations between MEMA and CDC Drinking Water Program								
1.6.2.	Build flood barriers to protect public water infrastructure and apply green infrastructure, such as rainfall collection and retention ponds.	DWP Interview 9-2022	Infrastructure	Flood	PWS, DWP	HMA, CRP, CCPG, NOAA (RTPFPBR), NOAA (THRCR), NRCS (WFP), FPMS, CWIFP, NRCSWRP	2023-2028	HIGH	HIGH
	New action, begun preliminary conversations between MEMA and CDC Drinking Water Program								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.6.3.	Drought: Determine feasibility and benefits of public water supply interconnections to mitigate drought impacts on water utilities. Provide technical assistance for FEMA HMA grant programs and trainings.	DWP Interview 9-2022	Infrastructure	Drought	DWP	HMA, CRP, FDRP,	2023-2025	HIGH	MODERATE
	New action, begun preliminary conversations between MEMA and CDC Drinking Water Program								
1.6.4.	Drought: update drought contingency plans, monitor surface water conditions with a climate change lens, practice innovative water conservation and demand management, implement modern watershed management, and exercise innovative water shortage and outage scenarios with local government and mutual aid partners.	DWP Interview 9-2022	Training	Drought	PWS, DWP	Staff, EMPG, HMA,	2023-2025	HIGH	MODERATE
	New action, begun preliminary conversations between MEMA and CDC Drinking Water Program								
1.7.	**The future threat of Tier 2 hazards and their sensitivity to climate change concerns Maine communities and state agencies who will have difficulty managing future hazards.**								
1.7.1.	Forest Pests: monitor for amplification of forest pests' issues and utilize appropriate mitigation resources.	MFS Interview 5-2022	Knowledge	Forest pests	MFS, MEMA	Staff, EMPG	2023-2028	MODERATE	MODERATE
	New action; new hazard included in latest SHMP								
1.7.2.	Forest Pests: Due to the increase of climate change, drought, wildfire and air pollution, forest pests have increased leading to mitigation for state assets and the economy in Maine. Continue to provide technical assistance for the interconnection of natural hazards.	Expert Review	Knowledge	Forest pests	MEMA	Staff, HMA, EMPG	2023-2028	HIGH	HIGH
	New Action: There has been an increase in State Agencies, Towns and Communities expressing the detrimental effect on Maine's forests and flora which is the number one economic producer in Maine and there is not preparation to stop this hazard only mitigation actions.								
1.7.3.	Harmful Algal Blooms: Explore funding resources that support long-term monitoring of HAB risk trends for future multi-agency mitigation planning to the greatest extent possible under current statute obligations and staff and resource limitations.	DEP-DMR Interviews 7-2022	Knowledge	HABs	DEP, DMR, MEMA	Staff, HMA, EMPG	2023-2028	MODERATE	MODERATE
	New action; new hazard included in latest SHMP								
1.7.4.	Harmful Algal Blooms: Establish joint-agency advisory plans for freshwater HAB safety under the guidance of Maine CDC and in partnership with local conservation organizations and municipalities.	DEP-DMR Interviews 7-2022	Policy	HABs	DEP, CDC	Staff	2025	MODERATE	MODERATE
	New action; new hazard included in latest SHMP								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.7.5.	Harmful Algal Blooms: Explore funding resources to support method development for mitigating new HAB challenges.	DEP-DMR Interviews 7-2022	Policy	HABs	DMR	Staff	2024-2025	MODERATE	MODERATE
	New action; new hazard included in latest SHMP								
1.7.6.	Harmful Algal Blooms: Due to the increase of climate change, drought, floods, wildfire and air pollution, algal blooms have increased, leading to mitigation projects to ensure reservoirs, water treatment, tourism, and Maine's fishing communities and revenue are not affected. Continue to provide technical assistance for the interconnection of natural hazards.	Expert Review	Knowledge	HABs	MEMA	Staff, HMA, CCPG, MSCU, SHIP, NOAA (C-BHR), NOAA (RFPBRG), NOAA (RTPFPBR), AOP, NFPP,	2023-2028	HIGH	MODERATE
	New Action: There has been an increase in State Agencies, Towns and Communities expressing the detrimental effect on water bodies and there is no preparation to stop this hazard only mitigation actions.								
1.7.7.	Air Quality: Due to the increase of climate change, drought, floods, wildfire and air pollution, air quality has increased leading to mitigation projects to ensure environmental effects on flora and fauna is not degraded and wet and dry deposition to Maine's waterbodies does not promote algal blooms, fish die off, etc. to Maine's fishing economy. An increase in public health issues, a community lifeline, will negatively affect Maine's assets and economy. Air Quality: monitor for amplification of air quality issues and identify appropriate mitigation resources. Provide technical assistance for FEMA HMA grant programs and trainings.	Expert Review	Knowledge	Air quality	DEP, MEMA	HMA, EMPG, Staff	2023-2028	HIGH	MODERATE
	New Action: There has been an increase in State Agencies, Towns and Communities expressing the detrimental effects of air pollution (criteria air pollutants) on public health, water bodies, structures and there is not preparation to stop this hazard only mitigation actions.								
1.7.8.	Monitor Tier 2 hazards and evaluate the need for new mitigation assistance efforts for these and other hazards sensitive to climate change. Provide technical assistance for FEMA HMA grant programs and trainings.	MFS Interview 5-2022	Knowledge	Tier 2 hazards	DEP, DMR, MFS, MEMA	Staff, HMA, EMPG	2023-2024	HIGH	HIGH
	New action; new hazard included in latest SHMP								
1.8.	**Maine's dam infrastructure is aging and the Dam Safety Program is currently understaffed, facing significant challenges with implementing dam risk reduction. [HHPD3]**								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.8.1.	Utilize National Dam Safety Program funds to the greatest extent possible by hiring a Dam Safety Engineer.	HHPD 3-2023	Staffing	Dam hazards	DSP	NDSP	2023	HIGH	HIGH
	Maine has been without a Dam Safety Engineer since 2021 and relies on a contractor								
1.8.2.	Establish criteria for prioritizing HHPD-eligible mitigation projects.	Expert Review	Policy	Dam hazards	DSP	Staff	2024	MODERATE	MODERATE
	New action; required to implement HHPD program in Maine								
1.8.3.	Continue working collaboratively with other regulatory state agencies to share resources and improve GIS capabilities for updating the dam database and supporting dam safety compliance.	HHPD 3-2023	Partnership	Dam hazards	DEP, DSP	Staff	2023	HIGH	MODERATE
	New action; MEMA works with MEGIS and DEP to update a digital dams database for safety and environmental assessments								
1.8.4.	Encourage greater interest in the Dam Safety Program from professional engineers and the University of Maine School of Engineering to enhance recruiting efforts.	HHPD 3-2023	Outreach	Dam hazards	DSP	Staff, academic internship	2023-2024	MODERATE	HIGH
	New action to build interest in dam safety with university students								
1.8.5.	Work with dam owners to digitize EAPs: dam failure risk maps, standardize calculations for populations and properties at risk, and incorporate these and other emergency action plan products into LHMPs, the SHMP, emergency operations plans, and a dam incident annex.	Expert Review	Policy	Dam hazards	Dam owners, DSP	Staff	2024	HIGH	MODERATE
	New action; EAP products generally provided in paper format								
1.8.6.	Rehabilitate or remove high hazard potential dams where appropriate.	Expert Review	Infrastructure	Dam hazards	Dam owners	NFPP, NOAA (C-BHR), NOAA (RFPBRG), NOAA (RTPFPBR), AOP	2023-2028	HIGH	HIGH
	New action; dam removals have increased in Maine over the last decade but with the primary goal of improving access for diadromous fish migration.								
1.8.7.	Calculate populations at risk (PAR) and identify exposed property for Maine's high hazard dams.	HHPD 3-2023	Knowledge	Dam hazards	DSP, MEMA	Staff	2023-2024	MODERATE	HIGH
	New action, calculate PAR and impacted structures for dam EAPs if information is absent								
1.9.	**The Forest Protection Division is under-resourced for large wildfire events with limited capacity for hazard mitigation, and Maine's administrative plan for the FMAG and HMGP Post Fire requires updates. [FMAG2]**								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.9.1.	Reduce vulnerability of jurisdictions by training communities on wildfire planning and assistance programs such as Community Wildfire Defense Grants, FMAG, HMGP Post Fire, Maine Firewise, and the Northeast-Midwest Wildfire Risk Assessment Portal.	FMAG 4-2023	Training	Wildfire, Forest pests	DACF, MEMA	Staff, CWDG, HMA	2024-2028	HIGH	HIGH
	New action; MEMA coordinating with DACF to appropriately direct interest in each program								
1.9.2.	Strengthen collaborative ties between MEMA and Maine Forest Service to support expanding wildfire mitigation in the state, focusing on Community Wildfire Protection Plan updates and the Maine Firewise Education Program.	FMAG 5-2022	Partnership	Wildfire	MEMA, DACF	Staff, HMA, CWDG	2023-2028	HIGH	HIGH
	Carryover SHMP, new CWDG program overlaps with HMA nd there is a need for CWPP updates								
1.9.3.	Monitor wildfire occurrences and collection of intensity reports for future risk assessments.	FMAG 4-2023	Knowledge	Wildfire	DACF	Staff	2023-2028	MODERATE	HIGH
	Carryover SHMP, recent drought elevated the total number of wildfires in Maine, and adjacent areas in Canada are experiencing severe wildfires								
1.9.4.	As county plans are updated, implement strategies consistent with the latest Maine Forest Action Plan.	FMAG 4-2023	Policy	Wildfire	MEMA, DACF	Staff, HMA, EMPG	2025-2028	HIGH	MODERATE
	New action; MEMA assessing best practices to integrate LHMPs with Forest Action Plan and implementing through MEMA's technical assistance role								
1.9.5.	Strengthen wildfire risk verification and prioritization by combining real wildfire response data, wildfire risk model data, and vulnerability metrics such as SVI and Justice40 in the Northeast-Midwest Wildfire Risk Explorer.	FMAG 2-2023	Knowledge	Wildfire	SFA, DACF, MEMA	Staff, HMA	2024	HIGH	MODERATE
	New action; the Wildfire Risk Assessment Portal is published and deployed for use by emergency managers and state-local planners, but has limited use because it only includes model data and not real wildfire report data and social vulnerability metrics that would greatly increase usability.								
1.9.6.	Incorporate wildfire breaks and fuel reduction in municipal land use planning/development policy, such as through local government ordinances, zoning, or subdivision law.	Expert Review	Infrastructure	Wildfire	Municipal	Staff, SFA, FMAG	2024-2028	HIGH	MODERATE
	New action based on lack of natural hazard mitigation concepts in local land use/planning								
1.9.7.	Provide training and education to eligble sub applicants on FEMA HMA funding for wildfire mitigation.	Expert Review	Knowledge	Wildfire, Forest pests	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	New action: In concurrent with updating the HMGP Post Fire, and increased wildfire warnings, education on wildfire mitigation will continue.								
1.10.	**Numerous state assets are identified as vulnerable to flooding, coastal storms, erosion, wind damage, and other natural hazards identified in this plan, requiring complex, expensive, and long-term solutions**								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.10.1.	Complete scoping of Stonington Causeway hazard mitigation project to elevate roadway and improve flow under the structure to mitigate ongoing flood and coastal hazard risks amplified by sea level rise	MDOT project list	Infrastructure	Coastal hazards	MDOT	Staff, HMA, MDOT funds	2023-2025	HIGH	HIGH
	New action from MaineDOT priority project list: www.maine.gov/mdot/projects								
1.10.2.	Complete scoping of Machias dike bridge mitigation project to mitigate ongoing flood and coastal hazard risks	MDOT project list	Infrastructure	Coastal hazards	MDOT	Staff, HMA, MDOT funds	2023-2025	HIGH	HIGH
	New action from MaineDOT priority project list: www.maine.gov/mdot/projects								
1.10.3.	Complete Madawaska/Edmundston international bridge replacement to prevent risk of flood damage to aging infrastructure.	MDOT project list	Infrastructure	Flood, erosion	MDOT, HIP, INFRA	Staff, HMA, MDOT funds	2023-2025	HIGH	HIGH
	New action from MaineDOT priority project list: www.maine.gov/mdot/projects								
1.10.4.	Complete Woolwich station 46 bridge mitigation replacement due sea level rise, erosion, and flooding of aging infrastructure.	MDOT project list	Infrastructure	Coastal hazards	MDOT	Staff, HMA, MDOT	2023-2024	HIGH	HIGH
	New action from MaineDOT priority project list: www.maine.gov/mdot/projects								
1.10.5.	Complete Sanford downtown revitalization project	MDOT project list	Infrastructure	All-hazards	MDOT	Staff, MDOT funds	2023-2025	HIGH	HIGH
	New action from MaineDOT priority project list: www.maine.gov/mdot/projects								
1.10.6.	Complete Waterville-Winslow Ticonic Bridge mitigation project	MDOT project list	Infrastructure	Flood, erosion	MDOT	Staff, HMA, MDOT funds	2023-2024	HIGH	HIGH
	New action from MaineDOT priority project list: www.maine.gov/mdot/projects								
1.10.7.	Complete Frank J. Wood bridge replacement project to prevent risk of flood damage to aging infrastructure	MDOT project list	Infrastructure	Coastal hazards	MDOT	Staff, HMA, MDOT funds	2025-2026	HIGH	HIGH
	New action from MaineDOT priority project list: www.maine.gov/mdot/projects								
1.10.8.	Assess sea level rise flood risk of Lincolnville Beach ferry terminal	MDOT Interview 10-2022	Infrastructure	Coastal hazards	MDOT	Staff, HMA, MDOT funds	2023-2028	MODERATE	HIGH
	New action from MaineDOT								
1.10.9.	Assess flood risk of Swan Island ferry terminal	IF&W Interview 10-2021	Infrastructure	Flood, erosion	MDOT	Staff, HMA, MDOT funds	2023-2028	MODERATE	MODERATE
	New action from IF&W								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.10.10.	Provide technical assistance to Presumpscot River Corridor Vulnerability Assessment	Expert review	Infrastructure	Mass wasting, erosion	MGS, GPCOG, MDOT	Staff, HMA	2023-2028	HIGH	HIGH
	New action from MaineDOT								
1.10.11.	Merge Gray and Yarmouth water districts to meet water demand under dry/drought conditions and growing population	Expert review	Infrastructure	Drought	DWP, water districts	BRIC	2023-2028	HIGH	HIGH
	New action from public water suppliers								
1.10.12.	Merge Wiscasset water district with adjacent districts to meet water demand under dry/drought conditions and growing population	Expert review	Infrastructure	Drought	DWP, water districts	BRIC	2023-2028	HIGH	HIGH
	New action from public water suppliers								
Goal 2:	**Enhance state natural hazard mitigation capabilities through greater coordination among federal, state, county, and local partners.**								
2.1.	**Maine SHMP products are underutilized for informing other planning efforts that would benefit from the natural hazard risk/capability assessments and mitigation strategy. State agencies are proactive in plan integration.**								
2.1.1.	Align hazard mitigation concepts across the SHMP, State Climate Plan, and Maine Climate Council initiatives, reports, and planning guidance.	MWW 5-2022	Integration	Climate hazards	MCC, MEMA, GOPIF	Staff, HMA	2024-2026	HIGH	HIGH
	MCC to kick off again in 2024. Concepts: state infrastructure adaptation fund. Best aligned with Safeguarding Tomorrow								
2.1.2.	Collaborate with the Floodplain Management Program to improve the Substantial Damage Plan. The current SDP provides the bare minimum of requirements and requires stronger cooperation with partner agencies and full integration with the State Hazard Mitigation Plan.	PT 4-2023	Integration	Flood	FMP	Staff, HMA, NFIP	2024	HIGH	HIGH
	New integrated SDP to be implemented in 2024. 2023 SDP fulfills base requirements of Floodplain Management Program, but requires stronger cooperation with MEMA and other state agencies to be more effective.								
2.1.3.	Support integration between municipal comprehensive plans and LHMPs with formal distribution of planning packets including mitigation planning resources, fact sheets, and strategies for integration in other planning mechanisms.	PT 4-2023	Policy	All-hazards	MEMA	Staff, EMPG, HMA	2023-2028	HIGH	HIGH
	New action; implement HMP products in MPAP packets								
2.1.4.	Establish and facilitate collaborations among regional planning organizations in support of multi-jurisdictional plans.	PT 4-2023	Partnership	All-hazards	MEMA	Staff, CRP, HMA, EMPG	2023-2024	HIGH	MODERATE
	New action; substantial need for regional planning assistance for County EMAs. Exploring potential in coastal counties.								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
2.1.5.	Promote wider involvement of partners in the SHMP update through the Silver Jackets program.	SJ 5-2023	Partnership	Flood, erosion	USACE, DACF, DEP, NOAA, MEMA	Staff, FPMS, EMPG, HMA	2022-2023	MODERATE	MODERATE
	New action based on feedback from Maine SJ team members								
2.1.6.	Provide awareness of importance of the SHMP and LHMPs for eligibility of FEMA HMA grants.	SHMP 2019	Integration	All-hazards	MEMA	Staff, HMA, EMPG	2023, 2025-2028	HIGH	HIGH
	Carryover SHMP; trainings and outreach continue to be important for growing interest in the mitigation program								
2.1.7.	Integrate SHMP Risk Assessment findings into the next State Commodity Flow Study to determine potential cascading risk between natural hazards and HAZMAT concerns.	PT 4-2023	Integration	All-hazards	MEMA	Staff, HMA, EMPG	2023-2024	HIGH	HIGH
	New action; previous Commodity Flow Study did not provide digital geospatial data for overlay analysis with SHMP Risk Assessment. New study will produce digital data for analysis.								
2.1.8.	Integrate SHMP Risk Assessment findings into the next THIRA/SPR through use of MEMA's Capabilities and Risk Assessment Tool (CaRAT).	Expert Review	Integration	All-hazards	MEMA	Staff, HMA, EMPG	2023-2024	MODERATE	HIGH
	New action; new information on natural hazard risks will help inform local emergency managers of capability gaps.								
2.1.9.	Support DEP Priorities and Commitments for taking action on climate change, protecting human and environmental health, and advancing sustainable development.	DEP Strategic Planning 2023	Integration	All-hazards	MEMA	Staff, HMA, EMPG	2023-2028	HIGH	HIGH
	New action; new information on natural hazard risks will help inform best practices for implementing the strategic plan.								
2.2.	**Though current technical assistance and administration needs are met, a growing interest in the HMA program has led to an unprecedented number of grant applications with potential future capacity issues.**								
2.2.1.	Implement a Mitigation Fellowship Program through various funding sources and partnerships to assist local government with hazard mitigation needs.	PT 5-2023	Staffing	All-hazards	VM, NBRC, MEMA	NBRC, HMA	2023-2028	HIGH	HIGH
	New action; applying for NBRC funding to support fellows								
2.2.2.	Create internship opportunities leveraging university fellowships/scholarships to support state and local planning efforts.	PT 5-2023	Staffing	All-hazards	MC, TCI, MEMA	University, WRRI	2023-2028	HIGH	HIGH
	New action; ongoing opportunity, MEMA has hosted three interns in the last two years								
2.3.	**State mitigation/resilience grant programs have limited cross-agency coordination, posing challenges for applicants wishing to pursue the most eligible and least competitive funding sources. Communication between federal grant and planning officials and state officials is currently insufficient.**								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
2.3.1.	Utilize the 406 public assistance program and the 404 FEMA hazard mitigation assistance program to the maximum extent possible to implement mitigation actions.	SHMP 2019	Funding	All-hazards	MEMA	Staff, PA, HMA, EMPG	Disaster Declaration event	HIGH	HIGH
	Carryover SHMP utilizing new programs and new tools for accurately documenting damage								
2.3.2.	Partner with Maine Forest Service to better utilize wildfire mitigation funds from the Community Wildfire Defense Grant Program for At-Risk Communities.	FMAG 4-2023	Funding	Wildfire, Forest pests	DACF, MEMA	Staff, CWDG, HMA	2023-2028	MODERATE	HIGH
	New action based on Maine receiving new funds for CWDG								
2.3.3.	Partner with GOPIF to integrate climate hazards and resilience concepts into LHMPs to better utilize the Community Resilience Partnership in support of LHMP mitigation actions that align with GOPIF's list of Community Actions.	MWW WG 5-2022	Funding	All-hazards	GOPIF, MEMA	CRP, EMPG, HMA	2022-2024	HIGH	HIGH
	New action based on MCC working group								
2.3.4.	Coordinate programs with other organizations responsible for funds listed in the Capabilities Assessment to better implement mitigation actions across the state.	PT 5-2023	Funding	All-hazards	All partners	Staff	2023-2024	MODERATE	MODERATE
	New action established through Mitigation Team interviews								
2.3.5.	Collaborate with GEO to identify, prioritize, and implement resilient energy solutions for critical public facilities under the Grid Resilience Grant Program.	ESP 8-2022	Energy	All-hazards	GEO	GRP	2022-2023	MODERATE	MODERATE
	New action based on collaboration between GEO and MEMA to identify priority critical facilities for GRP								
2.3.6.	Collaborate with MaineDOT to encourage use of best mitigation practices during planning and completion of priority MaineDOT projects, where appropriate.	MDOT Interview 10-2022	Infrastructure	All-hazards	MDOT	Staff, HMA, MHF,	2024	MODERATE	HIGH
	New action from collaboration with MaineDOT on transportation vulnerability assessment								
2.3.7.	Implement the new Farmer Drought Relief Program to support Maine farmers in identifying and accessing new water sources to overcome the adverse effects of drought conditions.	DTF 3-2023	Funding	Drought	DACF	FDRP	2023-2028	HIGH	HIGH
	Program first received funding in 2023								
2.4.	**Plan integration is limited by a lack of collaborative map and data production and sharing.**								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
2.4.1.	Meet with mitigation experts to review and combine GIS/data capabilities and resources to support mitigation planning and grant applications.	SHMP 2019, Expert review	Partnership	All-hazards	All partners	All	2023-2024	HIGH	HIGH
	Carryover SHMP, new useful data are constantly being provided for use in planning								
2.4.2.	Improve information sharing and facilitate meaningful engagement by all sectors potentially impacted by flood and drought for the River Flow Advisory Commission and Drought Task Force.	DTF AAR 2021	Policy	Flood, Drought	RFAC/DTF Members	Staff, EMPG	2024	MODERATE	HIGH
	New action; need identified through 2021 after action report								
2.4.3.	Collect hazard, vulnerability, and potential/actual loss data to estimate losses, future risk, and mitigation benefit-cost estimates for state- and municipally-owned and operated assets.	SHMP 2019, Expert Review	Knowledge	All-hazards	MEMA, County EMAs	Staff, EMPG	2023-2024	MODERATE	HIGH
	Carryover SHMP, new tools and resources are available at state and local level								
2.4.4.	Collaborate with Maine GeoLibrary to track changes in development in hazard-prone areas: disseminate E911 data, digitize and update/maintain municipal parcels data, and identify potential funding sources to support GIS efforts.	GeoLib 1-2023	Knowledge	All-hazards	GeoLib	Staff, EMPG	2023-2024	MODERATE	MODERATE
	New action; began out of necessity to track development in hazard-prone areas using GIS								
2.4.5.	Support development of ME-CFRM coastal dynamic inundation model and utilize map products to identify changes in vulnerability from combined impacts of sea level rise, storm surge, and inland flooding for storms of differing magnitude.	ME-CFRM 3-2022	Knowledge	Coastal hazards	MDOT	ME-CFRM	2022-2025	MODERATE	MODERATE
	New action expanding from old action for collecting LiDAR data; new NOAA coastal LiDAR flights proceeding through 2023 and processing into 2024 2024								
2.4.6.	Establish and maintain ESRI Group between MEMA and NOAA to share georeferenced natural disaster imagery and data relevant to monitoring the location, extent, and impacts of all natural hazards that occur in Maine.	GeoLib 3-2023	Partnership	All-hazards	MEMA, NOAA, MEGIS	Staff, ESRI, EMPG	2023	HIGH	HIGH
	New action based on local NOAA weather office interest in data from MEMA digital Initial Damage Assessments and assistance with sharing ESRI content from MEGIS.								
2.4.7.	Share risk analysis data with NOAA to establish a Brief Vulnerability Overview Tool (BVOT).	NOAA Interview 5-2023	Knowledge	All-hazards	MEMA, NOAA, MEGIS	Staff, ESRI, EMPG	2023-2024	MODERATE	HIGH
	New action; NWS Gray given opportunity to develop BVOT for western Maine and New Hampshire								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
2.4.8.	Coordinate with county and municipal governments to retrieve better information of rates and locations of development changes in hazard prone areas, such as from municipal address registration and residential construction and septic permit records.	Expert Review	Knowledge	All-hazards	MEMA, County EMA, Municipal	Staff, EMPG, HMA	2023-2024	HIGH	HIGH
	New action; all oversight on construction/development is managed at municipal levels, making it very difficult to determine development trends across all of Maine and potential infringement on hazard-prone areas.								
2.4.9.	Utilize Maine Cooperative Snow Survey to analyze trends and determine potential indicators of snow drought and multi-year drought.	MGS Interview 5-2022	Knowledge	Drought, Flood	MEMA, MGS	Staff, EMPG	2021-2028	MODERATE	MODERATE
	New action based on drought trends and low relative snowpack from 2020-2023								
2.4.10.	Promote and provide education to State Agencies on eligibility of FEMA HMA grants and the importance of integration of plans for funding.	Expert Review	Knowledge	All-hazards	MEMA	Staff, HMA, EMPG	2023-2024	HIGH	HIGH
	New action: Continue education on FEMA HMA grant program to State Agencies for mitigation actions.								
2.5.	**Maine needs stronger standards for evaluating the effectiveness of mitigation projects to keep pace with greater investment in hazard mitigation assistance.**								
2.5.1.	Continued revisions the FEMA disaster 404 program and HMGP Post Fire, hazard mitigation Administrative Plan to include current presidential guidance, current FEMA guidance, and subrecipient responsibilities.	PT 5-2023	Policy	All-hazards	MEMA	HMA, EMPG	2023-2024	HIGH	HIGH
	Revision will be based on new SHMP risk assessment and FEMA guidance. State Administrative Plan is updated with each new disaster or significant weather event.								
2.5.2.	Prioritize mitigation projects that serve state and federal requirements for the equitable distribution of resources.	PT 5-2023	Equity	All-hazards	MEMA	Staff, HMA	2023	HIGH	MODERATE
	New action; new prioritization will be based on federal guidance								
2.5.3.	Assist with MaineDOT's vulnerability assessment of transportation assets and procure a statewide asset management platform.	State Transit Plan 2023	Infrastructure	All-hazards	MDOT	Staff	2023-3024	HIGH	HIGH
	New action; MEMA has shared the SHMP risk assessment with MaineDOT								
2.6.	**The HHPD program is unused in Maine. [HHPD3]**								
2.6.1.	Utilize HHPD funds to the greatest extent possible by notifying eligible dam owners of the funding opportunity and training them in the application process.	HHPD 3-2023	Knowledge	Dam hazards	DSP	HHPD	2024-2028	HIGH	MODERATE
	New action; Maine recently identified some dams that are eligible in the state								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
2.6.2.	Identify other opportunities for non-federal high hazard potential dam risk reduction investments consistent with SHMP goals for natural hazard risk reduction.	Expert Review	Funding	Dam hazards	DSP	Staff, HMA	2023-2028	HIGH	HIGH
	New action; identifying potential funding sources relevant to dam risk reduction through natural solutions or infrastructure improvement								
2.6.3.	Provide FEMA HMA grant program education for dams needing mitigation for future natural hazards.	Expert Review	Knowledge	Dam hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	New action: provide education on mitigation for dams that have historic evidence of natural hazard issues								
Goal 3:	**Improve hazard mitigation literacy and awareness among the public, business owners, academic institutions, and state, county, and local officials.**								
3.1.	**Though there have been gradual improvements in mitigation literacy, frequent turnover in local government, creation of new programs, and other challenges reduce awareness of and interest in the hazard mitigation program.**								
3.1.1.	Provide hazard mitigation assistance trainings on a recurring basis and in the event of natural disasters.	SHMP 2019	Training	All-hazards	MEMA	Staff, HMA,	2023-2028	HIGH	HIGH
	Carryover SHMP, new programs and new staff require training								
3.1.2.	Use MEMA's website to post the State's Hazard Mitigation Plan as well as articles and other hazard mitigation educational materials, awarded grants, notice of funding opportunities, and to post notice of meetings, workshops and training exercises.	SHMP 2019	Outreach	All-hazards	MEMA	Staff, website	2023-2028	HIGH	HIGH
	Carryover SHMP; MEMA has used its website to post the State Mitigation Plan, training, exercises, and workshops.								
3.1.3.	Leverage existing social media platforms to distribute information to the public.	SHMP 2019	Outreach	All-hazards	MEMA	Staff	2023-2028	HIGH	HIGH
	Carryover SHMP, utilize the service to promote HMA								
3.1.4.	Continue the annual Maine Preparedness Conference. Continue to revise, update, and make available materials aimed at educating local officials and the public about hazard mitigation.	SHMP 2019	Outreach	All-hazards	MEMA	Staff, EMPG	2024	HIGH	MODERATE
	Carryover SHMP; MEMA has held the Maine Partners in Preparedness Conference annually since 2009. Other outreach efforts are ongoing.								
3.1.5.	Facilitate mitigation workshops for state agencies, federally recognized tribes, counties, municipal partners, and interested stakeholders in an effort to mitigate all natural hazards	SHMP 2019	Training	All-hazards	MEMA	Staff, HMA, EMPG	2023-2028	MODERATE	MODERATE
	Carryover SHMP; workshops continue to be held on a recurring basis. During COVID-19, the majority of workshops were held virtually.								
3.1.6.	Develop and conduct workshops for communities on natural hazard mitigation centering on the use of nature-based solutions, emphasizing assistance for communities interested in applying for BRIC funding.	Expert Review	Training	All-hazards	TNC, MEMA	Staff, HMA	2024-2027	HIGH	HIGH
	New action based on proposal by TNC								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
3.1.7.	Provide HHPD program trainings to county and local emergency managers to increase awareness and interest. [HHPD4]	HHPD 3-2023	Training	Dam hazards	DSP	Staff, HHPD, EMPG	2024-2025	MODERATE	HIGH
	New action; HHPD is virtually unknown to Maine county EMAs								
3.2.	**Previous SHMP Risk assessment products lack accessibility and are underutilized as an educational tool.**								
3.2.1.	Develop online and GIS risk assessment resources to facilitate greater intake of SHMP resources.	GeoLib 7-2022	Knowledge	All-hazards	MEMA	Staff, HMA	2023	HIGH	HIGH
	New action; online resources developed for SHMP and referenced in the Plan; eventual intent to create a fully digital SHMP by next plan update 2028.								
3.2.2.	Implement digital surveys that support monitoring, evaluating, and updating mitigation plans.	GeoLib 12-2022	Knowledge	All-hazards	MEMA	Staff, HMA	2022-2028	HIGH	MODERATE
	New action; transferring methods used to support digitization of PA program damage assessments (Survey123 and Microsoft Power Automate)								
3.2.3.	Implement natural hazard dashboard to determine local risks, EDRCs, and SVI.	Expert Review	Knowledge	All-hazards	MEMA	Staff, HMA	2023-2024	HIGH	HIGH
	New action; online resources have been developed but require review by users to determine effectiveness.								
3.3.	**Future changes in risk will require new, effective mitigation actions informed by a diversity of subject matter experts.**								
3.3.1.	Present on the state hazard mitigation program in university courses focused on resilience planning and emergency management such as UMaine Augusta's Trauma-Informed Emergency Management Program.	Umaine Interview 12-2021	Outreach	All-hazards	MEMA	Staff, EMPG, HMA	2023-2024	MODERATE	MODERATE
	New action; connecting with researchers to build future planning collaborations								
3.3.2.	Engage subject matter experts and incorporate new natural hazards research literature into state and local risk assessments to improve our understanding of risk and craft new effective actions to mitigate risk.	Umaine-USGS Interview 4-2023	Knowledge	All-hazards	USGS, NOAA, MEMA	Staff, EMPG, WRRI, HMA	2023-2028	HIGH	HIGH
	New action based on new SHMP risk assessment process								
3.3.3.	Explore academic-government projects such as the Novel Shallow Well Design to mitigate drought risks in Maine and improve development practices in areas with poor access to potable water.	Umaine-USGS Interview 4-2023	Partnership	Drought	USGS, NOAA	Staff, WRRI, EMPG, FDRP	2023-2028	HIGH	MODERATE
	New action; communicating with potential partners and exploring feasibility of mitigation assistance								
3.3.4.	Attend and present at FEMA workshops the natural hazards in Maine.	Expert Review	Outreach	All-hazards	MEMA	Staff, HMA, EMPG	2023-2028	MODERATE	MODERATE
	New action; present on the unique natural hazard issues in Maine								
3.4.	**More engagement is needed with local businesses for whole community mitigation planning.**								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
3.4.1.	Coordinate with SBA to help businesses and homeowners transition from disaster recovery (low-interest disaster loans) to hazard mitigation.	Expert Review	Partnership	All-hazards	SBA, MEMA	Staff, SBA, IA	2024	HIGH	HIGH
	New action; SBA is beginning to offer a new disaster assistance program that can be deployed by a much lower damage threshold, with the potential to encourage business investment in hazard mitigation rather than just purely recovery from major damage. However, more collaboration is necessary to align programs with MEMA.								
3.4.2.	Seek opportunities to improve rural small business recovery and mitigation through SBA's implementation of the new Disaster Assistance for Rural Communities Act.	Expert Review	Equity	All-hazards	SBA, MEMA	Staff, SBA, IA	2025-2028	HIGH	MODERATE
	New action; Rural communities often face more severe impacts from natural disasters due to limited access to resources and infrastructure, which limits a community's ability to recover and avert long-lasting economic hardship. This act authorizes the SBA to remove burdensome requirements for declaring disasters in rural communities.								
Goal 4:	**Implement mitigation actions that preserve or restore the functions of natural systems and emphasize sustainable development.**								
4.1.	**Land use planning and development practices do not necessarily incorporate the comprehensive range of natural hazard impacts present in Maine.**								
4.1.1.	Update the Maine Uniform Building and Energy Code with the most recent (2021) International Code Council family of codes.	MUBEC 5-2023	Policy	All-hazards	OSFM	Staff, BRIC	2023	HIGH	HIGH
	New action; MUBEC will be updated to 2021 codes by fall 2023.								
4.1.2.	Utilize the Third-Party Inspector Program to the greatest extent possible.	MUBEC 5-2023	Infrastructure	All-hazards	OSFM	Staff	2023-2028	HIGH	HIGH
	New action; this program is currently underutilized, but provides crucial support for building permitting/inspections in rural areas with limited capacity for building code enforcement.								
4.1.3.	Incorporate official state sea-level rise projections into regulations.	MWW 10-2022	Policy	Flood, Climate hazards	DEP	Staff	2022	HIGH	HIGH
	New action; In 2022 Sea level rise projections for 2050 and 2100 were been incorporated into several Maine statutes (LD 1970, P.L. 590), and regulatory agencies are studying how best to implement those changes along with any other changes for a comprehensive approach. 2019 legislation (LD 1679, P.L. 476) established that SLR projections be updated every four years.								
4.1.4.	Develop and implement updated land-use regulations, laws, and practices to enhance community resilience to flooding and other climate impacts.	MWW 5-2023	Policy	Flood, Climate hazards	DEP	Staff, NFIP, CCGP	2024	HIGH	MODERATE
	New action; in 2022 Sea level rise projections for 2050 and 2100 have been incorporated into several Maine statutes (LD 1970, P.L. 590), and regulatory agencies are studying how best to implement those changes along with any other changes for a comprehensive approach. In 2021, DEP, DACF, MEMA, DMR, IFW, DOT, and the Maine OAG assembled a preliminary list of laws and rules administered by each agency where regulated activities could be impacted by sea level rise, storm surges or flooding. DEP identified changes to statutes and rules for solid waste facilities, sites that have a substantial effect on the environment, for protected natural resources, stormwater management, for certain critical infrastructure, and for contractor training. DEP has begun to convene partners, to begin developing revisions, and to adopt changes to several rules concurrently and ongoing.								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
4.1.5.	Develop recommendations for the use of hurricane storm surge inundation maps and hurricane evacuation zones in model ordinance guidance and provide public education to promote storm surge awareness.	HES 2020	Policy	Tropical Cyclone	MEMA	Staff, FEMA, FPMS	2024-2026	HIGH	MODERATE
	MEMA completed the Hurricane Incident Annex in 2018. The HES was completed for Maine in 2020 including participation with 10 coastal counties and resulting in 140 designated evacuation zones. MEMA was selected for potential FEMA Contract Support for Evacuation Planning to update the evacuation Incident Annex. MGS has worked with individual communities on modeling the impacts of storm surges.								
4.1.6.	Develop recommendations for the use of EAP dam failure inundation maps and evacuation zones in model ordinance guidance and provide public education to promote dam failure risk awareness. [HHPD4]	HHPD 6-2023	Policy	Dams	MEMA	Staff, NDSP, EMPG	2024-2026	HIGH	MODERATE
	New action utilizing strategy to digitize dam resources								
4.1.7.	In developing areas of the state, monitor the extent to which upstream development may or may not be contributing to the potential for increased downstream flooding, erosion, and other hazards. Implement findings in future development regulations and mitigation planning efforts to avoid adverse impacts.	SHMP 2019	Knowledge	Flood, Erosion	DACF	Staff, MSCU	2023-2028	HIGH	MODERATE
	Carryover SHMP; DEP has just hired an intern to help with some GIS work to begin analyzing development trends in Maine.								
4.1.8.	Use best-available hazard, vulnerability, and asset spatial overlay data to inform all-hazards model ordinance guidance, including guidance for hazards not covered by current ordinance language, such as building codes, bluff erosion, and mass wasting.	SJ 5-2023	Integration	All-hazards	Municipal, MEMA, MEGIS, DACF, DEP	Staff, website	2023-2028	HIGH	MODERATE
	New action; MEMA has completed the Maine Risk Map but there is currently no implementation of all-hazards model ordinance								
4.1.9.	Implement NFIP, Mandatory Shoreland Zoning, Maine Forest Practices Act, MUBEC, Growth Management, Coastal Zone Management, and other state land use, development, and construction requirements.	SHMP 2019; Expert review	Policy	All-hazards	DACF, DEP, FM, DMR	Staff, HMA, NFIP	2023-2028	HIGH	HIGH
	Carryover SHMP with expanded regulation								
4.2.	**Traditional mitigation actions tend to rely on built infrastructure with less prioritization for natural solutions.**								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
4.2.1.	Provide trainings and guidance on natural based solutions in accordance with the FEMA Building Resilience Infrastructure and Communities and Flood Mitigation Assistance grant programs.	SHMP 2019	Policy	All-hazards	MEMA	HMA	2023-2028	HIGH	HIGH
	Carryover SHMP; DEP is currently working on developing guidance and trainings for nature-based solutions and are also exploring rule revisions to help facilitate more streamlined, and perhaps incentivized, permitting for living shorelines.								
4.2.2.	Encourage living shorelines as an effective, natural mitigation action against flooding, erosion, and mass wasting and seek new sources of funding for this valuable program.	Living Shorelines Program	Policy	flood, erosion, mass wasting	MGS	Staff, CRP, HMA	2023-2028	HIGH	HIGH
	A decision support tool was developed for Casco Bay and several projects have been implemented, but the program lacks sufficient funding								
4.2.3.	Utilize MDOT hydraulic capacity guidance for sizing and placement of municipal culverts and implement through the Municipal Stream Crossing Upgrade Program.	Expert Review	Infrastructure	flood, erosion	MDOT, municipal	MSCU, FMPS, CCGP	2023-2028	HIGH	HIGH
	New action, MDOT guidelines were published prior to this plan update and MSCU has provided funding to some of these projects, but many more municipal culvert projects require assistance and are eligible.								
4.3.	**Hazard mitigation planning lacks integration with management practices for vulnerable natural systems, cultural historic sites, and other assets valuable to Maine's tourism and resource-based economies.**								
4.3.1.	Identify and implement opportunities to integrate the SHMP into other state agency plans where appropriate.	PT 5-2023	Integration	All-hazards	MEMA and all partners	Staff, EMPG, HMA, CRP	2023-2028	HIGH	HIGH
	New action based on input from mitigation partners. DEP is incorporating natural hazards into environmental regulations, guidance, and funding programs in reference to the SHMP.								
4.3.2.	Explore strategies for implementing Natural and Beneficial Functions to the floodplain and preserving historic buildings.	SHMP 2019	Partnership	Flood	DACF, MEMA, MHPC	Staff, NFIP, CCGP, HPF	2023-2028	HIGH	HIGH
	Carryover SHMP, incorporating Weathering Maine report into future local and state planning								
4.3.3.	Coordinate with Maine Historic Preservation Commission to incorporate mitigation concepts into local and state planning for historic locations, set prioritization for preserving vulnerable archaeological sites, and integrate findings from Weathering Maine into future risk assessments.	MHPC Interview 12-2022	Partnership	All-hazards	MHPC, MEMA	Staff, HPF, HMA, EMPG	2023-2024	MODERATE	MODERATE
	New action based on communication with Maine Historic Preservation Commission								
4.3.4.	Coordinate with the Department of Environmental Protection to incorporate considerations for environmental impacts in mitigation planning.	DEP Interview 12-2022	Partnership	All-hazards	DEP, MEMA	Staff, HMA	2023-2028	MODERATE	HIGH

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
	New action but efforts have been ongoing since last plan update								
4.3.5.	Participate in working groups, committees, workshops, conferences, as well as facilitate communication between state agencies, counties, tribes, and municipal partners.	Expert Review	Outreach	All-hazards	MEMA, all partners	Staff, HMA	2023-2028	MODERATE	HIGH
	New action but efforts have been ongoing since last plan update								
Goal 5:	**Integrate equity into all facets of the state hazard mitigation program.**								
5.1.	**Maine lacks implementation of a common equity protocol.**								
5.1.1.	Implement final recommendations from the Maine Climate Council Equity Subcommittee and establish common equity protocols with partners for use in future SHMP and LHMP updates.	MWW 1-2023	Policy	All-hazards	MCC Partners	Staff, CRP	2023-2028	HIGH	HIGH
	New action; final recommendations provided at the start of 2023								
5.1.2.	Evaluate whether mitigation actions and capabilities are implemented with equitable distribution of benefits and update strategies accordingly.	MWW 5-2023	Equity	All-hazards	MEMA, GOPIF	Staff, HMA	2023-2028	HIGH	HIGH
	New action; MEMA is establishing process for evaluation								
5.1.3.	Include FEMA definition of impoverished communities, SVI, and Justice40 during the State Review Panel ranking for FEMA HMA grants.	Expert Review	Equity	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	New action: Maine has become proactive in equity alongside of FEMA and the importance of grant awards.								
5.2.	**Many knowledge gaps remain regarding the diversity of Maine's hazard mitigation equity landscape.**								
5.2.1.	Provide comprehensive assessments and planning/grant guidance for socially vulnerable and disadvantaged communities at highest risk of natural disasters identified by vulnerability indicators such as Justice40, EDRCs, FEMA RAPT, SVI, and CEJST, with further prioritization of repetitive loss and intense development pressures.	MWW 6-2022	Equity	All-hazards	MEMA, GOPIF	Staff, EMPG, HMA, CRP	2023-2028	HIGH	HIGH
	New action; MEMA implements GIS tools: CDC SVI and CEJST								
5.2.2.	Develop best practices for inferring vulnerability from spatial demographic data in Maine.	Expert Review	Equity	All-hazards	MEMA, GOPIF	Staff	2023-2028	MODERATE	HIGH
	New action; MEMA reviewing various demographic analyses to identify common trends in vulnerability								
5.2.3.	Develop and maintain dashboard to distinguish hazard risks, SVI, and impoverished communities for potential mitigation projects.	Expert review	Equity	All-hazards	MEMA	Staff	2023-2028	HIGH	HIGH
	New action: This tool will aid in promoting FEMA HMA grants to equitable areas.								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
5.2.4.	Provide education on the FEMA HMA BRIC grant and opportunities for SVI .6 or greater.	Expert review	Equity	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	New action: FEMA HMA BRIC grant assists Towns with a SVI of .6 or greater with grant development.								
5.3.	**Many community action agencies are focused on immediate housing/vulnerability challenges and lack capacity to plan for long-term equitable hazard mitigation.**								
5.3.1.	Strengthen partnerships with MaineHousing, MaineCAP, Maine Municipal Association, and other organizations that have developed equitable practices to work directly with socially vulnerable and disadvantaged communities.	IA Interview 3-2023	Equity	All-hazards	MEMA	Staff, EMPG	2023-2028	HIGH	HIGH
	New action; MEMA is growing a pre-existing partnership with these organizations that previously were focused on response and recovery as opposed to mitigation								
5.3.2.	Expand Maine's Individual Assistance program and build stronger connections between recovery and mitigation to encourage risk reduction practices by private residents.	IA Interview 3-2023	Capability	All-hazards	MEMA	Staff, EMPG, HMA	2023-2028	HIGH	HIGH
	New action; new staff hired for Individual Assistance program and partner outreach has begun								
5.3.3.	Develop and Implement Preparedness Education strategies to target Vulnerable Communities on a state level to increase resilience in partnership with State Social Service Agencies such as DHHS, Office of Aging and Disability and Office of Family Independence.	IA Interview 6-2023	Training	All-hazards	MEMA	Staff, EMPG	2023-2028	HIGH	HIGH
	New action expanding on work done for recovery by IA Program								
5.3.4.	Provide FEMA HMA grant program opportunities to engage the funding options to community action agencies.	Expert review	Knowledge	All-hazards	MEMA	Staff, HMA	2023-2028	HIGH	HIGH
	New action: Provide individual FEMA HMA training and education to CA groups.								
5.3.5.	Improve housing availability for disadvantaged and underserved communities.	Maine Housing Interview 4-2023	Infrastructure	All-hazards	Maine Housing	CDBG, CDBG-DR, CDBG-MIT, USDA-RD	2023-2028	HIGH	MODERATE
	New action: Maine Housing notes that there is not enough housing for disadvantaged communities in Maine.								
	Actions completed since 2019 Plan Update. Ongoing or expanded actions are listed above and compose the majority of 2019 actions.								
1.2.C.	State Plan. Maintain and update a State Hazard Mitigation Plan, including the State Administrative Plan.	SHMP 2019	Knowledge	Flood	MEMA	Staff	2018	MODERATE	HIGH
	Completed								

ID number	Goals, Objectives, and Actions	Source	Category/gap	Hazards Addressed	Responsible Entities	Potential resources*	Timeline	Impact	Feasibility
1.4.A.	Additional Staff. Hire additional staff to improve the agency's hazard mitigation capabilities.	SHMP 2019	Staffing	All-hazards	MEMA	Staff, Federal, State funds	2018-2023	HIGH	HIGH
	Completed								
1.4.B.	Prioritization. Develop agency priorities so that MEMA staff resources can be directed to the most important tasks and the areas of the state with the greatest need, within the limits of maintaining a manageable workload.	SHMP 2019	Staffing	All-hazards	MEMA	Staff, Federal, State funds	2018-2023	HIGH	HIGH
	Completed								
1.5.C.	Potential Losses. Collect hazard, vulnerability, and potential/actual loss data to estimate losses for state-owned and operated buildings, infrastructure and critical facilities associated with all plausible hazard events.	SHMP 2019	Knowledge	All-hazards	MEMA	Staff	2022	HIGH	HIGH
	State assessment completed; see actions above for other infrastructure								
3.2.A.	Risk Map. Coordinate and Support FEMA's Risk Map Program and provide support to communities undergoing updated flood hazard mapping.	SHMP 2019	Knowledge	Flood	FEMA, DACF	Staff, Federal funds	2018-2023	HIGH	HIGH
	Completed for Southern Penobscot, Oxford, Kennebec, Knox, Androscoggin, Cumberland, York counties, ongoing for several others								
4.1.C.	Complete the Hurricane Incident Annex	SHMP 2019	Knowledge	Flood	MEMA	Staff	2018	MODERATE	HIGH
	Completed								
6.1.A.	Monitoring. Continue to monitor drought conditions on an as-needed basis.	SHMP 2019	Knowledge	Flood	MEMA	Staff	2018	MODERATE	HIGH
	Not Mitigation - Removed								
3.1.A.	Workshops on Geo-Synthetics. Continue to sponsor workshops through the Local Roads Center on the use of geo-synthetics to better mitigate flood damages to local roads, bridges, culverts and ditches.	SHMP 2019	Knowledge	Flood	MEMA	Staff	2018	MODERATE	HIGH
	Completed								

** Under the "Potential Resources" column, HMA refers to all Hazard Mitigation Assistance programs including BRIC, BRIC DTA, FMA, HMGP, HMGP Post Fire, and LPDM. These programs are often reported together as a potential resource for actions that have not yet applied for funding because their eligibility requirements are similar. Though not part of the HMA programs, 406 Mitigation Program may be eligible if critical infrastructure is damaged during a disaster. Any reference to "Staff" in this column indicates that staff hours are a primary resource for implementing the action.*

Plan Maintenance

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Section 7 – Plan Maintenance

Stafford Act 44 CFR §201.4(c)(5)(i)-(iii), §201.4(d)[1]

7.1 Plan Responsibilities and Schedule [S17]

For the plan to remain relevant, the state's overall strategy for reducing risks from natural hazards, the mitigation plan must reflect current conditions, including statewide trends or anticipated growth and development, changes in the state's priorities, and progress toward implementation. To this end, the state mitigation plan must be regularly reviewed and evaluated to keep the plan current within the five-year cycle (Figure 7.1). This section demonstrates how MEMA, the primary agency responsible for the monitoring, evaluating, and updating the plan, has established a maintenance process and schedule to ensure the Plan continues to serve Maine now and in the future.

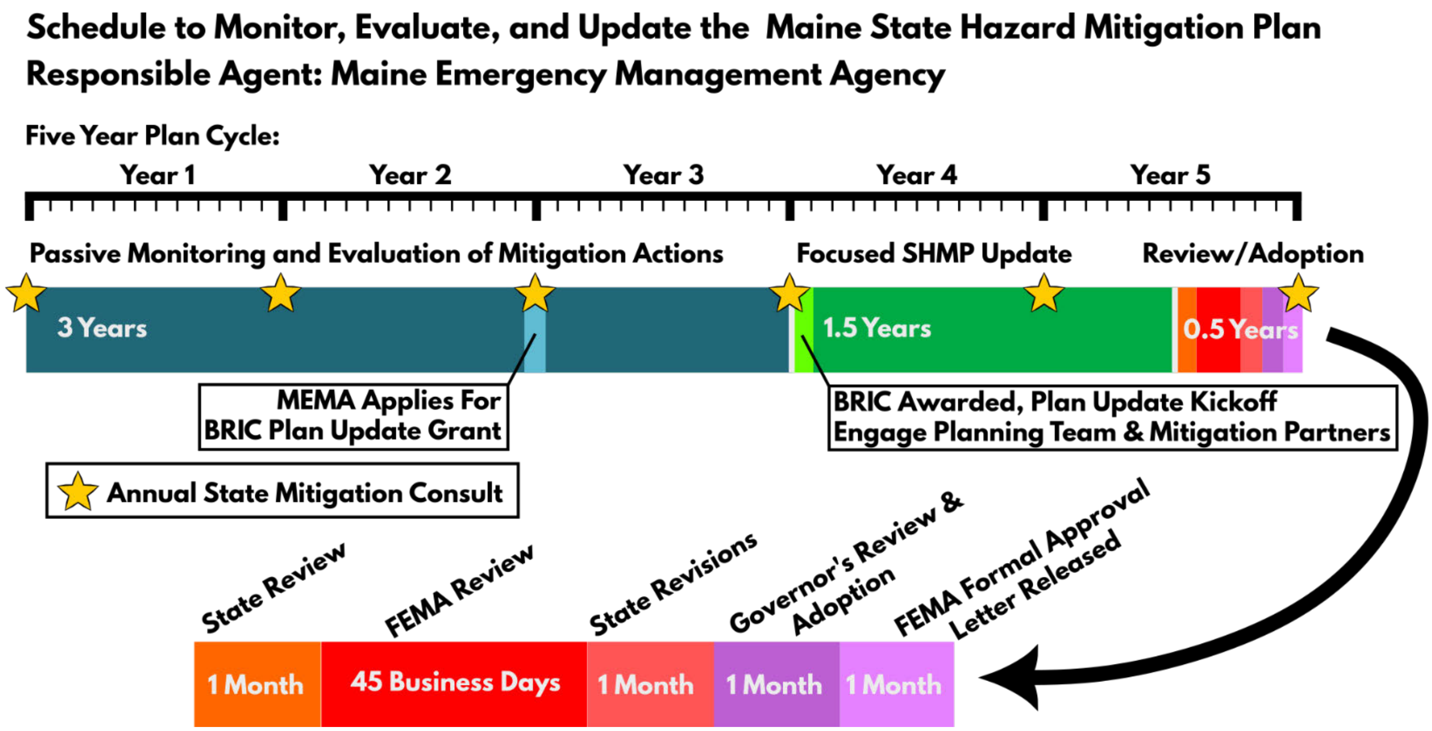

Figure 7.1: MEMA's SHMP maintenance schedule. The 2023 Update did not take advantage of BRIC, but the intent is to take advantage of this mitigation capability in future updates. [S17.b.]

7.1.1 Monitoring the Plan

Monitoring plan implementation begins with mitigation actions. Many of the mitigation actions describe ongoing or recently improved services provided by MEMA. It is a simple process to monitor when and how these actions are implemented. Many new actions were included for this plan update to reflect the partnerships MEMA holds with other state, federal, and local entities, and these actions are monitored as part of ongoing collaborations to document their implementation.

Monitoring the risk assessment follows a similar approach. Many of the mitigation actions are geared toward improving our understanding of the nature of hazards, potential exposure to them, the vulnerability of communities and infrastructure, and the overall product of risk. By monitoring how these mitigation actions are implemented, MEMA also monitors and assesses the effectiveness of the risk assessment and determines update needs.

[1] Stafford Act 44 CFR §201.4: https://www.law.cornell.edu/cfr/text/44/201.4

Since mitigation actions are tied to the goals in the Plan, the Mitigation Strategy has been monitored monthly as part of regular meetings with county and state officials, after significant weather events, after Disaster Declarations, and reporting by the State Hazard Mitigation Officer of received inquiries on mitigation projects for FEMA HMA grant program. As previously noted in the Planning section, the county directors meet monthly at MEMA and immediate concerns about the Plan and how it connects with LHMPs or other planning products and grant opportunities can be addressed then.

The public is on occasion in attendance to state or county meetings, offering the public the opportunity to provide input to the plan. Public participation is required for LHMPs and this information is often brought up into the SHMP as noted in the Local Capabilities section. Lastly, the Plan has resided on the MEMA website since 2010, updates related to mitigation actions are frequently shared via MEMA's social media outlets, and several online mitigation mapping tools have been published online since the last plan update, giving the public immediate access to all State Hazard Mitigation Plan information in different forms.

The Plan will also be monitored relevant to any disasters (and new lessons learned, especially as described in the planning section) or new legislation. Reports are due on a quarterly basis as part of both MEMA and FEMA protocols.

7.1.2 Evaluating the Plan

MEMA's evaluation of the Plan is based on whether mitigation actions effectively address mitigation needs. State needs may be relevant to the Risk Assessment, Capabilities Assessment, Mitigation Strategy, Plan Maintenance, or Planning Process of the State Hazard Mitigation Plan. Needs may include new partners, new risks potentially triggered by climate change and development, new capabilities, budget changes, new/updated laws and federal guidelines, or changes in responsibilities or goals of the Mitigation Partners. Mitigation actions will be evaluated, updated, removed, or added on an as-needed basis with approval of the agent responsible for implementation. Evaluation is crucial for improving mitigation program management and keeping goals current.

Plan evaluation may occur at any time, but in general this is completed as part of plan monitoring. A natural progression of implementation monitoring is to determine the effectiveness of the implementation. Monitoring and evaluation are a consistent practice throughout the five-year plan cycle. However, there is greater intent to evaluate and update mitigation actions (thereby evaluating and updating all components of the Plan) during the update period that typically occurs within the last two years of the five-year cycle.

7.1.3 Updating the Plan

The Plan will continue to be fully updated once every five years based on the schedule shared in Figure 7.1. MEMA is the primary responsible agent of the SHMP update but relies upon multiple Mitigation Partners to establish goals, objectives, and actions that support the state mitigation program. MEMA's mitigation program utilizes SHMP products on a regular basis and this allows frequent opportunities for a growing number of participants to monitor, evaluate, and suggest updates to the Plan at any time.

Suggestions for updates will be documented and credited to partners throughout the plan cycle, but MEMA will begin investing time and resources to implement the full Plan Update within two years of the current Plan's expiration date. MEMA will have applied for a BRIC Plan Update grant a full year before this point to ensure that funds are obligated at the time of the formal update process. The update is begun with a kickoff meeting and establishment of the Planning Team and Mitigation Partners as noted in the Planning Process section.

All updates are implemented by MEMA though many relating to the goals of partner agencies or from integrated plans are provided by Mitigation Partners. Seasonally, a review will occur after the winter and usual spring flooding months, wildfire season, and the hurricane season to properly assess any changes in risk and to review reports from the River Flow Advisory Commission. Updates will also occur in the event of changing capabilities, such as the termination of funding programs/resources or addition of new mitigation opportunities. It will also be in conjunction with 2nd Quarter Work Reports, when the Mitigation Officer would normally report on any mitigation activities within the agency.

7.2 Adoption and Assurances

This SHMP was adopted by Governor Janet Mills in September 2023, as required by 44 CFR Section §201.4(c)(6). A signed adoption letter from the Governor is included at the beginning of this plan. This plan was reviewed by the Planning Team that was assembled for oversight of, and contribution to, the development of the SHMP including engagement by Mitigation Partners. The Planning Team and Mitigation Partners consist of staff across multiple State agencies documented in Section 2 – Planning Process.

The State of Maine does comply, and assures it will continue to comply, with all applicable federal statutes and regulations in effect with respect to the periods for which it receives grant funding, in compliance with Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards 2 CFR 200 and 2 CFR 3002. This includes managing and administering FEMA funding in accordance with applicable Federal statutes and regulations. The State also assures it will amend the State Hazard Mitigation Plan in accordance with 44 CFR 13.11(d), including amending the plan whenever necessary to reflect changes in State or Federal laws and statutes, as described in this section.

7.3 History of Plan Effectiveness

The previous plan's methods and schedules worked reasonably well, but some adjustments are needed to ensure greater consistency between plans. To expedite the planning process, in 2009 MEMA developed a guide for the preparation of hazard mitigation plans so that as county or University of Maine plans were updated, they will follow the same format, thus allowing better coordination between local plans and the State Plan. The guide has proven to be extremely beneficial and simplified the process of updating both the 2013, 2018, and 2023 State Hazard Mitigation Plan. Further standardization is still needed to include one methodology for assessing financial impacts of the profiled hazards.

MEMA is exploring potential improvements to the evaluation strategy by standardizing feedback from mitigation partners. This includes the design of digital surveys requesting feedback on the effectiveness of specific mitigation actions that fall within the responsibility of each partner. Currently MEMA uses an "interview" style process to request plan update assistance that would be supported by the survey. The digital survey approach is documented as a new mitigation action in the Mitigation Strategy section.

7.4 Program Monitoring [S18]

7.4.1 Monitoring FEMA HMA [S18.a.]

FEMA HMA grant project activities have been monitored on a monthly schedule according to Section 8, Project Management of the State's Hazard Mitigation Grant Program Administrative Plan for each Disaster Declaration. This includes the administration, roles and responsibilities, and financial administration of projects. MEMA has developed spreadsheets for tracking the status of plans and projects. The State Administration Plan has been updated after every declaration for more than two decades. After the February 2013 blizzard declaration (DR-4108) it was decided that, going forward, the cover of the plan and footers would be named by the declaration number instead of a "version number."

The FEMA HMA Non-Disaster grant program does not require a State Administrative Plan. However, the program also requires an active and approved SHMP per the Notice of Funding Opportunity. The Building Resilient Infrastructure and Communities grant appropriations authority is Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), as amended (Pub. L. No. 93-288) (42 U.S.C. § 5133) and Section 203(i) of the Stafford Act, as amended (Pub. L. No. 93-288) (42 U.S.C. § 5133) and Infrastructure Investment and Jobs Act (Pub. L. No. 117-58) (2021).

The Flood Mitigation Assistance grant program is under the authority of Section 1366 of The National Flood Insurance Act of 1968, Pub. L. No. 90-448 (codified as amended at 42 U.S.C. § 4104c) and Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, 135 Stat. 1387–1388 (2021) and Department of Homeland Security Appropriations Act, 2022, Pub. L. No. 117-103, Division F and Infrastructure Investment and Jobs Act, Pub. L. No. 117-58 (2021), 135 Stat. 1387–1388 (2021).

The Legislature Pre-Disaster Mitigation grant program's authority is Section 203 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act) (Pub. L. No. 100-707), amending the Disaster Relief Act of 1974 (Pub. L. No. 93-288) (42 U.S.C. § 5133) and Department of Homeland Security Appropriations Act, 2023 (FY23 DHS Appropriations Act) (Pub. L. No. 117-328).

Due to resource limitations, and the previously described distances across the state, site visits will usually be limited to the pre-application and final inspection process. Wherever possible, multiple site visits will be the norm to keep a "working inventory" and to reduce travel time and costs. Phone calls will substitute for travel or face-to-face meetings in many cases. However, complex projects, such as, but not limited to acquisition/demolition, will receive much more frequent monitoring based on circumstances.

[HMGP Project/Subaward Closeout Process]

Specifically, the FEMA Project/Subaward Closeout includes the following process for Sub-Recipient grant awards. Within 90-180 days (depending on grant program) from the date the State or a Subrecipient completes each non- Management Cost HMGP project, the State shall submit a payment of claim to FEMA as required by 44 C.F.R. § 206.438(d), the Hazard Mitigation Assistance Guidance (2015), Part VI, ¶ F, Hazard Mitigation Assistance Guidance (2023), and FEMA- State Agreement, ¶ V.C.

Project Closeout Content: The payment of claim will include a letter signed by the Governor's Authorized Representative that certifies that the reported costs were incurred in the performance of eligible work, the approved work was completed, and the mitigation measure complies with the provisions of the FEMA-State Agreement. The payment of claim package shall also include the following:

- Verification that any program income has been deducted from total project costs as specified in 2 C.F.R. § 200.307.
- Final site inspection report that includes photographs of the completed project.
- Final project costs, including Federal share, non-Federal share, administrative allowance (if applicable), and cost underrun and overruns.
- Geospatial coordinates, in the form of latitude and longitude with an accuracy of +/- 20 meters (64 feet), have been provided for the project. For flood reduction, hazardous fuels reduction, and soil stabilization projects, an accurate recording of the official acreage, using open file formats geospatial files (i.e., shapefiles), must be submitted.
- Certification and documentation to support that the project was completed in compliance with environmental conditions, required permits, and applicable building codes.
- Certification that the project meets NFIP insurance requirements (if applicable).
- For new or updated hazard mitigation plans, a final copy of the FEMA-approved and community-adopted plan.
- For planning-related activities, the activity is consistent with 44 CFR Part 201 or 206.
- Other supporting documents required by FEMA to close mitigation project types as outlined in the HMA Job Aids: (1) Closeout Toolkit: Checklist for Hazard Mitigation Grant Program and (2) Closeout Toolkit: Hazard Mitigation Grant Program Subaward Closeout FAQs.

Subrecipient Closeout: The State must submit a Subrecipient final expenditure report to FEMA for all projects and management costs approved under the HMGP grant for a Subrecipient as required by the FEMA-State Agreement. This report is submitted after the State has submitted all payment of claim information and certifications for a subrecipient's project. The report is submitted as part of the quarterly SF-425 report by noting the following in the remarks section:

- That the report represents the final expenditures for a Subrecipient;
- The name of that Subrecipient; and
- The date on which the recipient submitted to FEMA a payment of claim for each of that Subrecipient's approved projects and management costs, or reference to other documents submitted to FEMA that includes this information.

Grant Closeout: The State will submit a HMGP grant closeout request within 90 days from the end of the State's management cost project period of availability as required by 2 C.F.R. § 200.343 for DR-4522 and 2 C.F.R. § 200.344 (a) for DR-4647. DR-4647, Recipients must submit, no later than 120 calendar days after the end of the period of performance all financial, performance and other repots as required by the terms and conditions of the award. FEMA will withhold 3 percent of the recipient's management costs until the closeout of the last non-management cost HMGP project. The closeout request will include a letter from the Governor's

Authorized Representative (or, Alternate Governor's Authorized Representative (GAR) with supporting documentation, including the following:

- Statement that the scope of work has been completed as approved;
- Final Federal Financial Report (SF-425);
- Final performance/progress report;
- SF-428, Report on Government Property, if applicable;
- SF-270, Request for Advance or Reimbursement, if applicable, or request for de- obligation of unused funds, if applicable; and a Statement that no inventions were made, or patents applied for in the implementation of the award.

Record Retention: Three-year rule – FEMA-State Agreement and C.F.R. § 200.333 set forth the records retention requirements.

7.4.2 Other State Funding Programs

Though MEMA is only responsible for managing the FEMA HMA grant programs in Maine, many additional partners administer other grant programs shared within the Capabilities section. Links referenced in that section provide more information on their scope of monitoring/review.

7.4.3 General System for Monitoring/Reviewing Progress

System for Reviewing Progress on Achieving Goals in the Mitigation Strategy

Since mitigation activities will be occurring at the local and state levels, there will be two processes for monitoring progress. For local activities, the County Directors will provide annual updates to MEMA's mitigation program and/or as part of the agenda at one of the above referenced monthly meetings for LHMP. In addition to LHMP updates, these project updates will be incorporated into the digital database of LHMP mitigation actions described in the Mitigation Strategy section. Progress of state mitigation activities will be coordinated on an annual basis or after a Disaster Declaration by TELCOMs between the mitigation program and the agencies identified in the Capabilities section.

For FEMA HMA sub recipient grant awards, the State Hazard Mitigation Officer (SHMO) will monitor all sub recipient's mitigation actions formally during the FEMA required quarterly reporting for programmatic and financial programs. The SHMO will provide FEMA HM grant monitoring program quarterly reports for their review.

Modifications to Track Initiation, Status and Completion of Mitigation Activities

The current system used to track the initiation, status and completion of mitigation activities for FEMA HMA grants is provided with FEMA HMA grant program guidance which MEMA institutes. The FEMA HMA guidance was updated March 23, 2023 for all grant programs from this date forth. All sub recipient awards prior to March 23, 2023 will follow the 2015 FEMA HMA guidance.

System for Reviewing Progress on Implementing Activities and Projects

The list of goals, objectives, and actions in the Mitigation Strategy section contains current status data. As each action shows progress or is completed, the status column is updated. Progress is determined through annual meetings with Planning Team members responsible for each action.

Implementation of Mitigation Actions from Previous Plan

Refer to the current status data contained in the goals, problem statements, and actions table in the Mitigation Strategy section of this plan. The status report dictates the implementation of mitigation efforts and summarizes how hazard mitigation capabilities have changed since the last plan if relevant.

Appendices

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APPENDIX A – HHPD2

List of High Hazard dams regulated by the Maine Dam Safety Program (March 24, 2023)

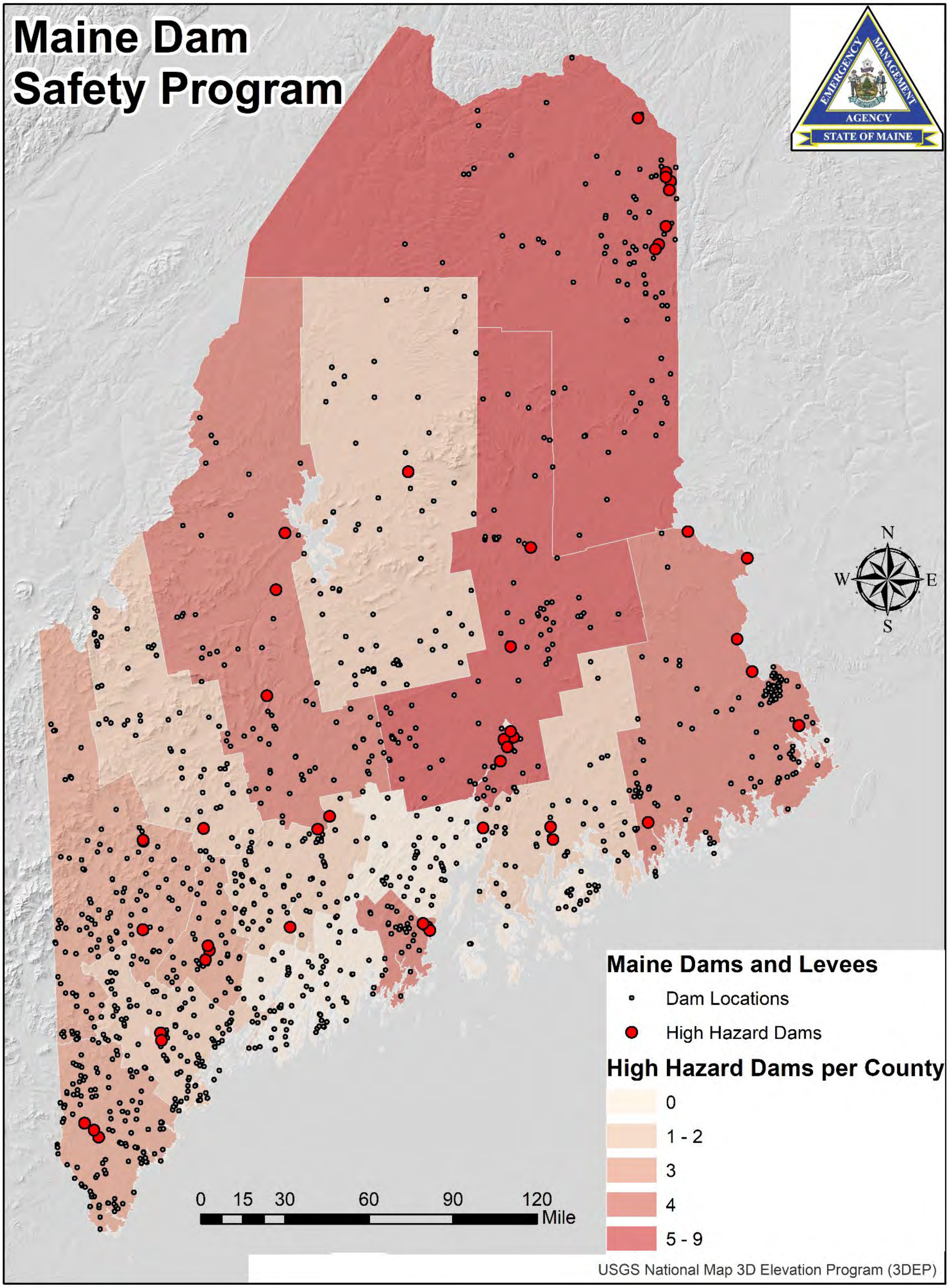
Dam Name [HHPD-eligible dams in bold*]	NID ID	Town	County	River	Downstream Hazard Potential
Abbott Brook Dike	ME00424	Lincoln Plantation	Oxford	Abbott Brook	HIGH
Alamoosook Lake	**ME00144**	**Orland**	**Hancock**	**Narramissic River**	HIGH
American Tissue	ME00094	Gardiner	Kennebec	Cobbosseecontee Stream	HIGH
Aziscohos	ME00024	Lincoln Plantation	Oxford	Magalloway River	HIGH
Brassua	ME00133	T1 R1 NBKP	Somerset	Moose River	HIGH
Bryant Pond	ME00476	Fort Fairfield	Aroostook	Libby Brook	HIGH
Canada Falls	ME00215	T2 R4 NBKP	Somerset	West Branch Penobscot River	HIGH
Cherryfield	**ME00061**	**Cherryfield**	**Washington**	**Narraguagus**	HIGH
Christina	**ME00226**	**Fort Fairfield**	**Aroostook**	**Prestile Stream**	HIGH
Community Pond	**ME00492**	**Limestone**	**Aroostook**	**Limestone**	HIGH
Dolby	ME00201	East Millinocket	Penobscot	West Branch Penobscot	HIGH
Dundee Falls	ME00068	Gorham, Windham	Cumberland	Presumpscot	HIGH
Dunham Brook	ME96075	Dover-Foxcroft	Piscataquis	Dunham Brook	HIGH
Durepo Brook	ME00348	Limestone	Aroostook	Durepo Brook	HIGH
East Davee Brook	ME96080	Dover-Foxcroft	Piscataquis	Davee Brook East Branch	HIGH
Eel Weir	ME00070	Windham	Cumberland	Presumpscot	HIGH
Ellsworth	ME00263	Ellsworth	Hancock	Union	HIGH
Emery Mills	**ME00186**	**Shapleigh**	**York**	**Mousam**	HIGH
Estes Bog # 5	ME00377	Poland	Androscoggin	Coyne Brook	HIGH
Estes Lake	**ME00183**	**Sanford**	**York**	**Mousam**	HIGH
Flagstaff	ME00127	Dead River TWP	Somerset	Dead River	HIGH
Graham Lake	ME00264	Ellsworth	Hancock	Union	HIGH
Graham Lake Flood Control	ME83052	Ellsworth	Hancock	Union	HIGH
Grand Falls	**ME00219**	**Baileyville**	**Washington**	**Saint Croix**	HIGH
Grand Lake (Matagamon)	**ME00180**	**T06 R08 WELS**	**Penobscot**	**Penobscot River**	HIGH
Gulf Island	ME00007	Lewiston	Androscoggin	Androscoggin	HIGH
Hanson Brook	ME00482	Mapleton	Aroostook	Hanson Brook	HIGH
Harris	ME00090	Indian Stream	Somerset	Kennebec	HIGH
Howard Pond	**ME96095**	**Hanover**	**Oxford**	**Howard Pond**	HIGH

Hydro-Kennebec	ME83054	Winslow	Kennebec	Kennebec	HIGH
Josephine	ME00345	Easton	Aroostook	TR Prestile stream	HIGH
Lake Auburn	ME00019	Auburn	Androscoggin	Bobbin Mill Brook	HIGH
Libby Brook	ME00493	Fort Fairfield	Aroostook	Libby	HIGH
Lower West Bay Pond	ME00703	Gouldsboro	Hancock	Lower West Bay Stream	HIGH
Mantle Lake	ME00480	Presque Isle	Aroostook	Mantle Brook	HIGH
Mattaceunk (Weldon)	ME00143	Mattawamkeag	Penobscot	Penobscot River	HIGH
McDonough Brook	ME00561	Stow	Oxford	McDonough Brook	HIGH
Megunticook East	ME00278	Camden	Knox	Megunticook	HIGH
Megunticook West	ME00279	Camden	Knox	Megunticook	HIGH
Middle Dam Project	ME00025	Township C	Oxford	Rapid	HIGH
Mill Street	ME00273	Sanford	York	Mousam	HIGH
Millinocket Lake	ME00205	T01 R08 WELS	Penobscot	Millinocket Stream	HIGH
Mount Zircon	ME00244	Rumford	Oxford	Zircon Brook	HIGH
New Mills	ME00095	Gardiner	Kennebec	Cobbosseecontee	HIGH
North Auburn	ME00255	Auburn	Androscoggin	Little Wilson Pond outlet	HIGH
North Gorham Hydro Station	ME00069	Windham	Cumberland	Presumpscot	HIGH
North Twin	ME00203	T3 Indian Purchase	Penobscot	West Branch Penobscot	HIGH
North Twin - Dike 6	ME82050	T3 Indian Purchase	Penobscot	West Branch Penobscot	HIGH
Noyes Mill	ME00347	Limestone	Aroostook	Noyes	HIGH
Ripogenus	ME00204	T3 R11 WELS	Piscataquis	West Branch Penobscot	HIGH
Rumford Falls Project Upper	ME00013	Rumford	Oxford	Mooselookmeguntic	HIGH
Scopan	ME00234	Masardis, Ashland	Aroostook	Scopan Stream	HIGH
Seabright	ME00277	Camden	Knox	Megunticook	HIGH
Sebec Lake	ME00163	Sebec	Piscataquis	Sebec River	HIGH
Seboomook	ME00206	Seboomook TWP	Somerset	West Branch Penobscot River	HIGH
Silver Lake	ME00147	Bucksport	Hancock	Tannery	HIGH
Skelton	ME00033	Dayton;Buxton	York	Saco River	HIGH
Snow Pond	ME00106	Oakland	Kennebec	Messalonskee Stream	HIGH
Snow's Pond	ME96079	Dover-Foxcroft	Piscataquis	Davee Brook	HIGH
Snow's Pond Dike	ME96079S001	Dover-Foxcroft	Piscataquis	Davee Brook	HIGH
Stone	ME00202	Millinocket	Penobscot	West Branch Penobscot	HIGH
Stone - Dike 8	ME83051	Millinocket	Penobscot	/west Branch Penobscot	HIGH
Toddy Pond	ME00146	Orland	Hancock	Narramissic River	HIGH
Trafton Lake	ME00229	Limestone	Aroostook	Limestone Stream	HIGH
Upper	ME00026	Richardsontown TWP	Oxford	Rapid	HIGH

Violette Brook	ME00496	Cyr Plantation	Aroostook	Violette Brook	HIGH
Wassookeag Lake	ME00356	Dexter	Penobscot	EB Sebasticook	HIGH
Wesserunsett	ME00118	Madison	Somerset	Mill Stream	HIGH
Weston North Channel	ME00085	Skowhegan	Somerset	Kennebec River	HIGH
Weston South Channel	ME83033	Skowhegan	Somerset	Kennebec	HIGH
Wilson Pond	ME00121	Wilton	Franklin	Wilson Pond	HIGH
Woodland	ME00218	Baileyville	Washington	Saint Croix	HIGH
Wyman Station	ME00089	Moscow, Pleasant Ridge	Somerset	Kennebec River	HIGH

*Eligibility determined by Maine Dam Safety Program based on dams that were not constructed by federal funds or managed by federal agencies.

Map of High Hazard dams (red dots) regulated by the Maine Dam Safety Program



APPENDIX B – NFIP SUBSTANTIAL DAMAGE PLAN

State of Maine
Dept. of Agriculture, Conservation & Forestry/Floodplain Management Program
NFIP Substantial Damage Outreach & Support Plan

This plan has been developed as a guidance tool for the State of Maine, Department of Agriculture, Conservation & Forestry, Floodplain Management Program staff, in order to assure that certain practices will be in place to offer training, assistance, and support to local communities in their efforts to implement the Substantial Damage requirements of the National Flood Insurance Program (NFIP). This work is eligible and funded under the Community Assistance Program – State Support Service Element (CAP-SSSE) NOFO for state NFIP coordination.

In this plan, the "Program" means DACF's Floodplain Management Program staff, the agency/program responsible for oversight of the NFIP.

Individual Assistance History
This is amount of IA since 2000.

Disaster Number	Declaration Date	Counties	Total Housing Assistance	Total Other Needs Assistance	Applications Approved
DR-1644-ME	5/25/2006	York	$934,193.09	$79,011.97	581
DR-1693-ME	4/25/2007	Oxford, Cumberland, York, Sagadahoc, Lincoln, Knox	$1,834,542.40	$162,440.67	1186
DR-1755-ME	5/9/2008	Aroostook, Penobscot	$1,093,134.16	$168,336.80	263

Typical hazards which may affect floodplain structures include Winter nor'easters, heavy snowfall or rainfall, ice jams, fire, and coastal storms.

<u>Pre-Disaster</u>
The following activities will be conducted on a year-round, as needed basis, using updated materials, practices, FEMA guidance and/or other substantial damage implementation options as they become available.

Awareness of Local Capacity
The Program will maintain some sense of local capacity for implementation of the substantial damage (SD) requirements of the NFIP. This may include keeping a spreadsheet of contact information for pertinent local officials, notes regarding past issues or best practices in implementing SD, notes on local capacity to conduct SD assessments post-disaster, and/or files on non-compliant activities or violations.

Training Opportunities
The Program will provide training for local officials on implementation of SD practices, including FEMA courses/ webinars, use of FEMA SD tools, and state-developed presentations on post-disaster responsibilities of NFIP communities.

Distribution of Materials
The Program will distribute FEMA SD materials and/or any relevant SD materials prepared for the purposes of guidance or assistance to local communities on implementation of SD practices. These materials could include the FEMA P-758 publication "Substantial Improvement/ Substantial Damage Desk reference," the FEMA P-784, "Substantial Damage Estimator (SDE) Tool", DRRA 1206 materials and other FEMA materials, websites where such materials can be located, and materials developed by the state. A listing of materials distributed during workshops and training sessions will be maintained for FEMA review.

Program staff will take every opportunity to discuss SD with local officials—as a routine part of CAV and CAC meetings, during training workshops, and through relevant general technical assistance requests.

Active Disaster
Local Technical Assistance
As flood events are predicted, the Program will send out electronic messages about SD preparedness, permitting, insurance, model documents and any additional information as deemed necessary. The State Coordinator belongs to the state listserv for local code officials and can easily push messages to the group.

As available, the Program will visit affected communities when SD impacts are substantial, meeting with local officials and when called for, property owners, to offer technical assistance regarding the implementation of SD requirements.

Training
The Program will distribute FEMA SD materials and/or any relevant SD materials prepared for the purposes of guidance or assistance to local communities on the implementation of SD practices. Training sessions will be scheduled as warranted. If a flood disaster is federally declared, the Program will request FEMA SD training for the local officials in the affected communities.

Damage Assessments
Program staff will participate in local damage assessments, as needed. This effort would be coordinated through the Maine Emergency Management Agency.

Post-Disaster
Local Technical Assistance
After any disaster where damages may have occurred to structures in the floodplain, the Program will communicate with local code officials by phone or e-mail to gather information about the severity of the event. The Program will provide written information to communities, including guidance on SD permitting, flood insurance, and other topics as deemed necessary.

Follow up Enforcement
The Program follow-up with affected communities, where necessary, to assure that SD requirements are being met. This will include regular communication with the communities and may include review of elevation certificates and conducting site visits with local officials to check on compliance at building repair sites as needed.

On all matters of post-disaster SD implementation, the Program will coordinate with FEMA Region I to assure that community compliance is taking place. Coordination may be accomplished through emails, virtual or in-person meetings, phone calls, and/or written communication.

Hazard Mitigation Strategy

Following a Presidentially declared disaster, the State NFIP Coordinator participates in the development and implementation of the Hazard Mitigation Strategy by identifying and implementing activities that support NFIP compliance in recovering communities. The Program would seek an amendment to the approved statement of work should significant disaster activity occur that warrants participation in post-disaster floodplain management activities. The Program will support the implementation of policy and guidance related to DRRA Section 1206 as needed.

Coordination with SHMO

The SHMO is located within the Maine Emergency Management Agency. Coordination with the SHMO happens regularly through interagency GTA. The Program provides assistance with the State Hazard Mitigation Plan update and the update of the 16 County Hazard Mitigation Plans. These updates include text edits and data on repetitive losses, insurance policies and claims, and CRS status. The Program also serves on the HM grant review council. The Program would collaborate with the SHMO throughout any SD event to ensure consistent messaging and assistance.

Market Value Guidance

The Program trains local code officials to start by using the tax assessment for the structure only. If the valuation is not at 100%, they can factor that in. If an applicant is dissatisfied, they can choose to get an independent appraisal. The only method that is acceptable is “actual cash value” (replacement cost minus depreciation).

Appendix C – State Review Ranking Criteria

FEMA Hazard Mitigation Assistance (HMA)
State Review Ranking Criteria

Members of the State Review Council to include members of the State Hazard Mitigation Team

Mitigation for Future Natural Hazards Application:

STATE REVIEWER/STATE DEPARTMENT:

Check the option that you feel this application falls under for each question

REVIEW CRITERIA	STRONGLY AGREE	AGREE	NEUTRAL	DISAGREE	STRONGLY DISAGREE	STATE REVIEWER COMMENTS	SCORING CRITERIA	SCORE
Does the sub-application have a well-defined and clear scope of work that ties cleanly to natural hazard risk reduction?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Does the sub-application improve community lifelines?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Does the sub-application mitigate for future natural hazards events?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Does the sub-application positively contribute to climate change?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Does the sub-application promote long term resiliency benefits?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Does the sub-application provide supporting documentation of reoccuring natural hazard events?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Is this an impoverished community (as per Sec 203. Pre-disaster Hazard Mitigation (42 U.S.C. 5133 Stafford Act)?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Does this sub-applicant meet the criteria for EO14008, the Justice40 Initiative?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Does this sub-applicant have a score of .6 or greater per the social vulnerability index (SVI)?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
Does the sub-application promote partnerships and outreach?							Strongly Agree - 20 points Agree - 15 points Neutral - 10 points Disagree - 5 points Strongly Disagree - 0 points	
FINAL STATE REVIEW RANKING							Total Possible Points: 200	Applicant Score:

Appendix D – Local Mitigation Actions

Appendix - Local Mitigation Actions

Total: $283 Million

County	Town	priority	Location	cost estimate	Timeline	Project scope	Responsible Agent	Status	latitude	longitude
Androscoggin	Auburn	2	Royal River Road	$40,000	4 weeks	Royal Road: Improve and add 2,300' of ditches, line and add check dams as needed. Blasting necessary.	Director of Public Works	No Progress/Lack of Funds	44.00613	-70.26007
Androscoggin	Auburn	4	Woodbury Hill Road	$42,000	5 weeks	Woodbury Hill Road: Improve and add 4,000' of ditches, line and add check dams as needed.	Director of Public Works	No Progress/Lack of Funds	44.02872	-70.25875
Androscoggin	Auburn	7	Hatch Road	$14,500	3 weeks	Hatch Road: Add ditches 1,500' and stone line.	Director of Public Works	Done	44.08702	-70.29788
Androscoggin	Auburn	8	Beaver Road	$28,000	4 weeks	Beaver Road: Add 2,400' of ditches, line and add check dams as needed, and relay driveway culverts as needed.	Director of Public Works	No Progress/Lack of Funds	44.17821	-70.25921
Androscoggin	Auburn	9	Blanchard Road	$72,000	4 weeks	Blanchard Road: Reclaim road base and pave, add 1,800' of ditches, line and add check dams as needed.	Director of Public Works	Partially done. Still needs work.	44.16073	-70.23175
Androscoggin	Auburn	10	Jordan School Road	$60,000	3 weeks	Jordan School Road: Rehabilitate the culvert headwall and wingwall to reduce erosion.	Director of Public Works	No Progress/Lack of Funds	44.00560	-70.21720
Androscoggin	Auburn	11	Park Avenue	$1,000,000	8 weeks	Park Avenue: Improve and add ditches.	Director of Public Works	In progress; completion anticipated in 2018.	44.11211	-70.25030
Androscoggin	Auburn	13	Johnson Road	$20,000	3 weeks	Johnson Road: Improve, and add 2,300' of ditches and add check dams as needed.	Director of Public Works	Funded 2010 CIP. In progress as long term project.	44.18403	-70.26366
Androscoggin	Auburn	22	Fickett Road	$30,000	4 weeks	Fickett Road: Add ditches and upsize culverts.	Director of Public Works	Needs ditching.	43.99286	-70.20843
Androscoggin	Durham	1	Swamp Road	$123,000	3 weeks	Swamp Road: Upsize existing multiple culverts with 8' x 4' x 40' bottomless box culvert with integrated headwalls. Flooded causing a road closure three times between January 1 and May 10, 2010. Dig and repave.	Road Commissioner	No Progress/Lack of Funds	43.97057	-70.07578
Androscoggin	Durham	2	Swamp Road	$7,000	2 weeks	Improve drainage on Swamp Road near Meadow Brook.	Road Commissioner	No Progress/Lack of Funds	43.97060	-70.07573
Androscoggin	Durham	4	Cedar Pond Road (Option 1)	$189,000	6 weeks	Cedar Pond Road (Option 1): Move 250' x 20' of road, repave and add ditches 250'.	Road Commissioner	No Progress	43.99627	-70.07831
Androscoggin	Durham	7	Auburn Pownal Road	$40,000	1 week	Add culvert, protect inlet/outlet and improve drainage on Auburn Pownal Road where Twin Brooks flow into Runaround Pond. Even with the increased culvert size, it floods at least annually causing a road closure.	Road Commissioner	Project requires clarification.	43.95268	-70.19724
Androscoggin	Durham	8	Cedar Pond Road	$50,000	4 months	Protect Cedar Pond Road from erosion (Option 2). Improved ditching, new culverts, riprap, grading and elevating the road.	Road Commissioner	No Progress/Lack of Funds	43.99532	-70.07645
Androscoggin	Durham	8	Brickyard Hill and Shiloh Road	$15,000	2 weeks	Improve and armor ditches on Brickyard Hill and Shiloh Road where steep slopes create problems.	Road Commissioner	No Progress/Lack of Funds	43.98809	-70.06402
Androscoggin	Durham	9	Brickyard Hill and Shiloh Road	$15,700	3 weeks	Brickyard Hill and Shiloh Road: Remove ledge as needed and stabilize slope 5' x 400' and ditch 400'.	Selectmen and Road Commissioner	No Progress/Lack of Funds	43.98809	-70.06402

Androscoggin	Durham	10	Meadow Road	$1,100,000	6 weeks	Meadow Road: Elevate 5,000' x 21' x 2', stabilize shoulders, upsize (13) 15'' x 40' culverts with 18'' x 40' HDPE culverts.	Road Commissioner	No Progress/Lack of Funds	43.95951	-70.07340
Androscoggin	Durham	11	Runaround Pond Dam	$200,000	12 weeks	Reconstruct Runaround Pond Dam. Dam has been patched, needs to be strengthened and repaired to prevent failure.	Road Commissioner	No Progress/Lack of Funds	43.95126	-70.16966

Androscoggin	Durham	12	Soper Road	$97,000	2 weeks	Soper Road: Upsize existing culvert with 6' x 4' x 40' bottomless box culvert with integrated headwalls. Floods at least annually causing a road closure.	Road Commissioner	No Progress	43.96275	-70.05910
Androscoggin	Greene	4	North Mountain Road	$16,000	3 weeks	North Mountain Road: Ditch and line 800', upsize (6) 12'' x 40' with 24'' x 40' HDPE culverts.	Road Commissioner	In progress. Long project, continued through 2017.	44.23790	-70.16907
Androscoggin	Greene	5	Old Green Road	UNK	3 weeks	Old Green Road: Improve drainage. Reclaiming road on existing asphalt, cross culvert, bring in gravel and regravel, 2" modified binder asphalt. On town line; raise dip and lower the rise.	Road Commissioner	Continue to work through list of projects.	44.13933	-70.13894
Androscoggin	Greene	7	River Road	$60,000	6 weeks	River Road: Elevate causeway 200' x 21' x 24'' and stabilize shoulders, ditch 1,500' and add (9) 24'' x 40' culverts. Florida Power and Light (FPL) is working near causeway at Cherry Pond doing road upgrades.	Road Commissioner	Continue to work through list of projects.	44.18985	-70.20209
Androscoggin	Leeds	8	Bernie Hartford Road	$45,000	5 weeks	Bernie Hartford Road: Install geotextile and elevate 2,500', 22' x 36'' stabilize shoulders and add (5) 24'' x 40' culverts.	Highway Foreman	Not done. Lack of funds.	44.28281	-70.10422
Androscoggin	Leeds	9	South End of Bishop Hill Road	$32,000	2 weeks	South End of Bishop Hill Road: 300'	Public Works Director	Not done. Lack of funds.	44.26689	-70.09206
Androscoggin	Lewiston	1	Bartlett Street	$50,000	2 months	Bartlett Street: Add 48" storm drain inlet.	Public Works Director	New Project	44.09247	-70.20836
Androscoggin	Lewiston	19	River Road past LAWPCA	UNK		River Road past LAWPCA:		South and Locust will be rehabbed by MDOT.	44.05016	-70.18733
Androscoggin	Lewiston	20	Main Street by Switzerland Road	UNK		Main Street by Switzerland Road and sewer upstream. Manhole cover gets blown off due to undersized sewer pipe.		No progress. Part of larger project.	44.13076	-70.19763
Androscoggin	Lewiston	21	Birch Street behind Polar Paint	UNK		Birch Street behind Polar Paint:		Privately owned basin. Problem solved at this time.	44.09396	-70.20863
Androscoggin	Lewiston	22	Pettingill Street	UNK		Pettingill Street:		Done	44.11050	-70.20253
Androscoggin	Lisbon	8	Bowdoinham Road	$150,000	1 month	Bowdoinham Road: Bridge #3530 replacement.	Public Works Director	Culvert replaced in 2004.	44.05374	-70.07246
Androscoggin	Lisbon	9	Ferry Road	$150,000	1 month	Ferry Road: Culvert upgrade adjacent to 73 Ferry Road.	Public Works Director	New Project	44.00513	-70.14040
Androscoggin	Lisbon	10	Lisbon	$20,000		Pump Station Generators: (7) single-phase generators, (2) 3-phase generators	Public Works Director	New Project		
Androscoggin	Lisbon	11	Lisbon	$150,000		Treatment Plant Generator	Public Works Director	New Project		
Androscoggin	Livermore	3	River Road	$50,000	4 weeks	River Road: Mitigate flooding to a 50-year event standard by elevating approximately 600' of 21'- wide road (4' elevation suggested), and upsize existing galvanized culvert from 36'' to 4' HDPE, stabilize shoulders and repave.	Town Administrator, Highway Foreman & Road Committee	Deferred/Lack of Funding	44.41973	-70.17889
Androscoggin	Livermore Fa	3	Cargill Street	$15,000	1 week	Cargill Street: Slip line existing underground drainage.	Road Commissioner	New Project	44.47890	-70.18903
Androscoggin	Livermore Fa	5	Baldwin Street	$15,000	3 weeks	Baldwin Street: Add a couple of catch basins and improve drainage.	Road Commissioner	No Progress/Lack of Funds	44.47855	-70.18312

Androscoggin	Mechanic Fal	4	Elm Street	UNK	6 weeks	Elm Street: Rebuild road bed and ditch 5,000'.	Road Commissioner	No Progress/Lack of Funds	44.11093	-70.39111
Androscoggin	Mechanic Fal	5	Libby Road	$2,500	3 weeks	Libby Road: Add 18'' x 40' HDPE and repave.	Road Commissioner	Deferred/Lack of Funding	44.10031	-70.39788
Androscoggin	Minot	1	Death Valley Road	$35,000	2 weeks	Death Valley Road: Stream crossing, upsize culverts, install wingwalls, lift road.	Town Administrator	Newly listed project.	44.15531	-70.32207

Androscoggin	Minot	2	Bucknam Bridge Road	$87,000	6 weeks	Bucknam Bridge Road: Elevate 1,000' x 4' x 21, stabilize shoulders and repave. Install (2) 24" cross culverts.	Road Commissioner	Costs revised, but no funds at this time.	44.15163	-70.38566
Androscoggin	Poland	1	North Raymond Road	$190,000	6 weeks	North Raymond Road: Elevate roadways 36"; add geotextiles; repave; stabilize shoulders; add (4) cross culverts (40' each). Section A, about 1/4 miles from Route 11, 1800' x 20'. Section B, North Raymond Road Extension, 2500' x 20'.	Road Commissioner	Deferred/Lack of Funds	43.99660	-70.41076
Androscoggin	Poland	3	Hardscrabble Road	$20,000	4 weeks	Hardscrabble Road: Elevate two sections of road 500' x 20' x 24'' and stabilize shoulders.	Road Commissioner	Deferred/Lack of Funds	44.06505	-70.29604
Androscoggin	Sabattus	1	Long Beach Road	$12,000	2 weeks	Long Beach Road: Retrofit pump station by raising or replacing with submersible pump.	Highway Foreman	Deferred/Lack of Funds	44.11811	-70.10107
Androscoggin	Sabattus	3	Marsh Road #2	$150,000	4 weeks	Marsh Road #2 (from the intersection of Route 126 and Marsh Road at .4 to .6ths): Upsize stone culvert with 4' x 6' x 50' bottomless box culvert, elevate 600' x 2' x 24', repave and stabilize shoulders.	Highway Foreman	Deferred/Lack of Funds	44.12299	-70.06402
Androscoggin	Sabattus	4	Marsh Road #3	$127,000	4 weeks	Marsh Road #3 (from the intersection of Route 126 and Marsh Road at 2.4 miles): Upsize stone culvert with 4' x 6' x 50' bottomless box culvert, elevate 600' x 2' x 24', repave and stabilize shoulders.	Highway Foreman	Deferred/Lack of Funds	44.12146	-70.05455
Androscoggin	Sabattus	5	Maxwell Road	$110,000	3 weeks	Maxwell Road (extension of Marsh Road) (from the intersection of Route 126 and Marsh Road at 3.0 miles): Upsize existing culverts with 4' x 5' x 50' bottomless box culvert, elevate 500' x 2' x 24', repave and stabilize shoulders.	Highway Foreman	Deferred/Lack of Funds	44.12040	-70.02500
Androscoggin	Sabattus	6	Webster Corner Road	$22,000	3 weeks	Webster Corner Road: Improve drainage by upsizing existing (5) 15'' x 20' culverts with 18'' x 20' HDPE's, ditch and line 2,000', remove ledge as needed and add check dams.	Highway Foreman	No Progress/Lack of Funds	44.06700	-70.09744
Androscoggin	Sabattus	7	Dube Drive	$30,000	4 weeks	Dube Drive (intersection at Crowley Road): Upsize existing culvert with 4' x 5' x 50' bottomless box culvert, elevate 200' x 2' x 24', repave, ditch along Crowley Road 750'.	Highway Foreman	Deferred/Lack of Funds	44.06828	-70.08809
Androscoggin	Turner	2	Tidswell Road	$65,000	4 weeks	Tidswell Road: Upsize existing 14' x 50' culvert with 14' x 8' x 40' bottomless box culvert and with integrated headwalls and upsize (2) 18'' x 30' culverts with 24'' x 40' HDPE's and repave.	Road Commissioner	Still evaluating engineering concerns	44.29751	-70.26776
Androscoggin	Turner	3	Allen Road	$22,000	4 weeks	Allen Road: Elevate and repave 100' x 21' x 3' and stabilize shoulders.	Road Commissioner	Partially in Hebron; working to collaborate.	44.21043	-70.32883
Androscoggin	Turner	6	Snell Hill Road	$31,000	4 weeks	Snell Hill Road: Upsize (4) culverts with 15'' x 40' HDPE's and elevate two sections of road 100' and elevate (2) sections of road 100' and 400' x 21' x 2' and repave.	Road Commissioner	Deferred/Lack of Funds	44.24745	-70.26891

Androscoggin	Turner	8	Mason Road	$7,500	4 weeks	Mason Road: Ditch and line 2,500'.	Road Commissioner	Done	44.34998	-70.25592
Androscoggin	Turner	9	Conant Road	$8,000	4 weeks	Conant Road: Upsize (4) culverts with 18'' x 40' HDPE's and ditch and line 400'.	Road Commissioner	Done	44.18560	-70.22364
Androscoggin	Turner	10	Young Road	$5,000	3 weeks	Young Road: Upsize (2) 15'' x 40' culverts with 18'' x 40' HDPE's and riprap intake and outlet.	Road Commissioner	Done	44.24690	-70.30653
Androscoggin	Turner	12	Bennett Road	$4,000	3 weeks	Bennett Road: Upsize existing 12'' x 20' culvert with 15'' x 20' HDPE and ditch and line 60'.	Road Commissioner	Done	44.25891	-70.29416
Androscoggin	Turner	15	East Hebron Road	$28,000		Improve drainage on East Hebron Road through ditching and placing riprap.	Town Manager and Public Works Director	Done	44.23191	-70.31535
Androscoggin	Turner	16	Colony Drive	$12,000		Improve drainage on Colony Drive through ditching and placing riprap.	Town Manager and Public Works Director	Done	44.26063	-70.19097
Androscoggin	Turner	17	Harlow Hill Road	$6,500	1 week	Improve drainage on the south end of Harlow Hill Road, including blasting, ditching and placing riprap.	Town Manager and Public Works Director	Still working through list.	44.31100	-70.27356
Androscoggin	Wales	2	Bull Run Road	$2,500	3 Weeks	Bull Run Road: Install additional 15'' x 40' cross culvert and repave.	Road Commissioner	Newly listed project.	44.17595	-70.09735
Aroostook	Allagash	1	Frank Mack Road	$13,500	Medium Term	1) Frank Mack Road - Upsize 24' cmp to 48" x 40', rip rap	Road Commissioner	Deferred – Lack of funds	47.11079	-69.10953
Aroostook	Allagash	2	Walker Brook Road	$9,000	Medium Term	2) Walter Brook Road - Install (2)24" x 40' cmps & (2) 36" x 40'cmp's, rip rap	Road Commissioner	Deferred – Lack of funds	47.11368	-69.08961
Aroostook	Allagash	3	Inn Road	$5,000	Short Term	3) Inn Road - Bank stabilization, culvert	Road Commissioner	Deferred – Lack of funds	47.06510	-69.08785
Aroostook	Allagash	4	Old Rapid Road	$60,000	Medium Term	4) Old Rapid Road - Culvert	Road Commissioner	Deferred – Lack of funds	47.11124	-69.13552
Aroostook	Aroostook Band of Mic		Please see Annex for updates on Tribe projects	UNK		Please see Annex for updates on Tribe projects			46.92358	-67.89114
Aroostook	Ashland	1	Wrightville Road	$120,000	Long Term	1) Wrightville Road - Ditching & culverts	Public Works	Deferred – Lack of funds	46.68501	-68.36958
Aroostook	Blaine	1	Grass Road	$8,000	Long Term	1) Grass Road - Place geo fabric and elevate 125' section of road 7 repave	Public Works	Deferred – Lack of funds	46.47775	-67.81569
Aroostook	Blaine	2	Robinson Road	$10,500	Medium Term	2) Robinson Road - Upsize 48' x 70' culvert	Public Works	Deferred – Lack of funds	46.47327	-67.83956
Aroostook	Blaine	3	Barrett Road	$6,500	Medium Term	3) Barrett Road - Upsize 48' x 40' cmp	Public Works	Deferred – Lack of funds	46.47377	-67.79062
Aroostook	Blaine	4	Pierce Road	$3,000	Medium Term	4) Pierce Road - One culvert	Public Works	Deferred – Lack of funds	46.49573	-67.84519
Aroostook	Blaine	5	Libby Road	$6,000	Medium Term	5) Libby Road - One culvert.	Public Works	Deferred – Lack of funds	46.50860	-67.87345
Aroostook	Bridgewater	1	East Blaine Road	$95,000	Medium Term	1) East Blaine Road – Upsize culvert (size to be determined)/bridge	Road Commissioner	Deferred – Lack of funds	46.52002	-67.83580
Aroostook	Bridgewater	2	Packard Road	$33,000	Medium Term	2) Packard Road – Ditch 15,000', add (6) 18"' x 40' cmps	Road Commissioner	Deferred – Lack of funds	46.42800	-67.84842
Aroostook	Bridgewater	3	Generator(s	UNK	Short Term	3) Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		
Aroostook	Caribou	4	River Road	$156,000	Long Term	4) River Road – Easements, engineering and soil evaluations	Public Works	Deferred – Lack of funds	46.86827	-67.99006
Aroostook	Caribou	5	Install dry hydrants	UNK	Short Term	5) Install dry hydrants	Public Works	Deferred – Lack of funds		
Aroostook	Caribou	7	Limestone Street	UNK	Short Term	7) Limestone Street – stabilize bank that is eroding into river	Public Works	Deferred – Lack of funds	46.86712	-67.99542
Aroostook	Caribou	8	Generator(s	UNK	Short Term	8) Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		

Aroostook	Caswell	2	Create inventory of all town owned drainage (GPS	UNK	Long Term	2) Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Chapman		Willard Road	$73,000	Long Term	Willard Road – Ditch 6.5 miles, upsize (2) 24” cmps to 48” x 40’ cmps	Public Works	Deferred – Lack of funds	46.97749	-67.87990
Aroostook	Cyr Plantatio	1	Laplante Road	$14,000	Long Term	1) Laplante Road – Rebuild 300 feet	Road Commissioner	Deferred – Lack of funds	47.12239	-67.97505

Aroostook	Cyr Plantatio	2	Madore Road	$37,500	Long Term	2) Madore Road – Rebuild 800 feet	Road Commissioner	Deferred – Lack of funds	47.11463	-67.93953
Aroostook	Cyr Plantatio	3	Michelle L. Cross Road	$95,000	Long Term	3) Michelle L. Cross Road – Rebuild 2,000 feet	Road Commissioner	Deferred – Lack of funds	47.10077	-67.99763
Aroostook	Cyr Plantatio	4	Omer Dumond Road	$5,000	Short Term	4) Omer Dumond Road – Install one corrugated metal pipe	Road Commissioner	Deferred – Lack of funds	47.10972	-67.94523
Aroostook	Cyr Plantatio	5	LaPlante Road	$37,500	Long Term	5) LaPlante Road – Rebuild 800 feet	Road Commissioner	Deferred – Lack of funds	47.12208	-67.97523
Aroostook	Cyr Plantation		Create inventory of all town owned drainage (GPS	UNK	Long Term	Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Eagle Lake	2	Create inventory of all town owned drainage (GPS	UNK	Long Term	2) Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Eagle Lake		Gillmore Brook Road	$129,000	Long Term	Gillmore Brook Road – Ditch 20,000’, add surface gravel 5.5 miles x 20’ x 6’	Public Works	Deferred – Lack of funds	47.09520	-68.61982
Aroostook	Easton	1	Hersom Road	$65,000	Medium Term	1) Hersom Road – Mitigate drainage issues	Public Works	New Project	46.60642	-67.85244
Aroostook	Fort Fairfield	1	Currier Road	$149,000	Long Term	1) Currier Road – Install 12’ x 60’ box culvert, rip rap,raise road & repave	Road Commissioner/Selectmen	Deferred – Lack of funds	46.76901	-67.85704
Aroostook	Fort Kent	1	Shore Guard Levee Protection	$500,000	Long Term	1) Shore Guard Levee Protection – Fish River	Public Works	Deferred – Lack of funds	47.25510	-68.59629
Aroostook	Fort Kent	2	Bradbury Road	$1,000,000	Long Term	2) Bradbury Road – Study option of re-routing to 11 South – avoid major landslide and residents being stranded	Public Works	Deferred – Lack of funds	47.23660	-68.58310
Aroostook	Fort Kent	3	Charette Hill Road	$120,000	Long Term	3) Charette Hill Road – Bank stabilization, erosion control	Public Works	Deferred – Lack of funds New Project	47.26152	-68.51621
Aroostook	Fort Kent	4	Heritage Trail	$5,000	Short Term	4) Heritage Trail – Culvert and bank stabilization	Public Works	Deferred – Lack of funds	47.23467	-68.63440
Aroostook	Fort Kent	5	North Perley Brook Road	$18,837	Short Term	5) North Perley Brook Road – Upsize culverts to reduce flooding	Public Works	Competed; HMPG grant, August 2015	47.24353	-68.50741
Aroostook	Fort Kent	6	East Main Street	$250,000	Partially Completed	6) East Main Street – Acquire homes, demolish & expand park	Public Works	Some homes acquired	47.26147	-68.59016
Aroostook	Fort Kent	12	Generator(s	UNK	Short Term	12) Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		
Aroostook	Fort Kent	13	Little Black Lake	$20,000	Short Term	13) Little Black Lake – culvert upgrade, riprap	Public Works	Deferred – Lack of funds	47.21565	-68.45653
Aroostook	Fort Kent		Bradbury Road	$15,000	Long Term	Bradbury Road – Culverts to allow run off to flow	Public Works	Upsized by # 2, above	47.23096	-68.57891
Aroostook	Fort Kent		Bradbury Road	$10,000	Long Term	Bradbury Road – Document progression for future mitigation	Public Works	Upsized by # 2, above	47.23514	-68.58233
Aroostook	Frenchville	9	Pelletier Avenue	$5,267	Medium Term	9) Pelletier Avenue - Erosion control	Public Works	Deferred – Lack of funds	47.32527	-68.37988
Aroostook	Frenchville	11	Pelletier Avenue	$1,362	Short Term	11) Pelletier Avenue - Upsize culvert, drainage	Public Works	Deferred – Lack of funds	47.32004	-68.35919

Aroostook	Garfield Plt.	1	Upgrade roads & bridges as necessary to reduce flood hazard	UNK	Long Term	1) Upgrade roads & bridges as necessary to reduce flood hazard	Public Works	Deferred – Lack of funds		
Aroostook	Garfield Plt.	2	Create inventory of all town owned drainage (GPS	UNK	Long Term	2) Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Grand Isle	1	Grivois Road	$75,000	Long Term	1) Grivois Road - Ditch 25,000' of road and install (8) 18" x 24' cmps	Public Works	Deferred – Lack of funds	47.23957	-68.08838

Aroostook	Hamlin	2	Generator(s	UNK	Short Term	2) Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		
Aroostook	Haynesville		Create inventory of all town owned drainage (GPS	UNK	Long Term	Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Haynesville		Skagrock Road	$58,000	Medium Term	Skagrock Road - Ditch 10,000' upsize culvert to 5' x 30' box culvert, rip rap	Public Works	Deferred – Lack of funds	45.81766	-67.96726
Aroostook	Hodgdon	1	McIntyre Road	$37,500	Long Term	1) McIntyre Road - 800 feet road elevation	Public Works	Deferred – Lack of funds	46.09533	-67.86213
Aroostook	Hodgdon	2	Westford Hill Road	$27,500	Long Term	2) Westford Hill Road - 600 feet road elevation	Public Works	Deferred – Lack of funds	46.03604	-67.83990
Aroostook	Hodgdon	3	North Town Line Road	$47,500	Long Term	3) North Town Line Road - 1,000 feet road elevation	Public Works	Deferred – Lack of funds	46.04576	-67.90842
Aroostook	Hodgdon	4	Green Road	$95,000	Long Term	4) Green Road - 2,000 feet road elevation	Public Works	Deferred – Lack of funds	46.02867	-67.82681
Aroostook	Hodgdon	5	South McIntyre Road	$3,000	Short Term	5) South McIntyre Road - One culvert	Public Works	Deferred – Lack of funds	46.07890	-67.86440
Aroostook	Houlton Ban	1	Bell Road	$200,000	Long Term	1) Bell Road – Resize and replace water crossing.	Public Works	New	46.18398	-67.80809
Aroostook	Houlton Ban	2	Wilderness Pines	$40,000	Medium Term	2) Wilderness Pines – Establish internet service for non-congregate sheltering	Public Works	New	46.29552	-67.87934
Aroostook	Houlton Ban	3	Create inventory of all town owned drainage (GPS	UNK	Medium Term	3 Bell Road – Extend road to Carson Road for egress from Administration building	Public Works	New		
Aroostook	Island Falls	1	Old Patten Road	$22,000	Medium Term	1) Old Patten Road - Install 122" x 50' floodway arch culvert, rip rap & repave	Public Works	Deferred – Lack of funds	46.01457	-68.28317
Aroostook	Island Falls	2	Jacob Shur Road	$15,000	Long Term	2) Jacob Shur Road - Upsize culverts – build up road	Public Works	Deferred – Lack of funds	46.02387	-68.30847
Aroostook	Island Falls	3	Merriman Road	$25,000	Long Term	3) Merriman Road - Culverts and ditching	Public Works	Deferred – Lack of funds	45.98194	-68.20761
Aroostook	Island Falls	4	South Shore Road	$15,000	Short Term	4) South Shore Road - Ditching	Public Works	Deferred – Lack of funds	46.02035	-68.18818
Aroostook	Island Falls	5	Sewall Street	$20,000	Short Term	(5) Sewall Street - Drainage, ditching	Public Works	Deferred – Lack of funds	46.01340	-68.27419
Aroostook	Island Falls	6	Church Street	$20,000	Short Term	6) Church Street - Drainage, ditching	Public Works	Deferred – Lack of funds	46.01111	-68.27248
Aroostook	Limestone	1	Burleigh Street	$64,000	Long Term	1) Burleigh Street - Underground storm drain; install (2) catch basins and 450' x 4' culvert	Public Works	Deferred – Lack of funds	46.90887	-67.82293
Aroostook	Limestone	2	Silver Spring Brook	$20,000	Long Term	2) Silver Spring Brook - Dredge brook at intake	Public Works	Deferred – Lack of funds	46.92025	-67.82844
Aroostook	Limestone	3	Cutting back branches	UNK	Short Term	(3) Cutting back branches	Public Works	Deferred – Lack of funds		
Aroostook	Limestone	4	Stabilize bank to protect sewer	UNK	Medium Term	4) Stabilize bank to protect sewer	Public Works	Deferred – Lack of funds		
Aroostook	Limestone	5	Madawaska Dam	$100,000	Long Term	5) Madawaska Dam - Resurface spillway with proper material	Public Works	Deferred – Lack of funds	46.95341	-67.98086
Aroostook	Limestone	6	Fish Way to Madawaska Dam	$250,000	Long Term	6) Fish Way to Madawaska Dam	Public Works	Deferred – Lack of funds	46.95380	-67.98030

Aroostook	Limestone	7	Generator(s	UNK	Short Term	7) Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		
Aroostook	Linneus	1	South Oakfield Road	$18,000	Short Term	1) South Oakfield Road-Beaver Brook - Upsize & enlarge existing culvert, from 5' to 6'. Install 2' overflow. Rip rap. Resurface 300; of gravel travel surface	Road Commissioner	Deferred – Lack of funds	46.04661	-68.15736
Aroostook	Linneus	2	Folsom Road	$8,500	Medium Term	2) Folsom Road - Upsize & enlarge existing culvert. Rip Rap. Resurface 400' of gravel travel surface. Raise road profile.	Road Commissioner	Deferred – Lack of funds	46.05321	-67.93100
Aroostook	Linneus	3	Raise elevation of floor in furnace room at fire station	$30,000	Short Term	3) Raise elevation of floor in furnace room at fire station	Road Commissioner	Deferred – Lack of funds	46.03698	-67.96188
Aroostook	Linneus	4	Generator(s	UNK	Short Term	4) Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		
Aroostook	Littleton	1	Carson Road	$85,000	Short Term	1) Carson Road - Two culverts	Public Works	Deferred – Lack of funds	46.20980	-67.80003
Aroostook	Littleton	2	Wiley Road	$25,000	Short Term	2) Wiley Road - One culvert	Public Works	Deferred – Lack of funds	46.21703	-67.85109
Aroostook	Littleton	3	Hillsiding Road	$25,000	Medium Term	3) Hillsiding Road - Nine culverts	Public Works	Deferred – Lack of funds	46.27459	-67.84088
Aroostook	Littleton	4	Shanks Road	$8,000	Medium Term	4) Shanks Road - Three culverts	Public Works	Deferred – Lack of funds	46.26997	-67.85181
Aroostook	Littleton	5	Gillen Road	$14,000	Short Term	5) Gillen Road - One culvert	Public Works	Deferred – Lack of funds	46.20253	-67.88940
Aroostook	Littleton	6	Ingraham Road	$5,000	Short Term	6) Ingraham Road - One culvert	Public Works	Deferred – Lack of funds	46.23111	-67.83182
Aroostook	Littleton	7	Front Ridge Road	$30,000	Medium Term	7) Front Ridge Road - Six culverts	Public Works	Deferred – Lack of funds	46.16923	-67.87405
Aroostook	Madawaska	1	Create inventory of all town owned drainage (GPS	UNK	Long Term	1) Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Madawaska	5	Golf Course Road	$30,000	Short Term	5) Golf Course Road – Upsize culvert	Public Works	Temporary fix 2018	47.21743	-68.22426
Aroostook	Madawaska	6	Pelletier Avenue	$10,000	Short Term	6) Pelletier Avenue – Upgrade culvert	Public Works	New Project	47.29825	-68.33523
Aroostook	Madawaska	7	Third & Girard	$10,000	Short Term	7) Third & Girard – Upgrade culvert	Public Works	New Project	47.35121	-68.32136
Aroostook	Madawaska	8	Dufour Road Repair head of culvert to redirect water	$7,500	Short Term	8 Dufour Road Repair head of culvert to redirect water	Public Works	New Project	47.33037	-68.29087
Aroostook	Mapleton	1	NOMACCA Drive	$1,000,000	Long Term	1) NOMACCA Drive - Relocate access road away from Aroostook River approx. 600', fill & rip rap	Public Works	Deferred – Lack of funds	46.74307	-68.06020
Aroostook	Mapleton	2	Teakettle Brook	$150,000	Medium Term	2) Teakettle Brook - Upsize culvert with stream crossing culvert	Public Works	Deferred – Lack of funds	46.70305	-68.12995
Aroostook	Mapleton	3	Create inventory of all town owned roads and drainage (GPS	UNK	Long Term	3) Create inventory of all town owned roads and drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Mars Hill	1	Clark Road	$25,000	Medium Term	1) Clark Road - 24" x 50' cmp to 36" x 50' cmp & rip rap, elevate 250' of road bed	Public Works	Deferred – Lack of funds	46.52179	-67.88988
Aroostook	Mars Hill	2	Mountain Road	$25,000	Medium Term	2) Mountain Road - Upsize (2) 24' x 40' cmps to 36" x 40' rip rap & ditch 300'	Public Works	Deferred – Lack of funds	46.53427	-67.79644
Aroostook	Mars Hill	3	East Ridge Road	$60,000	Short Term	3) East Ridge Road – Upgrade 3 culverts at Gizoquit Brook	Public Works	Deferred – Lack of funds	46.55575	-67.83727
Aroostook	Merrill			UNK	Long Term	Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Monticello	1	Jones Road	$25,000	Short Term	1) Jones Road – Reconstruct road	Public Works	New	46.30737	-67.79722

Aroostook	Monticello	2	Hoyt Road	$20,000	Short Term	2) Hoyt Road – Upgrade culverts and repair road	Public Works	New	46.31681	-67.85440
Aroostook	Monticello	3	Hillsiding Road	$15,000	Short Term	3) Hillsiding Road - Upgrade culverts and repair road	Public Works	New	46.28210	-67.84103
Aroostook	Monticello	4	Bell Road	$15,000	Long Term	4 Bell Road – Install guard rails and repair roads	Public Works	New	46.28379	-67.78625
Aroostook	Monticello	5	Fullerton Road	$25,000	Short Term	5) Fullerton Road - Berm and seed, ditch 700' of road rip rap & coffer dam	Public Works	Still repairing sections	46.34883	-67.81074
Aroostook	Monticello	6	Install dry hydrants	UNK	Long Term	6) Install dry hydrants	Public Works	Deferred – Lack of funds		
Aroostook	New Sweden		Generator(s	UNK	Short Term	Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		
Aroostook	Perham		High Meadow Road	$295,000	LongTerm	High Meadow Road - Install underground channels for drainage, elevation, ditching & culverts	Public Works	Deferred – Lack of funds	46.87804	-68.25358
Aroostook	Presque Isle	2	Lombard Road	$10,000	ShortTerm	2) Lombard Road - Culvert	Public Works	Deferred – Lack of funds	46.68673	-67.99910
Aroostook	Presque Isle	3	Henderson Road	$42,000	Short Term	3) Henderson Road – Triple 36-inch Culverts	Public Works	Deferred – Lack of funds	46.62217	-67.97007
Aroostook	Presque Isle	4	Install dry hydrants	UNK	Long Term	4) Install dry hydrants	Public Works	Deferred – Lack of funds		
Aroostook	Presque Isle	8	Fort Road (Route 163/167 from North Street	$82,000	Short Term	8) Fort Road (Route 163/167 from North Street –Maple Grove Road - ditching	Public Works	Planned for 2021	46.70656	-67.95528
Aroostook	Presque Isle	9	Easton Road (Route 10	$199,000	Short Term	9) Easton Road (Route 10) east of Egypt Road – drainage improvements	Public Works	Planned for 2021	46.64270	-67.93144
Aroostook	Presque Isle	10	US Route 1 (south	$1,170,000	Medium Term	10) US Route 1 (south) 0.27 mile N of Westfield Town Line – bridge culvert rehab	Public Works	Planned for 2023	46.59676	-67.96600
Aroostook	Reed Plantat	1	Create inventory of all town owned drainage (GPS	UNK	Long Term	Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Sherman	1	Create inventory of all town owned drainage (GPS	UNK	Long Term	1) Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Sherman	2	Cold Brook and Gallison Roads	UNK	Long Term	2) Cold Brook and Gallison Roads – ditching & culverts	Public Works	Deferred – Lack of funds	45.89154	-68.35078
Aroostook	Sherman	3	Generator(s	UNK	Short Term	3) Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		
Aroostook	St. Agatha	4	Brook Road	$50,000	Long Term	4) Brook Road - Create buffer zone	Public Works	Deferred – Lack of funds	47.24733	-68.33170
Aroostook	St. Agatha	5	Create inventory of all town owned drainage (GPS	UNK	Long Term	5) Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	St. Francis		Sunset Drive	$20,000	Medium Term	Sunset Drive - Culverts & ditching	Public Works	Deferred – Lack of funds	47.15791	-68.87673
Aroostook	St. John		Create inventory of all town owned drainage (GPS	UNK	Long Term	Create inventory of all town owned drainage (GPS)	Public Works	Deferred – Lack of funds		
Aroostook	Unorganized	4	Benedicta	UNK	Short Term	4) Benedicta – Aroostook Road – Annual ditching (5-6 days)	Public Works	On-going (annual maintenance)		
Aroostook	Unorganized	7	Cary Township	$40,000	Long Germ	7) Cary Township- Wilcox & Smith Roads – Excavate shoulder materials, ditching, cross culvert upgrades	Public Works	On-going – 2nd year of 5-year de-organization plan	45.97667	-67.82450
Aroostook	Unorganized	8	Oxbow North Township	$100,000	Long Term	8) Oxbow North Township – Oxbow Road – Ditching, culvert upgrades, road surface rehabilitation on unpaved portion 9 miles	Public Works	On-going – 4th year of 5-year de-organization plan	46.41322	-68.48687

Aroostook	Van Buren	1	St. Mary's Road	$45,000	Long Term	1) St. Mary's Road - Two sections-1,000 ft., raise, rip rap, enlarge culverts	Public Works	Deferred – Lack of funds	47.14803	-67.97273
Aroostook	Van Buren	2	Lake Road	$78,000	Long Term	2) Lake Road - Ditch, rip rap, raise road & change culverts as needed for a distance of 2,000 feet	Public Works	Deferred – Lack of funds	47.16462	-68.03643
Aroostook	Van Buren	3	Alexander Road	$90,000	Long Term	3) Alexander Road - Raise, grade, rip rap & change culverts as needed for 3,000 feet	Public Works	Deferred – Lack of funds	47.18492	-67.99745

Aroostook	Van Buren	6	DOT Project in conj. with Van Buren Public Works	UNK	Long Term	6) DOT Project in conj. with Van Buren Public Works - Resolve under-sized culvert issues attempting to leverage federal highway funds	Public Works	Deferred – Lack of funds		
Aroostook	Van Buren	7	DOT Project in conf. with Van Buren Public Works	UNK	Long Term	7) DOT Project in conf. with Van Buren Public Works - Resolve proper drain issues relative to Champlain & Route 1 area	Road commissioner	Deferred – Lack of funds		
Aroostook	Van Buren	8	Generator(s	UNK	Short Term	8) Generator(s) – Install generators as needed at critical facilities	Contractor	Deferred – Lack of funds		
Aroostook	Wade	2	South Wade Road	$100,000	Medium Term	2) South Wade Road - Install 6 culverts and guardrail	Public Works	Several culverts replaced need guard rails on river side of road	46.76120	-68.22069
Aroostook	Wade	3	Gardner Creek	$10,000	Medium Term	3) Gardner Creek – add drainage tile under road and build up	Public Works	Deferred – Lack of funds	46.75823	-68.23952
Aroostook	Wade	4	North Wade Road	$50,000	Long Term	4) North Wade Road – Add guard rails along edge of brook	Public Works	New	46.82938	-68.20725
Aroostook	Wallagrass	1	Rip rap to protect bridge	UNK	Long Term	1) Rip rap to protect bridge	Public Works	Deferred – Lack of funds		
Aroostook	Wallagrass	2	Soldier Pond Road	$350,000	Long Term	2) Soldier Pond Road - Acquisition of six homes	Public Works	Deferred – Lack of funds	47.15506	-68.58321
Aroostook	Wallagrass	3	Church Street	$22,500	Medium Term	3) Church Street - 500 feet road elevation	Public Works	Deferred – Lack of funds	47.16141	-68.57233
Aroostook	Washburn	2	Emergency communication equipment	UNK	Long Term	2) Emergency communication equipment - install 3 backup generator system	Public Works	New Project		
Aroostook	Washburn	4	Gardner Creek Road	$1,000,000	Long Term	4) Gardner Creek Road - Upsize culverts & upgrade with bridge	Public Works	Deferred – Lack of funds	46.77217	-68.17810
Aroostook	Washburn	6	Annis Road	$500,000	Long Term	6) Annis Road – Road build up with bridge	Public Works	New Project	46.75653	-68.13583
Aroostook	Westfield	2	Miller Road	$40,000	Medium Term	2) Miller Road - Three culverts	Public Works	Deferred – Lack of funds	46.53305	-67.93443
Aroostook	Westmanlan	1	Westmanland Road	$15,000	Long Term	1) Westmanland Road – Ditch and upsize culverts	Public Works	New Project	46.94132	-68.15849
Aroostook	Westmanlan	2	Little Madawaska Lake Road	$33,000	Long Term	2) Little Madawaska Lake Road - Raise road at bridge for 500 feet, install culverts	Public Works	Deferred – Lack of funds	46.99500	-68.19380
Aroostook	Weston	5	North of 106 Springer Road	$2,000	Short Term	5) North of 106 Springer Road - Culvert	Public Works	Deferred – Lack of funds	45.67758	-67.86741
Aroostook	Weston	6	Harris Hill Road	$7,500	Short term	6) Harris Hill Road – shoulder grading and ditch maintenance	Public Works	New Project	45.76446	-67.88098
Aroostook	Weston	7	Paving	UNK	Short Term	7) Paving - Springer, Butterfield, and Dark Cove roads	Public Works	New Project		
Aroostook	Weston	8	Harris Hill Road	$400,000	Medium Term	8 Harris Hill Road – Reconstruct road base and surface on eastern half of road	Public Works	New Project	45.75728	-67.87422
Aroostook	Winterville P	1	Goss Brook	$25,000	Medium Term	1) Goss Brook - Culverts and guardrails	Public Works	Deferred – Lack of funds	46.95466	-68.60579
Aroostook	Winterville P	2	Red River Road	$75,000	Long Term	2) Red River Road - Culverts and guardrails	Public Works	Deferred – Lack of funds	47.01121	-68.60136
Aroostook	Winterville P	3	North Shore Road	$20,000	Long Term	3) North Shore Road - Culverts and ditching along both sides of roadway	Public Works	Deferred – Lack of funds	46.97864	-68.61946
Aroostook	Winterville P	4	Station Road	$10,000	Short Term	4) Station Road – Culvert	Public Works	Deferred – Lack of funds	46.96253	-68.61126
Aroostook	Woodland	1	McIntyre Road	$15,000	Long Term	1) McIntyre Road - Elevate road & install 1, 36" culvert	Public Works	Deferred – Lack of funds	46.85202	-68.11404

Aroostook	Woodland	3	Skidgel Road	$15,000	Long Term	3) Skidgel Road - Elevate road	Public Works	Deferred – Lack of funds	46.90807	-68.15749
Aroostook	Woodland	4	Pratt Road	$25,000	Long Term	4) Pratt Road - Elevate road	Public Works	Deferred – Lack of funds	46.89364	-68.15347
Aroostook	Woodland	6	Davis Road	$25,000	Long Term	6) Davis Road - Elevate road	Public Works	Deferred – Lack of funds	46.86576	-68.16643
Aroostook	Woodland	7	Everett Road	$20,000	Long Term	7) Everett Road - Elevate road and install one culvert	Public Works	Deferred – Lack of funds	46.81945	-68.15659
Aroostook	Woodland	8	Thibodeau Road	$15,000	Short Term	8) Thibodeau Road - Ditching along both sides of road	Public Works	Deferred – Lack of funds	46.86562	-68.07105

Cumberland	Bridgton	1	Smith Avenue new culvert system, roadside curbing and repaving	$25,000	Mid-term	1)Smith Avenue new culvert system, roadside curbing and repaving	Road Commissioner	New Project	44.05333	-70.69300
Cumberland	Bridgton	2	Oak Street Install 2 catch basins, underdrainage, curbing and re	$60,000	Mid-term	2) Oak Street Install 2 catch basins, underdrainage, curbing and re-pavement	Road Commissioner	New Project	44.05199	-70.69140
Cumberland	Bridgton	3	Mountain Road improve ditching, new culvert system, paving	$35,000	Mid-term	3) Mountain Road improve ditching, new culvert system, paving	Road Commissioner	New Project	44.03514	-70.80070
Cumberland	Bridgton	4	Post Office Square (Main St	UNK	Long Term	4) Post Office Square (Main St-Depot St.); Upsize existing 48'' x 50' culvert with 4' x 10' x 50' bottomless box culvert to match culvert under US 302. Revised: needs study and permitting from DEP, EPA, NFIP and USACE	Road Commissioner; Engineering Firm	Revised from 2012 Plan – crosswalk adjustments and road resurfacing postpones this work for at least 5 years	44.05437	-70.69930
Cumberland	Brunswick	1	Bath Road replace underperforming culvert with one of adequate size	$350,000	Long term	1) Bath Road replace underperforming culvert with one of adequate size	Director of Public Works	New Project	43.90906	-69.90960
Cumberland	Brunswick	2	Pleasant Hill Rd	$175,200	Long Term	2) Pleasant Hill Rd; Upsize twin 5' x 66' culverts w/ 12' x 6' x 70' bottomless box culvert w/ integrated headwalls.	Director of Public Works	Deferred, Lack of Funding	43.91277	-69.97930
Cumberland	Brunswick	3	Highland Rd. Upsize existing 24'' x 40' culvert with 36'' x40' N	$25,000	Long Term	3) Highland Rd. Upsize existing 24'' x 40' culvert with 36'' x40' N-12 culvert and riprap inlet and outlet.	Director of Public Works	Deferred, Lack of Funding	43.88203	-70.03540
Cumberland	Brunswick	4	Bull Rock Rd	$12,000	Long Term	4) Bull Rock Rd; Ditch and armor 400' add (2) 15'' x 40' N-12 driveway culverts & an 18'' x 40' N-12 cross culvert riprap inlet and outlet	Director of Public Works	Deferred, Lack of Funding	43.90553	-69.86980
Cumberland	Cape Elizabet	3	Hemlock Hill & Oakhurst Road	$60,000	Short term	3) Hemlock Hill & Oakhurst Road - Drainage Improvements	Director of Public Works	Deferred, Lack of Funding	43.62535	-70.23250

Cumberland	Cape Elizabet	4	Sawyer St	$1,000,000	Long Term	Existing culvert is slightly compromised (hole in top of it). The roadway easterly of culvert floods during astronomical high tides and when extreme weather events coincide with high tide conditions. Assessment of conditions was done as part a town-wide culvert assessment study in 2018. Additional grant was obtained to undertake a potential sea level rise feasibility study of remedial options for both towns to consider.				
Cumberland	Cape Elizabet	6	Willow Brook Stream Crossing @ Portland Water District X	$320,000	Short Term	6) Willow Brook Stream Crossing @ Portland Water District X-Country Sanitary Sewer Line - Culvert Replacement	Director of Public Works	New Project 2019	43.59728	-70.24280
Cumberland	Cape Elizabet	7	Mitchell Road @ Pond Cove Brook	$365,000	?	7)Mitchell Road @ Pond Cove Brook - Culvert Replacement	Director of Public Works	New Project 2019	43.62027	-70.23380
Cumberland	Cape Elizabet	8	Shore Road @ Pond Cove	$1,000,000	Long term	8) Shore Road @ Pond Cove – Roadway & Drainage Improvements	Director of Public Works	New Project 2019	43.61902	-70.21420
Cumberland	Casco	2	Point Sebago Rd. Site #1	$4,000	Mid term	2) Point Sebago Rd. Site #1; Add 24'' x 40' N-12 cross culvert, ditch and line 200' and repave	Road Commissioner	Deferred - Lack of Funding	43.92483	-70.54770
Cumberland	Chebeague Is	1	Stone Wharf. Replace or relocate Chebeague island Ferry landing. Vulnerability Study complete	$1,000,000	Long Term	1) Stone Wharf. Replace or relocate Chebeague island Ferry landing. Vulnerability Study complete; Engineering Study ongoing. The town intends to have a design-level assessment done on the Stone Wharf within the coming (21/22) year. Cost Range: $300,000-1M	Town Manager; road commissioner; Select Board	New Project	43.75128	-70.10520
Cumberland	Chebeague Is	2	Indian Point Road planning process of limiting access to the most vulnerable sections of the Indian Point Rd to vehicles	UNK	Mid term	2) Indian Point Road planning process of limiting access to the most vulnerable sections of the Indian Point Rd to vehicles	Town Manager	New	43.72085	-70.13790
Cumberland	Chebeague Is	3	Bennett Cove. Engineering Study for improvements to stone block commercial boat ramp	UNK	Long Term	3) Bennett Cove. Engineering Study for improvements to stone block commercial boat ramp	Town Manager; road commissioner; Select Board	New Project	43.71230	-70.12540
Cumberland	Chebeague Is	4	Indian Point Rd	$14,000	Mid term	4) Indian Point Rd; Install sheet pile 500' x 10'.	Town Manager; road commissioner	Deferred - Lack of Funding	43.72114	-70.13570
Cumberland	Chebeague Is	6	South Shore Drive	UNK	Long Term	6) South Shore Drive	Town Manager; road commissioner; Select Board	New Project	43.71517	-70.11980

Cumberland	Cumberland	1	Public safety radio communications tower installation	$240,000	Short Term	1)Public safety radio communications tower installation	Charles Rumsey, Chief of Police crumsey@cumberlandmaine.com	New Project	43.78916	-70.24500
Cumberland	Cumberland	2	Tuttle Rd Site 2	$18,000	Long Term	2) Tuttle Rd Site 2; Elevate 200' x 21' x 3' stabilize shoulders and repave. Engineering Study completed	Director of Public Works	Deferred - Lack of Funding	43.78045	-70.22690
Cumberland	Cumberland	3	Middle Rd @ Hazeltines	$17,000	Long Term	3) Middle Rd @ Hazeltines; Upsize existing 36'' x 50' lined culvert with 42'' x 50' N-12 culvert and riprap inlet and outlet.	Director of Public Works	Deferred - Lack of Funding	43.74656	-70.22770
Cumberland	Falmouth	1	Northbrook Drive	$200,000	Long Term	1) Northbrook Drive; Upsize existing 48" culvert with 8' x 4' x 80' bottomless box culvert and riprap inlet and outlet.	Director of Public Works	Deferred – Lack of Funding	43.73623	-70.22240
Cumberland	Falmouth	3	Shoreline Drive Coastal Erosion	$75,000	Long Term	3) Shoreline Drive Coastal Erosion; Stabilize bank 100' x 50' x 3' with large fractured stone Engineering study complete	Director of Public Works	Study -Town funds; Deferred – Lack of Funding	43.69746	-70.23650
Cumberland	Freeport	1	Monitoring of recent mitigation project at Percy Street to evaluate previous projects	UNK	Long Term	1) Monitoring of recent mitigation project at Percy Street to evaluate previous projects	Director of Public Works	New Project	43.86292	-70.11050
Cumberland	Freeport	3	Percy Street. Upsize existing culvert with 24" culvert	$10,000	Mid term	3 Percy Street. Upsize existing culvert with 24" culvert	Director of Public Works	New Project	43.86241	-70.11080
Cumberland	Frye Island	1	Monitor/ mitigate hillside erosion in Recreation Area trail between Beach 10 and Long Beach. Site monitoring will continue in order to collect more information and determine the best approach to mitigating the hazard.	UNK	Long Term	1) Monitor/ mitigate hillside erosion in Recreation Area trail between Beach 10 and Long Beach. Site monitoring will continue in order to collect more information and determine the best approach to mitigating the hazard.	Director of Public Works	Retained	43.84059	-70.52360
Cumberland	Gorham	1	Wood Rd	$80,000	Long Term	1) Wood Rd; Upsize existing multiple culverts with 12' x 6 x 40' bottomless box culvert and riprap inlet and outlets.	Director of Public Works	Deferred - Lack of Funding	43.68304	-70.49570
Cumberland	Gorham	2	Wilson Rd	$60,000	Long Term	2 Wilson Rd: Upsize existing culvert with 10' x 5 x 40' bottomless box culvert and riprap inlet and outlets.	Director of Public Works	Deferred - Lack of Funding	43.76762	-70.45930
Cumberland	Gorham	3	Buck St	$130,000	Long Term	3) Buck St; Upsize existing multiple culverts with 20'x 8' x 40' bottomless box culvert and riprap inlet and outlets. Elevate road 200' x 21' x 3' and repave.	Director of Public Works	Deferred - Lack of funding	43.71989	-70.50050

Cumberland	Gray	1	Connect the water supply for Gray to either Portland Water District or Yarmouth District. 1	$1,528	Long Term	1) Connect the water supply for Gray to either Portland Water District or Yarmouth District. 1) Connection to Yarmouth Water District 2) Connect to Portland Water District	Gray Water District	Deferred - Lack of funding	43.89616	-70.33790
Cumberland	Gray	2	Campbell Shores Rd Site #1	$60,000	Long Term	2 Campbell Shores Rd Site #1; Upsize triple 24'' x 40' culvert with 4' x 8' x 40' bottomless box culvert raise road 21' x 3' x 500' and repave	Director of Public Works	Deferred - Lack of Funding		
Cumberland	Gray	4	Long Hill Rd.	$70,000	Long Term	4) Long Hill Rd.; Upsize 60'' x 40' culvert with 5' x 8' x 40' bottomless box culvert, raise road 21' x 6' x 500' stabilize shoulders and repave.	Director of Public Works	Deferred – Lack of Funding	43.85638	-70.30390
Cumberland	Harpswell	1	Basin Point Rd. preliminary design/engineering study ($20,000 from State's Coastal Communities grant for sea level rise	$20,000	Long Term	1) Basin Point Rd. preliminary design/engineering study ($20,000 from State's Coastal Communities grant for sea level rise)	Town Planner	New Project	43.75408	-70.03290
Cumberland	Long Island	2	Wave breaks on east side of Mariners' Wharf	$434,000	Mid Term	2) Wave breaks on east side of Mariners' Wharf	Town officials	New Project	43.69141	-70.16470
Cumberland	Naples	1	Lakehouse Road near Muddy River ditching	$3,500	Mid term	1) Lakehouse Road near Muddy River ditching	Road Commissioner	New Project	43.94995	-70.62830
Cumberland	Naples	2	Lamb's Mill Road from Rt 302 to hilltop ditching	$3,500	Mid term	2) Lamb's Mill Road from Rt 302 to hilltop ditching	Road Commissioner	New Project	43.96408	-70.64020
Cumberland	Naples	3	Edes Falls Road and River Road junction 30"culvert upgrade and ditching	$6,500	Mid term	3) Edes Falls Road and River Road junction 30"culvert upgrade and ditching	Road Commissioner	New Project	43.99803	-70.57230
Cumberland	Naples	4	Wiley Rd @ Sam's Bluff	$8,000	Mid term	4) Wiley Rd @ Sam's Bluff; Upsize existing 30'' x 40' corrugated metal pipe with 36'' x 40' N-12 culvert and riprap inlet and outlet.	Road Commissioner	Deferred - Lack of Funding	44.00754	-70.59670
Cumberland	New Glouces	1	Ayers Rd	$116,000	Long Term	Ayers Rd; Upsize multiple culverts with (1) 3' x 8' x 40' bottomless box culvert and (1) 3' x 10' x 40' bottomless box culvert, elevate road 300' x 21' x 2' and stabilize shoulders riprap and repave	Director Public Works	Complete		
Cumberland	New Glouces	2	Durham Rd	$73,000	Long Term	Durham Rd; Upsize multiple culverts with 3' x 8' x 40' bottomless box culvert, elevate road 600' x 21' x 2' and stabilize shoulders riprap and repave	Director Public Works	Complete		
Cumberland	North Yarmo	1	West Pownal Rd	UNK	Long Term	1) West Pownal Rd; Continue to monitor erosion at site (elevation of road would cost $2 million). Site monitoring will continue in order to collect more information and determine the best approach to mitigating the hazard.	Road Commissioner	Revised from 2012 Plan	43.88460	-70.22030
Cumberland	North Yarmo	3	438 Walnut Hill Road	UNK	Short Term	3) 438 Walnut Hill Road	Road Commissioner	New	43.83105	-70.25150

Cumberland	North Yarmo	4	494 Walnut Hill Road	UNK	Long Term	4) 494 Walnut Hill Road	Road Commissioner	New	43.83053	-70.25150
Cumberland	North Yarmo	5	418 Walnut Hill Road	UNK	Mid term	5) 418 Walnut Hill Road	Road Commissioner	New	43.82571	-70.24870
Cumberland	Portland	3	Eastern Promenade Trail Erosion @ EEWWTP	$10,000	Mid term	3) Eastern Promenade Trail Erosion @ EEWWTP - Redirection of hillside runoff to prevent erosion of embankment, Cost: <10,000	Director of Public Works		43.67053	-70.24540
Cumberland	Portland	4	Franklin Street CSO Backflow Prevention and Storm Drainage Improvements	$200,000	Mid term	4) Franklin Street CSO Backflow Prevention and Storm Drainage Improvements	Director of Public Works	2019 Project with SRF funding	43.66286	-70.25620
Cumberland	Portland	5	Back Cove Embankment Erosion @ Preble Street	$25,000	Long Term	5) Back Cove Embankment Erosion @ Preble Street - Stabilize bank erosion along walking trail 10'x250'x2' using stone riprap	Director of Public Works	New Project 2018	43.68067	-70.27390
Cumberland	Portland	6	Back Cove Embankment Erosion @ Preble Street Parking Lot	$100,000	Long Term	6) Back Cove Embankment Erosion @ Preble Street Parking Lot - Stabilize bank erosion along walking trail 10'x1200'x2' using stone riprap	Director of Public Works	New Project 2018	43.67980	-70.26680
Cumberland	Portland	7	Park Avenue @ Hood Diary Street Flooding	UNK	Long Term	7) Park Avenue @ Hood Diary Street Flooding – New Storm Drain discharging to the Fore River or New Stormwater Pump Station within Hood Dairy Parking Lot	Director of Public Works	New Project 2018	43.65584	-70.28210
Cumberland	Portland	8	Emergency Back Up Power for Public Works Fuel Pumps and Dispatch at Canco Rd.	$20,000	Short term	8) Emergency Back Up Power for Public Works Fuel Pumps and Dispatch at Canco Rd.	Director of Public Works	New Project 2018	43.68410	-70.28330
Cumberland	Portland	9	Emergency Back Up Power for City Emergency Shelter	$70,000	Mid term	9) Emergency Back Up Power for City Emergency Shelter	Emergency Management Coordinator	New Project 2018	43.65928	-70.25740
Cumberland	Portland	10	Emergency Back Up Power for Bramhall Fire Station	$100,000	Short term	10) Emergency Back Up Power for Bramhall Fire Station	Chief -Fire Department	New Project 2018	43.65347	-70.27210
Cumberland	Portland	11	District Road Operation Center	$500,000	Mid term	11) District Road Operation Center	Director of Public Works	New Project 2019	43.64889	-70.33820
Cumberland	Portland	12	Emergency Back Up Power for Ocean Ave Fire Station	$20,000	Mid term	12) Emergency Back Up Power for Ocean Ave Fire Station	Chief -Fire Department	New Project 2020	43.69132	-70.26500
Cumberland	Portland	13	Portland	$138,000	18 Months	Army Corp of Engineers Sea Level Rise Projections project Develop hydrodynamic coastal flood model to identify current and future community/infrastructure vulnerabilities	USACE	New Project 2021		
Cumberland	Pownal	1	Pownal	UNK	Mediuim term	Partner with Central Maine Power Co. to mitigate trees falling on lines on dead end roads CMP partners generally rim trees on main roads, not those with only a few houses. This causes longer term outages for many parts of town	EMA Director and Road Commissioner	New Project		

Cumberland	Pownal	2	Replace the triple culverts at the Verrill Road site with a box culvert to better handle the larger rain events.	UNK	Long Term	2) Replace the triple culverts at the Verrill Road site with a box culvert to better handle the larger rain events.	Road Commissioner	New Project	43.88284	-70.14670
Cumberland	Pownal	3	Chadsey Rd Site #1 Upstream	$45,000	Long Term	3) Chadsey Rd Site #1 Upstream; Upsize triple N-12 culverts with 12' x 4' x 40' bottomless box culvert and riprap inlet and outlets.	Road Commissioner	Deferred - Lack of funding	43.90814	-70.23810
Cumberland	Pownal	4	Chadsey Rd Site #2	$45,000	Long Term	4) Chadsey Rd Site #2; Upsize triple N-12 culverts with 12' x 4' x 40' bottomless box culvert and riprap inlet and outlets	Road Commissioner	Deferred - Lack of funding	43.90691	-70.23580
Cumberland	Pownal	5	Brown Rd	$48,000	Long Term	5) Brown Rd; Upsize twin 48'' x 40' culverts with 12' x 4' x 40' bottomless box culvert, riprap inlet and outlets and repave.	Road Commissioner	Deferred - Lack of funding	43.91519	-70.13350

Cumberland	Raymond	1	Monitor/mitigate as needed ditch erosion at Raymond Hill Rd and Webbs Mill Rd Site monitoring will continue in order to collect more information and determine the best approach to mitigating the hazard.	UNK	Long Term	1) Monitor/mitigate as needed ditch erosion at Raymond Hill Rd and Webbs Mill Rd Site monitoring will continue in order to collect more information and determine the best approach to mitigating the hazard.	Road Commissioner	New Project		
Cumberland	Scarborough	1	Gorham Rd at Nonesuch River. Engineering study and replacement of existing 5' culvert	$200,300	Long Term	1) Gorham Rd at Nonesuch River. Engineering study and replacement of existing 5' culvert	Director of Public Works	Revised cost	43.62275	-70.36060
Cumberland	Scarborough	2	Pleasant Hill Upgrade storm drain system.	$600,000	Long Term	2) Pleasant Hill Upgrade storm drain system.	Director of Public Works	Deferred - Lack of funding	43.59042	-70.29860
Cumberland	Scarborough	3	Broadturn Rd & Martin Ave	$65,000	Long Term	3) Broadturn Rd & Martin Ave; Upsize existing twin 36'' x 40' corrugated metal pipes with 10' x 4' x 40' bottomless box culvert and add 36'' x 40' N-12 culvert on Martin Ave.	Director of Public Works	Deferred - Lack of funding	43.59540	-70.43440
Cumberland	Scarborough	4	Mitchell Hill Rd	$600,000	Long Term	4) Mitchell Hill Rd; Elevate road 300' x 3' x 22' stabilize shoulders and upsize existing culvert with bridge approx. 100' x 22' with wing walls.	Director of Public Works	Deferred - Lack of funding	43.62124	-70.42750
Cumberland	Scarborough	5	Sawyer St.	$95,000	Long Term	5) Sawyer St.; Elevate 600' x 22' x 18'' add (3) 18'' x 40' N-12 cross culverts, stabilize shoulders and repave.	Director of Public Works; Joint project with Cape Elizabeth	Deferred - Lack of funding	43.58854	-70.26290
Cumberland	Scarborough	6	Payne Road @ Phillips Brook	$350,000	Long term	6)Payne Road @ Phillips Brook: Replace (2) 60" culverts with bottomless box culvert	Director of Public Works	New Project 2019	43.60061	-70.36830
Cumberland	Sebago	4	Peabody Pond Rd. Ditch and line 1,800' add (2	$75,000	Short Term	4) Peabody Pond Rd. Ditch and line 1,800' add (2) driveway culverts 15'' X 30' and (12) cross culvert 15'' x 40' remove ledge from ditch line. Second cross culvert 4' x 45"	Road Commissioner	Revised from 2102 Plan	43.94022	-70.69800
Cumberland	South Portlan	1	Fessenden St @ Trout Brook	$65,000	Long Term	1) Fessenden St @ Trout Brook; Upsize existing twin 36'' x 50' culvert with 3' x 8' x 50' bottomless box culvert and riprap inlet and outlet	Director of Public Works	Deferred - Lack of funding	43.66457	-70.27660
Cumberland	South Portlan	2	Alfred St	$55,000	Long Term	Alfred St; Upsize existing twin 24'' x 40' culvert with 3' x 6' x 50' bottomless box culvert and riprap inlet and outlet.	Director Public Works	Deferred, Lack of Funding		
Cumberland	South Portlan	3	Boothby St @ Trout Brook	$55,000	Long Term	3) Boothby St @ Trout Brook; Upsize existing culvert with 3' x 6' x 50' bottomless box culvert and riprap inlet and outlet.	Director of Public Works	Deferred - Lack of funding	43.62945	-70.24710
Cumberland	South Portlan	4	city's public access pier (at Thomas Knight Park under the Casco Bay Bridge	$100,000	Long Term	4) city's public access pier (at Thomas Knight Park under the Casco Bay Bridge)	Director of Parks, Rec and Waterfront	New Project 2018	43.66508	-70.20830

Cumberland	South Portlan	4	Running Hill Rd	$25,000	Long Term	Running Hill Rd; Install catch basin.	Director Public Works	Deferred, Lack of Funding		
Cumberland	Standish	2	Standish	UNK	Medium Term	Emergency shelter identification and surveys Currently no shelter designated, but need to have an effective plan in place	Emergency Management Director	New		
Cumberland	Standish	4	Middle Jam Rd	$15,000	Mid term	4) Middle Jam Rd; Install precast head wall with wing walls on inlet and outlet of 40'' culvert.	Director of Public Works	Deferred - Lack of funding	43.81313	-70.45130
Cumberland	Standish	5	Northeast Rd @ Rt. 35	$7,000	Mid term	5) Northeast Rd @ Rt. 35; Ditch and armor 300' add 30'' x 30' N-12 driveway culvert.	Director of Public Works	Deferred - Lack of funding	43.75145	-70.53480
Cumberland	Standish	6	Route 35A	UNK	Mid term	6) Route 35A – Cape Road; upsize culvert, create spillway, armor downstream side of road bed.	Director of Public Works	Deferred - Lack of funding	43.77020	-70.50670
Cumberland	Westbrook	1	Presumpscot River landslide study	$800,000	Mid Term	1) Presumpscot River landslide study	City Engineer	New	43.71781	-70.26810
Cumberland	Westbrook	2	Brook Street. Replace bridge over Minnow Brook with new culvert to meet crossing standards	UNK	Long term	2) Brook Street. Replace bridge over Minnow Brook with new culvert to meet crossing standards	Director of Public Works	Retained	43.71742	-70.32880
Cumberland	Yarmouth	1	Yarmouth	UNK	Medium Term	Develop building codes and fire sprinkler codes for all new construction		New		
Cumberland	Yarmouth	3	Highland Cliff Rd	$45,000	Long Term	Highland Cliff Rd @ Annie Leighton Brook. Add second culvert	Director Public Works	Complete		
Cumberland	Yarmouth	4	Nash Rd	$74,000	Medium Term	Nash Rd; Elevate road 1,200' x 21' x 2' stabilize shoulders add 24'' x 40' N-12 cross culvert and repave.		Complete		
Franklin	Farmington	1	Front Street	$297,326	Short Term	Front Street: Elevate 500' x 21' x 3', upsize existing culvert to 48'' x 40', riprap and repave.	Road Commissioner	In planning stage.	44.66601	-70.14910
Franklin	Farmington	2	Farmington Fire Department	$36,742	Completed	Farmington Fire Department: Add 60 kw backup generator.	Road Commissioner	New	44.65998	-70.14600
Franklin	Farmington	4	Cushman Drive	$295,000	Short Term	Cushman Drive: Riprap and vegetate 500' x 75' x 3'.	Public Works	Deferred/Lack of Funds	44.70766	-70.17760
Franklin	Jay	1	Morse Hill Road	$100,000	Long Term	Morse Hill Road: Elevate 3,000' x 21' x 3' and repave.	Road Commissioner	Deferred/Lack of Funds	44.55316	-70.25050
Franklin	Kingfield	1	Island Road	$10,000	Short Term	Island Road: Stabilize 150' of Carrabassett River bank.	Road Commissioner	Deferred/Lack of Funds	44.96007	-70.15560
Franklin	Kingfield	2	West Kingfield Road	$4,500	Medium Term	West Kingfield Road: Upsize culvert and stabilize adjacent area.	Road Commissioner	Deferred/Lack of Funds	44.95383	-70.18640
Franklin	Kingfield	3	Ledge Road Landslide	$30,000	Medium Term	Ledge Road Landslide: Change entrance of Ledge Road onto Route 27, reslope bank, riprap bank, change crown of road, install berm and guardrail.	Road Commissioner	Deferred/Lack of Funds	44.99706	-70.17040
Franklin	New Sharon	1	Lane Road near Route 2	$150,000	Long Term	Lane Road near Route 2: Upgrade or remove bridge.	Road Commissioner	Deferred, Lack of Funding	44.65066	-69.97640
Franklin	New Sharon	2	Lane Road middle part	$150,000	Short Term	Lane Road middle part: Upsize culvert.	Road Commissioner	Deferred, Lack of Funding	44.64959	-69.98780
Franklin	New Sharon	3	New Sharon	$150,000	Long Term	Improve ditching, upsize culverts as needed.	Road Commissioner	Deferred/Lack of Funds		
Franklin	New Vineyar	1	Miller Road	$10,400	Medium Term	Miller Road: Upsize 30'' to 36'' x 40' culvert, remove debris and install debris catcher on intake to culvert.	Road Commissioner	Deferred/Lack of Funds	44.84565	-70.07750

Franklin	New Vineyar	2	Adams Brook Road	$18,000	Short Term	Adams Brook Road: Install 5' x 21' x 30' bottomless box culvert and raise approaches, add (2) cross culverts.	Road Commissioner	Deferred/Lack of Funds	44.74015	-70.15180
Franklin	New Vineyar	3	Eastmont Drive	$9,500	Short Term	Eastmont Drive: Install 36'' x 40' culverts and riprap intake and outlet.	Road Commissioner	Deferred/Lack of Funds		
Franklin	New Vineyar	4	High Street	$10,000	Short Term	High Street: Upsize existing culvert to 36'' x 40' culvert, ditch and riprap intake and outlet.	Road Commissioner	Deferred/Lack of Funds	44.80251	-70.11920
Franklin	New Vineyar	5	Brahmer Road	$22,000	Medium Term	Brahmer Road: Ditch and add 15'' x 40' HDPE and elevate (2) dips in road.	Road Commissioner	Deferred/Lack of Funds	44.82113	-70.04940
Franklin	New Vineyar	6	Wells Road	$185,000	Completed	Wells Road: Install bottomless box culvert 5' x 40', and riprap.	Road Commissioner	Deferred/Lack of Funds	44.83814	-70.04780
Franklin	Phillips	1	Davenport Hill Road	$185,000	Medium Term	Davenport Hill Road: Ditch 550', elevate 3,600' x 21' x 3', upsize existing 48'' x 40' culvert to 96'' squash culvert, add 8' x 40' bottomless box and (3) 24'' x 40' HDPE culverts.	Road Commissioner	Deferred/Lack of Funds	44.53240	-70.27490
Franklin	Phillips	2	Pinkham Hill Road	$29,000	Short Term	Pinkham Hill Road: Ditch 7,500', blast ditch line as needed, add (7) 24'' x 40' HDPE culverts.	Road Commissioner	Deferred/Lack of Funds	44.83480	-70.40860
Franklin	Rangeley	1	Mingo Loop Causeway	$260,000	Long Term	Mingo Loop Causeway: Build up shoulders and riprap entire length of causeway.	Town Manager	Deferred/Lack of Funds	44.96191	-70.71420
Franklin	Rangeley	2	Bald Mt. Road	$175,000	Short Term	Bald Mt. Road: Ditch and elevate 14,000' of road, replace twin 36" culverts with 10' box culvert.	Town Manager	Deferred/Lack of Funds	44.95542	-70.79030
Franklin	Rangeley	3	Gile Road	$35,000	Short Term	Gile Road: Upsize (2) 50' x 18" culverts with (2) 50' x 30" ADS culverts and riprap.	Town Manager	Deferred/Lack of Funds	44.99003	-70.65070
Franklin	Rangeley	4	Old Skiway Road	$33,000	Long Term	Old Skiway Road: Upsize 30" culvert to 42" ADS culvert and riprap.	Town Manager	Deferred/Lack of Funds	44.95771	-70.77350
Franklin	Rangeley	5	Haley Pond Dam	$150,000	Short Term	Haley Pond Dam: Rebuild concrete structure and rehabilitate gate mechanism.	Town Manager	Deferred/Lack of Funds	44.89986	-70.62430
Franklin	Rangeley Pla	1	Beamis Road	$15,000	Medium Term	Beamis Road: Upsize existing 12'' x 40' CMP to 18'' x 40 HDPE and add (2) 36'' x 40' HDPE culverts and extend (1) 48'' and (1) 60'' CMP by 8' each and riprap intake and outlets.	Road Commissioner	Deferred/Lack of Funds	44.92791	-70.75460
Franklin	Sandy River P	2	Sandy River Plantation	$150,000	Medium Term	Improve ditching, upsize culverts as needed.	Road Commissioner	Deferred/Lack of Funds		
Franklin	Strong	2	Burbank Hill Road	$150,000	Short Term	Burbank Hill Road: Upsize culvert and ditch at the intersection with Route 149.	Road Commissioner	Deferred/Lack of Funds	44.81555	-70.22640
Franklin	Strong	3	Strong	$39,000	Completed	Generator for emergency shelter, town office, water office, library.	Selectmen	Planning design phase.		
Franklin	Temple	1	Intervale Road	$72,000	Long Term	Intervale Road: Geo-engineer Temple River to return river to original channel, upsize (3) 36'' x 40' HDPE culverts.	Road Commissioner	Deferred/Lack of Funds	44.69483	-70.24360
Franklin	Unorganized	1	Madrid Township, Reed Mills Road	$270,000	Short Term	Madrid Township, Reed Mills Road: Construct slope protection using gabion baskets 300' x 30' x 3'.	County Commissioner	Deferred/Lack of Funds	44.85345	-70.35890
Franklin	Unorganized	2	Salem Township, How ard Road	$18,000	Short Term	Salem Township, Howard Road: Construct slope protection using gabion baskets 300' x 6' x 3'.	County Commissioner	Deferred/Lack of Funds	44.90953	-70.26820
Franklin	Weld	1	Byron Road	$52,000	Medium Term	Byron Road: Ditch 1,500' and blast ledge as needed, add check dams; upsize (4) 24'' x 40' HDPE's, add 5' x 3' x 40' bottomless box culvert, add 24'' x 50' overflow culvert. Add 2,000' x 24' x 8'' gravel to road.	Road Commissioner	Some work done including one culvert upgrade, ditching, addition of gravel	44.72595	-70.48400
Franklin	Weld	2	Cushman Road	$12,000	Medium Term	Cushman Road: Ditch 600', upsize existing 24'' to 36'' x 40' HDPE and elevate dip in road 200' x 16' x 2' on average and stabilize slope.	Road Commissioner	Deferred/Lack of Funds	44.66211	-70.40190

Franklin	Weld	3	Center Hill Road (Site 2)	$26,000	Medium Term	Center Hill Road (Site Two): Ditch and line 6,000'.	Road Commissioner	Deferred/Lack of Funds	44.74279	-70.41140
Franklin	Weld	4	Upper Temple Road	$28,000	Long Term	Upper Temple Road: Elevate 1,000' x 21' x 2' and stabilize shoulders.	Road Commissioner	Deferred/Lack of Funds	44.70501	-70.39620
Franklin	Weld	5	West Brook Road	$37,000	Short Term	West Brook Road: Move section of road along riverbank, build 700' of gravel road.	Road Commissioner	Deferred/Lack of Funds	44.71098	-70.49550
Franklin	Wilton	1	Cemetery Road	$8,700	Short Term	Cemetery Road: Upsize existing culverts with twin 36'' x 40' HDPE's and riprap intake and outlets.	Road Commissioner	Deferred/Lack of Funds	44.61184	-70.18590
Franklin	Wilton	2	Pond Road	$12,000	Short Term	Pond Road: Elevate 300' x 21' x 12" and repave, upsize 24" x 40' with 36" x 40' culvert.	Director of Public Works	Deferred/Lack of Funds	44.60847	-70.27310
Franklin	Wilton	3	Butterfield Road	$36,000	Medium Term	Butterfield Road: Elevate 100' x 21' x 18" and repave, upsize 24" x 40' with 6' x 4' x 40' bottomless box culvert.	Director of Public Works	Deferred/Lack of Funds	44.59527	-70.29590
Hancock	Castine		Main Street	$1,051,000	Long Term	Main Street: Install new drainage, replace undersized culverts. Phase 2 of 20 year plan.		Deferred/Lack of Funds	44.41199	-68.66260
Hancock	Cranberry Isles		Heilker Road	$4,000	Short Term	Heilker Road: Ditch (750').		Deferred/Lack of Funds	44.30736	-68.56878
Hancock	Cranberry Isles		Jimmy's Point Road	$10,000	Short Term	Jimmy's Point Road: Blast where needed, ditch (200'), add culverts if necessary. Materials: Explosive, culverts, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.22883	-68.52427
Hancock	Cranberry Isles		Main Road	$25,000	Medium Term	Main Road (underground drainage project): Install 250' of 18" drainage pipe, install catch basin, minor road work. Materials: 250' of 18" drainage pipe, gravel, catch basin, hay and seed, geosynthetics		Deferred/Lack of Funds	44.32686	-68.58883
Hancock	Cranberry Isles		Manset Facility	$50,000	Medium Term	Manset Facility (parking, storage, rental space): Improve drainage around facility, install 1,500' of underground, 24" pipe, install (4) catch basins. Materials: 1,500' of 24" drainage pipe, (4) catch basins, pavement, gravel, geosynthetics		Deferred/Lack of Funds	44.35870	-68.79243
Hancock	Cranberry Isles		Northwood Road	$20,000	Short Term	Northwood Road: Blast where needed, upsize (3) 24" x 40' culverts to (3) 36" x 40' HDPE culverts. Materials: Explosives, (3) 36" x 40' HDPE culverts, gravel, geosynthetics, riprap		Used town funds to do some blasting	44.34908	-68.73436
Hancock	Cranberry Isles		Town Boat Ramp	$25,000	Medium Term	Town Boat Ramp: Blast where necessary (along 500' of road), add (1) 18" x 40' HDPE culvert, riprap. Materials: Explosive, (1) 18" x 40' HDPE culvert, riprap, geosynthetics, gravel		Deferred/Lack of Funds	44.57634	-68.78462
Hancock	Dedham		Dedham	$1,000	Short Term	Inspect all culverts and drainage systems for upgrade; note: effective March 2011, town is in the NFIP.		Deferred/Lack of Funds	44.25763	-68.25936
Hancock	Deer Isle		Dow Road	$15,000	Short Term	Dow Road: New ditching (2,000').		Deferred/Lack of Funds	44.25293	-68.26202
Hancock	Deer Isle		Dunham Point Road	$40,000	Medium Term	Dunham Point Road: Ditch (300'), upgrade current culvert to 3' bottomless box culvert, repave. Materials: Concrete bottomless box culvert (size unknown), gravel, geosynthetics, hay and seed, pavement		Deferred/Lack of Funds	44.21385	-68.71830
Hancock	Deer Isle		King Beach Hill Road	$15,000	Short Term	King Beach Hill Road: Add new 24" x 30' HDPE culvert, riprap, hay and seed. Materials: (1) 24" x 30' HDPE culvert, riprap, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.26182	-68.23361

Hancock	Deer Isle		Lowe Road	$25,000	Short Term	Lowe Road: Ditch (5,000'), upsize (4) 15" x 40' culverts, hay and seed. Materials: (4) 15" x 40' HDPE culverts, geosynthetics, hay and seed, gravel, riprap		Deferred/Lack of Funds	44.26097	-68.23915
Hancock	Deer Isle		Reach Road	$20,000	Short Term	Reach Road: Upsize (1) 36" x 40' culvert, riprap, repave. Materials: New culvert (size unknown), riprap, pavement, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.25735	-68.64104
Hancock	Deer Isle		Sunshine Road	$10,000	Short Term	Sunshine Road: Ditch (500'), upsize (1) 24" x 30' culvert to (1) 36" x 30' HDPE culvert. Materials: (1) 36" x 30' HDPE culvert, gravel, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.25665	-68.67115
Hancock	Deer Isle		Sunshine Village (East Side Road)	$10,000	Short Term	Sunshine Village (East Side Road): Ditch (500'), upsize (1) 24" x 30' culvert to (1) 36" x 30' HDPE culvert, hay and seed. Materials: (1) 36" x 30' HDPE culvert, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.21387	-68.71829
Hancock	Eastbrook		Municipal Building	$15,000	Short Term	Relocate emergency shelter to Municipal Building. Build shed for emergency generator and hard wire.		Deferred/Lack of Funds	44.19906	-68.57554
Hancock	Eastbrook		Neck Hill Road (Section 1)	$60,000	Medium Term	Neck Hill Road (Section 1): Ditching (?), riprap (?), add new culverts (size unknown), hay and seed. Materials: Riprap, culverts, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.21185	-68.62554
Hancock	Eastbrook		Neck Hill Road (Section 2)	$60,000	Medium Term	Neck Hill Road (Section 2): Ditching (?), riprap (?), add new culverts (size unknown), hay and seed. Materials: Riprap, culverts, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.23522	-68.68999
Hancock	Eastbrook		Sugar Hill Road	$40,000	Medium Term	Sugar Hill Road: Ditching (?), riprap (?), add new culverts (size unknown), hay and seed. Materials: Riprap, culverts, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.25744	-68.64109
Hancock	Ellsworth		Hansons Landing	$48,000	Medium Term	Hansons Landing: Upsize existing 36" x 40' CMP to 48" x 60" x 40' box culvert.		Deferred/Lack of Funds	44.63567	-68.56660
Hancock	Ellsworth		Nicolin Road aka Green Lake Road	$5,000	Short Term	Nicolin Road aka Green Lake Road: Ditch and line 300' and add 24" x 40' HDPE culvert.		Deferred/Lack of Funds	44.67050	-68.53672
Hancock	Ellsworth		Shore Road	$22,000	Short Term	Shore Road: Elevate 300' x 24' x 2' and repave.		Deferred/Lack of Funds	44.69467	-68.21975
Hancock	Ellsworth		Spindle Road	$48,000	Medium Term	Spindle Road: Upsize existing twin culverts to 36" x 50' HDPE culvert.		Deferred/Lack of Funds	44.67989	-68.26635
Hancock	Franklin		Macomber Road	$240,000	Long Term	Macomber Road: Elevate road (10,000' x 2' x 20'), add (15) 24" x 40' HDPE culverts, hay and seed. Materials: Gravel, (15) 24" x 40' HDPE culverts, geosynthetics, riprap, hay and seed		Deferred/Lack of Funds	44.55201	-68.43829
Hancock	Frencboro		Town Boat Ramp	$18,000	Short Term	Place concrete slabs 20' x 12' x 12" on town boat ramp to stabilize driving surface at town landing.		Deferred/Lack of Funds	44.50059	-68.42779

Hancock	Gouldsboro		Guzzel Road Bridge	$100,000	Long Term	Guzzel Road Bridge: (Option 1) Remove wooden beams and decking. Remove concrete block abutments, replace with poured concrete abutments. Replace wooden structure with steel. (Option 2) Replace bridge with concrete bottomless box culvert (size unknown). Materials: (Option 1) Concrete, gravel, steel beams and decking, riprap, geosynthetics, hay and seed, etc. (Option 2) Concrete bottomless box culvert, gravel, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.62111	-68.51433
Hancock	Gouldsboro		Myrick Road	$80,000	Medium Term	Myrick Road: Upsize from (1) 36" culvert to (1) 48" x 40' culvert, install wingwalls, riprap, install (2) 15" x 40' driveway culverts, hay and seed. Materials: (1) 48" x 40' culvert, (2) 15" x 40' HDPE driveway culverts, concrete wingwalls, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.64226	-68.22215
Hancock	Gouldsboro		Paul Bunyan Road	$60,000	Medium Term	Paul Bunyan Road: Elevate road bed (2,600' x 1' x 22'), add (1) 24" x 40' HDPE culvert. Materials: Gravel, (1) 24" x 40' HDPE culvert, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.43221	-67.98064
Hancock	Gouldsboro		Peninsula Road	$150,000	Long Term	Peninsula Road: Upsize culvert from 30" x (?) to 48" x 60' HDPE culvert, elevate road (dimensions unknown), install geosynthetics, riprap (6 truck-loads), install guardrails, hay and seed. Materials: (1) 48" x 60' HDPE culvert, gravel, geosynthetics, guardrail, riprap, hay and seed		Deferred/Lack of Funds	44.49378	-68.05123
Hancock	Great Pond		Great Pond	$500	Short Term When MFS issues extreme fire danger warnings.	Educate homeowners on wildfire protection and coordinate with Hancock County Firefighters' Association during extreme fire danger periods regarding issuance of burn permits.		Deferred/Lack of Funds	44.43226	-67.98057
Hancock	Hancock		Carter Beach Road	$200,000	Long Term	Carter Beach Road (Bank Stabilization): Stabilize bank (3' x 18' x 1,200'), add (3) 15" x 40' HDPE culverts. Materials: (3) 15" x 40' HDPE culverts, riprap, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.43574	-67.99264
Hancock	Hancock		Point Road	$75,000	Medium Term	Point Road: Ditch (1,000'), add (1) 4' concrete bottomless box culvert, elevate road (2' x 21' x 250'), riprap, repave. Materials: (1) 4' concrete bottomless box culvert, gravel, riprap, geosynthetics, pavement, hay and seed		Deferred/Lack of Funds	44.36741	-68.03975
Hancock	Hancock		West Shore Road	$50,000	Medium Term	West Shore Road: Add (4) 18" x 30' HDPE culverts, elevate road (2' x 12' x 1,200'), riprap. Materials: (4) 18" x 30' HDPE culverts, gravel, riprap, geosynthetics, hay and seed		Town has added some culverts and riprap with town funds.	44.46956	-68.23584
Hancock	Hancock		Wyman Road	$10,000	Short Term	Wyman Road: Ditch (200'), upsize (2) 15" plastic culverts to (2) 18" x 50' CMP culverts, install geosynthetics, hay and seed. Materials: (2) 18" x 50' CMP culverts, riprap, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.49785	-68.25535
Hancock	Lamoine		Asa's Lane	$10,000	Short Term	Asa's Lane: Ditch (300'), add (1) 32" x 40' culvert. Materials: (1) 32" x 40' culvert, gravel		Deferred/Lack of Funds	44.47735	-68.23018

Hancock	Lamoine		Marboro Beach Road	$25,000	Medium Term	Marboro Beach Road: Ditch (5,000'), add (2) 32" x 40' culverts. Materials: (2) 32" x 40' culverts, gravel, geosynthetics, hay and seed		Identified in 2006. Repositioned culverts with town funds.	44.55213	-68.38517
Hancock	Lamoine		Mill Road	$70,300	Medium Term	Mill Road: (Paving) (Need more detailed assessment of current conditions.)		Deferred/Lack of Funds	44.48107	-68.32624
Hancock	Lamoine		Shore Road	$75,240	Medium Term	Shore Road: (Paving) (Need more detailed assessment of current conditions.)		Deferred/Lack of Funds	44.46793	-68.31166
Hancock	Mariaville		Dourity Farm Road (Bridge at Tawnery Brook)	$80,000	Medium Term	Dourity Farm Road (Bridge at Tawnery Brook): Replace bridge with concrete box culvert (size unknown).		Deferred/Lack of Funds	44.76836	-68.38767
Hancock	Mariaville		River Road	$80,000	Medium Term	River Road (Bank Stabilization along Union River): Reshape slope, install geosynthetics, riprap, hay and seed. Materials: Gravel, dirt, geosynthetics, riprap, hay and seed		River Road subject to erosion by Union River. Overflow culverts on stream installed on other area of River Road.	44.70757	-68.42256
Hancock	Mariaville		River Road (Section 1 at Frost Brook)	$75,000	Medium Term	River Road (Section 1 at Frost Brook): Replace twin metal culverts (6' each) with 15' precast bottomless box culvert, elevate road (3' x 15' x 100'), riprap, hay and seed. Materials: (1) 15' precast bottomless box culvert, riprap, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.63289	-68.66149
Hancock	Mount Desert		Ox Hill (Seal Harbor)	$1,000,000	Long Term	Ox Hill (Seal Harbor): Install closed storm water management system, blast where necessary, install 1,000' of 24" drainage pipe, riprap, repave. Materials: Explosive, 1,000' of 24" drainage pipe, riprap, pavement, gravel, geosynthetics		Determined to be unnecessary as a big project; will be addressed as needed.	44.55529	-68.68640
Hancock	Orland		Bald Mountain Road	$70,000	Medium Term	Bald Mountain Road: Elevate road (2' x 20' x 1,250'), add (2) 24" x 40' culverts, repave, riprap, hay and seed. Materials: Gravel, (2) 24" x 40' ft HDPE culverts, geosynthetics, riprap, pavement, hay and seed		Deferred/Lack of Funds	44.54591	-68.72872
Hancock	Orland		Cedar Swamp	$40,000	Medium Term	Cedar Swamp: Upsize (2) 36" x 40' CMP culverts to (2) 48" x 50' HDPE culverts, repave, riprap. Materials: (2) 48" x 50' HDPE culverts, gravel, riprap, pavement, geosynthetics, hay and seed		Deferred/Lack of Funds	44.55537	-68.68653
Hancock	Orland		Gilpin Road	$120,000	Long Term	Gilpin Road: Add (6) 24" x 40' HDPE culverts, elevate road (1' x 12' x 1 mile), repave, riprap, hay and seed. Materials: (6) 24" x 40' HDPE culverts, gravel, pavement, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.66256	-68.43196
Hancock	Orland		Granite Hill Road	$70,000	Medium Term	Granite Hill Road: Elevate road (18" x 20' x 4,000'), add (2) 15" x 40' culverts, hay and seed. Materials: Gravel, (2) 15" x 40' culverts, geosynthetics, riprap, hay and seed		Some elevation done.	44.31248	-69.82260
Hancock	Orland		Happy Town Road	$65,000	Medium Term	Happy Town Road: Upsize (2) 36" x 40' CMP's to (2) 48" x 60' HDPE culverts, install erosion control, install geosynthetics, repave, riprap, hay and seed. Materials: (2) 48" x 60' HDPE culverts, geosynthetics, gravel, pavement, riprap, hay and seed		Deferred/Lack of Funds	44.52553	-68.64512

Hancock	Orland		Lower Falls Road	$15,000	Short Term	Lower Falls Road: Add (1) 24" x 40' relief culvert, repave, riprap. Materials: (1) 24" x 40't HDPE culvert, pavement, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.32985	-68.64974
Hancock	Osborn		Osborn	$500	Short Term When MFS issues extreme fire danger warnings.	Educate homeowners on wildfire protection and coordinate with Hancock County Firefighters' Associate during extreme fire danger periods regarding issuance of burn permits.		Deferred/Lack of Funds	44.50766	-68.18573
Hancock	Otis		Gary Moore Road	$90,000	Medium Term	Gary Moore Road: Ditch (600'), upgrade (1) 6' x 30' plastic culvert with concrete, bottomless box culvert, riprap, repave, hay and seed. Materials: Concrete bottomless box culvert (size unknown), riprap, gravel, geosynthetics, pavement, hay and seed		Deferred/Lack of Funds	44.48506	-68.18602
Hancock	Otis		Otis	UNK	Short Term	Reach out to non-profit, road associations to identify mitigation priorities.		Deferred/Lack of Available Staff	44.47987	-68.16300
Hancock	Otis		Piles Road	$60,000	Medium Term	Piles Road: Ditch (1,000'), upsize (1) 15" x 30' culvert to (1) 18" x 40' HDPE culvert, riprap, repave, hay and seed. Materials: (1) 18" x 40' HDPE culvert, pavement, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.47201	-68.17777
Hancock	Penobscot		Dogtown Road	$28,000	Medium Term	Dogtown Road: Install underdrains and geotextile fabric 500' x 24'; add 12" base gravel and repave.		Deferred/Lack of Funds	44.52555	-68.64513
Hancock	Sedgwick		Old County Road	$10,000	Short Term	Old County Road: Add (2) 32" x 40' culverts, riprap and repave.		Deferred/Lack of Funds	44.49635	-68.19143
Hancock	Sorrento		Fuller Road	$30,000	Medium Term	Fuller Road: Ditch (1,000'), blast where needed, upsize (1) 18" x 30' culvert to (1) 24" x 40 culvert, riprap, hay and seed. Materials: (1) 24" x 40' HDPE culvert, riprap, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.28164	-68.35375
Hancock	Sorrento		Isaac's Beach	$30,000	Medium Term	Isaac's Beach: Upsize (1) 36" x 40' culvert to (1) 48" x 40' HDPE culvert, ditch (1,500'). Materials: (1) 48" x 40' HDPE culvert, gravel, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.26970	-68.31603
Hancock	Sorrento		Nautilus Rpad	$30,000	Medium Term	Nautilus Road: Ditch (600'), armor ditches, add (3) 18" x 40' HDPE culverts, riprap, hay and seed. Materials: Riprap, (3) 18" x 40' HDPE culverts, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.26842	-68.30852
Hancock	Sorrento		Ocean Avenue	$30,000	Medium Term	Ocean Avenue (Bank Stabilization): Riprap bank (3' x 18' x 1,500'). Materials: Riprap		Deferred/Lack of Funds	44.28512	-68.34645
Hancock	Sorrento		Treasure Island Road	$30,000	Medium Term	Treasure Island Road: Ditch (1,000'), armor ditches, add (1) 18" x 40' HDPE culvert. Materials: Riprap, (1) 18" x 40' HDPE culvert, gravel, geosynthetics, riprap, hay and seed		Deferred/Lack of Funds	44.29553	-68.32029
Hancock	Sorrento		West Shore Road at Nautilus Road (Swallow Hollow)	$60,000	Medium Term	West Shore Road at Nautilus Road (Swallow Hallow): Upgrade (1) 36" x 40' CMP to (1) 4' x 40' smooth bore, cement culvert, riprap, repave. Materials: (1) 4' x 40' smooth bore, cement culvert, riprap, gravel, geosynthetics, pavement, hay and seed		Deferred/Lack of Funds	44.27883	-68.32931

Hancock	Southwest Harbor	Alder Lane	$80,000	Medium Term	Alder Lane: Elevate road (2' x 20' x 1,200'), ditch (2,500'), upsize (2) 15" x 40' culverts to (2) 18" x 40' HDPE culverts, repave. Materials: Gravel, riprap, geosynthetics, (2) 18" x 40' HDPE culverts, pavement, hay and seed		Deferred/Lack of Funds	44.27741	-68.32643
Hancock	Southwest Harbor	Chris' Pond (Retention Pond) at Main Street	$85,000	Medium Term	Chris' Pond (Retention Pond) at Main Street: Install flow control valve, upsize (1) 18" x 60' culvert on Main Street to (1) 24" x 60' HDPE culvert.		Deferred/Lack of Funds	44.28029	-68.32690
Hancock	Southwest Harbor	East Ridge Road	$20,000	Short Term	East Ridge Road: Ditch (600'), add (4) driveway culverts, armor ditches. Materials: (4) driveway culverts, riprap, hay and seed, geosynthetics		Deferred/Lack of Funds	44.28589	-68.33529
Hancock	Southwest Harbor	Fernald Point Road	$85,000	Medium Term	Fernald Point Road: Blast where needed, ditch (700'), armor ditches and install check dams, upsize (3) 18" x 30' culverts to (3) 24" x 30' HDPE culverts, upsize (1) 24" x 30' culverts to (1) 36" x 30' HDPE culvert. Materials: Explosive, riprap, (3) 24" x 30' HDPE culverts, (1) 36" x 30' HDPE culvert, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.29559	-68.32021
Hancock	Southwest Harbor	Seal Cove Road	$75,000	Medium Term	Seal Cove Road: Elevate road (2' x 20' x 1,200'), stabilize slope, add (1) 10' x 40' box culvert, repave. Materials: Gravel, riprap, (1) 10' x 40' box culvert, geosynthetics, pavement, hay and seed		Deferred/Lack of Funds	44.28176	-68.35367
Hancock	Southwest Harbor	Seal Cove Road (Bridge)	$150,000	Long Term	Seal Cove Road (Bridge): Demolish bridge, stabilize bank, upgrade to concrete, bottomless box culvert (size unknown). Materials: Concrete bottomless box culvert (size unknown), riprap, geosynthetics, gravel, pavement, hay and seed		Deferred/Lack of Funds	44.49119	-68.12533
Hancock	Southwest Harbor	Shore Road	$175,000	Long Term	Shore Road: Elevate road (3' x 20' x 4,000'), add (8) 15" x 40' HDPE culverts, repave. Materials: Gravel, (8) 15" x 40' HDPE culverts, riprap, geosynthetics, pavement, hay and seed		Deferred/Lack of Funds	44.52795	-68.16196
Hancock	Southwest Harbor	Village Green Way	$75,000	Medium Term	Village Green Way: Upgrade stone catch basins to increase drainage capacity.		Deferred/Lack of Funds	44.52699	-68.15133
Hancock	Southwest Harbor	Wesly Avenue	$135,000	Long Term	Wesly Avenue: Ditch (300'), blast ledge where needed, upsize culverts (unknown number) from 12" to 18", repave. Materials: Explosive, (300') of 18" HDPE pipe, gravel, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.53001	-68.23232
Hancock	Stonington	Fire Station	$400,000	Long Term	Fire Station: Assess feasibility of acquiring and demolishing fire station and returning the site to open space.		New	44.51360	-68.60117
Hancock	Stonington	Hatch Cove Road	$75,000	Medium Term	Hatch Cove Road: Elevate road (dimensions unknown), ditch (100'), add (3) 18" x 30' cross culverts, riprap, add (3) 15" driveway culverts. Materials: Gravel, (3) 18" x 30' HDPE culverts, (3) 15" HDPE driveway culverts, riprap, geosynthetics, hay and seed, (explosive?)		Deferred/Lack of Funds	44.45593	-68.48096
Hancock	Stonington	Municipal Fish Pier	$400,000	Medium Term	Municipal Fish Pier: Flood proof buildings on fish pier.		New	44.14686	-68.44144

Hancock	Stonington		Oceanville Road	UNK	Long Term	Oceanville Road: Elevate approximately 850' of roadway to reduce flooding and isolation of homes.		New	44.29636	-68.42094
Hancock	Stonington		Stonington	UNK	Long Term	Acquire and demolish repetitively flooded property.		Deferred/Lack of Funds	44.24277	-68.36260
Hancock	Stonington		Stonington	UNK	Long Term	Wells: Locate additional wells to supplement the municipal water supply.		New	44.24277	-68.36260
Hancock	Sullivan		Asheville Road	$40,000	Medium Term	Asheville Road: Ditch (100'), upsize (1) 18" x 30' culvert to (1) 36" x 40' HDPE culvert, riprap, hay and seed. Materials: (1) 36" x 40' HDPE culvert, riprap, geosynthetics, gravel, hay and seed		Deferred/Lack of Funds	44.44390	-68.41178
Hancock	Sullivan		Punkinville Road	$60,000	Medium Term	Punkinville Road: Widen ditches (200'), upgrade (1) 6' stone culvert to concrete bottomless box culvert. Materials: Concrete bottomless box culvert, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.45484	-68.36557
Hancock	Sullivan		Thorn Road	$600,000	Long Term	Thorn Road: Upsize (1) 12' CMP to (1) concrete bottomless box culvert, stabilize bank, repave. Materials: (1) 12' concrete bottomless box culvert, gravel, geosynthetics, pavement, hay and seed		Deferred/Lack of Funds	44.52712	-68.15115
Hancock	Sullivan		Wharf Road at Taunton Road	$125,000	Long Term	Wharf Road at Taunton Road: Upgrade (5) stone culverts with (5) new HDPE culverts.		Deferred/Lack of Funds	44.53279	-68.79285
Hancock	Surry		Carrying Place Beach	$200,000	Long Term	Carrying Place Beach: Excavate existing base (2,000'), reset with granite blocks, riprap, resurface, repave. Materials: Riprap, gravel, pavement, granite blocks (quantity and size unknown)		Deferred/Lack of Funds Town owned property that has had $30K of PA work in April 2007.	44.44010	-68.47131
Hancock	Surry		Cross Road	$50,000	Medium Term	Cross Road: Stabilize bank, riprap, armor shoulders, add (1) 24" x 40' HDPE culvert, repave. Materials: Riprap, gravel, geosynthetics, (1) 24" x 40' HDPE culvert, hay and seed		Deferred/Lack of Funds	44.39289	-68.05881
Hancock	Surry		Cross Road at Morgan's Bay	$10,000	Short Term	Cross Road at Morgan's Bay: Add (2) 36" x 40' relief culverts, add (1) cross culvert (size unknown), repave. Materials: (2) 36" x 40' relief culverts		Deferred/Lack of Funds	44.39289	-68.05881
Hancock	Surry		Gold Stream Road	$15,000	Short Term	Gold Stream Road: Widen road (4' x 100'), stabilize slope, add (2) 36" x 40' HDPE culverts, lengthen existing culvert (size unknown). Materials: Gravel, pavement, riprap, (2) 36" x 40' HDPE culverts, culvert sleeve/extension		Deferred/Lack of Funds	44.39289	-68.05881
Hancock	Swans Island		Minturn Town Road	$40,000	Medium Term	Minturn Town Road: Elevate road (dimensions unknown), upsize (1) 24" x 30' culvert to (1) 36" x 40' HDPE culvert, riprap, repave, hay and seed. Materials: Gravel, (1) 36" x 40' HDPE culvert, riprap, pavement, geosynthetics, hay and seed		Deferred/Lack of Funds	44.40647	-68.10368
Hancock	Swans Island		Rowe Road	$150,000	Long Term	Rowe Road (Bank Stabilization): Reshape slope, stabilize bank (300'), add erosion control. Materials: Town owned granite blocks, riprap, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds Town owned quarry could supply for in-kind match.	44.44745	-68.47295

Hancock	Swans Island		Stanley Point Road	$140,000	Long Term	Stanley Point Road: Blast where needed, ditch (500'), upsize (?) 12" x 20' culverts to (?) 24" x 30' HDPE culverts, elevate road (dimensions unknown), riprap, repave, hay and seed. Materials: Explosive, (?) 24" x 30' HDPE culverts, gravel, riprap, pavement, geosynthetics, hay and seed		Deferred/Lack of Funds	44.16095	-68.45635
Hancock	Tremont		Cape Road (Section 2)	$70,000	Medium Term	Cape Road (Section 2) Bank Stabilization: Remove dead trees (unknown number), restabilize bank (dimensions unknown), install granite blocks (size and number unknown), riprap. Materials: Gravel, granite blocks, riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.69612	-68.30309
Hancock	Tremont		Mitchell Cove Road	$30,000	Medium Term	Mitchell Cove Road: Ditch (1,000'), upsize culverts (size and number unknown), riprap, hay and seed. Materials: HDPE culverts (size and number unknown), riprap, geosynthetics, hay and seed		Deferred/Lack of Funds	44.32901	-68.70362
Hancock	Tremont		Rich Town Road	$30,000	Medium Term	Rich Town Road: Ditch (1,000'), upsize culverts (size and number unknown), riprap, hay and seed. Materials: HDPE culverts (size and number unknown), riprap, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.38378	-68.73435
Hancock	Trenton		Goose Cove Road	$20,000	Short Term	Goose Cove Road: Ditch (500'), riprap.		Deferred/Lack of Funds	44.15619	-68.66668
Hancock	Trenton		School Road	$50,000	Medium Term	School Road: Ditch (1,000'), realign and lengthen culverts (size and number unknown), armor ditches. Materials: Gravel, riprap, geosynthetics, culvert extensions, hay and seed		Deferred/Lack of Funds	44.45484	-68.36547
Hancock	Unorganized Territory			$103,000	Long Term	Upgrade drainage of roads and culverts as necessary within County's portion of the Unorganized Territory to protect against washouts from flooding.		Deferred/Lack of Funds	44.18798	-68.63935
Hancock	Verona Island		Verona Island	$50,000	Long Term	Upgrade road drainages with better ditching and upsized culverts.		New	44.15527	-68.66578
Hancock	Verona Island		West Side Drive	$25,000	Medium Term	West Side Drive: Rebuild intersection to improve dangerous sight line with Route 1.		Deferred/Lack of Funds	44.53279	-68.79279
Hancock	Waltham		Cemetery Road	$65,000	Medium Term	Cemetery Road: Ditch (3,000'), add (3) 18" x 40' HDPE culverts, riprap, hay and seed. Materials: (3) 18" x 40' HDPE culverts, riprap, gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.33158	-68.72794
Hancock	Waltham		Junior Ralph Road	$50,000	Medium Term	Junior Ralph Road: Reshape and riprap slope (12' x 2,000'), ditch (2,000'), line ditches, upsize (4) 24" x 40' culverts to (4) 36" x 40' HDPE culverts, hay and seed. Materials: Gravel, riprap, geosynthetics, (4) 36" x 40' HDPE culverts, hay and seed		Did ditching with town funds/PA funds with no 406.	44.61379	-68.79552
Hancock	Winter Harbor		Main Street (Section 2)	$30,000	Medium Term	Main Street (Section 2): Widen entrance to 12' box culvert, armor entrance with granite blocks.		Deferred/Lack of Funds	44.32146	-69.85124
Hancock	Winter Harbor		Main Street (Section 3)	$10,000	Short Term	Main Street (Section 3): Install berm (3' x 400'), stabilize with native plants.		Deferred/Lack of Funds	44.56923	-68.21428

Hancock	Winter Harbor		Main Street (Section 4)	$20,000	Short Term	Main Street (Section 4): Widen ditches (300'), armor ditches, install underdrains with fabric (75'), crushed rock. Materials: Riprap, crushed stone, underdrain (amount unknown), gravel, geosynthetics, hay and seed		Deferred/Lack of Funds	44.39471	-68.08448
Hancock	Winter Harbor		Main Street (Section 5)	$35,000	Medium Term	Main Street (Section 5): Add (1) 18" x 30' HDPE culvert, elevate road (2' x 20' x 250'), add 250' of 18" drainage pipe. Materials: (1) 18" x 30' HDPE culvert, gravel, riprap, geosynthetics, 250' of 18" drainage pipe, crushed stone		Deferred/Lack of Funds	44.46958	-68.23598
Hancock	Winter Harbor		Sumber Harbor Road	$70,000	Medium Term	Summer Harbor Road: Ditch (2,000'), riprap (100 cubic yards), upsize (1) 24" plastic culvert to (1) 4' concrete bottomless box culvert, repave, hay and seed. Materials: Riprap, (1) 4' concrete bottomless box culvert, gravel, geosynthetics, hay and seed, pavement		Deferred/Lack of Funds	44.40658	-68.10374
Kennebec	Albion	1	Robbins Road	$17,500	Medium Term	Robbins Road: Ditch 2,500' and remove ledge as needed approximately 300 cubic yards.	Road Commissioner	Deferred/Lack of Funds	44.28840	-70.05520
Kennebec	Albion	2	Harding Road	$12,000	Long Term	Harding Road: Remove ledge and install (5) 15'' x 20' HDPE driveway culverts.	Road Commissioner	Deferred/Lack of Funds	44.32450	-69.68970
Kennebec	Albion	3	Quaker Hill Road	$30,000	Long Term	Quaker Hill Road: Ditch 7,500' and add (4) 18'' x 40' cross culverts.	Road Commissioner	Deferred/Lack of Funds	44.39122	-70.10010
Kennebec	Albion	4	Barns Road	$45,000	Medium Term	Barns Road: Ditch 10,000' and remove ledge as needed.	Road Commissioner	Deferred/Lack of Funds	44.29742	-69.74520
Kennebec	Albion	5	Quimby Road	$48,000	Long Term	Quimby Road: Ditch 10,000' and upsize (1) 24'' x 40' CMP with 30'' x 40' HDPE culvert, (5) 12'' x 40' culverts with 15'' x 40' HDPE culverts and riprap intake and outlets.	Road Commissioner	Deferred/Lack of Funds	44.33476	-69.54670
Kennebec	Albion	6	Weymouth Road	$250,000	Long Term	Weymouth Road: Elevate 10,000' x 20' x 2' and stabilize shoulders.	Road Commissioner	Deferred/Lack of Funds	44.54174	-69.62350
Kennebec	Albion	7	Yorktown Road	$18,000	Long Term	Yorktown Road: Ditch 5,000' and upsize existing 24'' x 40' CMP with 36'' x 40' HDPE culvert and riprap intake and outlet.		Deferred/Lack of Funds	44.54487	-69.82190
Kennebec	Albion	8	Cookson Road	$6,000	Short Term	Cookson Road: Ditch 900' and remove ledge as needed.	Road Commissioner	Deferred/Lack of Funds	44.30218	-69.74570
Kennebec	Augusta	1	Mount Vernon Avenue Ball Field	$300,000	Medium Term	Mount Vernon Avenue Ball Field: Stabilize embankment with geotextile fabric and fractures stone and indigenous plantings. 1,000' x 5' x 2' on average.	Director of Public Works	Proposed for 2025	44.49099	-69.41880
Kennebec	Augusta	2	Cushnoc Drive at Whitey Brook	$870,000	Long Term	Cushnoc Drive at Whitey Brook: Upsize existing underground drainage 12'' x 400' with 18'' x 400' and add (3) catch basins.	Director of Public Works	Partially Approved	44.51242	-69.40390
Kennebec	Augusta	3	Eastside Boat Landing	$45,000	Medium Term	Eastside Boat Landing: Install driven sheet pile bulkhead 300 '.	Director of Public Works	On hold. Alternative solutions being explored.	44.52006	-69.39680
Kennebec	Augusta	4	Greenway Trail	$24,000	Short Term	Greenway Trail: Pave 2,000' x 8' x 3'' of multi-use trail along the Kennebec River.	Director of Public Works	Not done. Will make a CIP request for FY2018 budget.	44.30725	-69.77160
Kennebec	Augusta	4	Greenway Trail	$24,000	Short Term	Greenway Trail: Pave 2,000' x 8' x 3'' of multi-use trail along the Kennebec River.	Director of Public Works	Not done. Will make a CIP request for FY2018 budget.	44.30725	-69.77160

Kennebec	Augusta		City Landfill	$70,000	Long Term	City Landfill: Modify pump station by installing (2) dry pumps and elevate top of pond 2' x 700' and install larger double plastic liner.		Pumps replaced in 2012. Project cost $70,000. Elevate top of pond deferred until next waste disposable solution is considered.	44.25824	-69.78600
Kennebec	Belgrade	1	Bartlett Road	$50,000	Long Term	Bartlett Road: Upsize existing 60'' x 50' CMP with 8' x 6' x 50' bottomless box culvert and riprap intake and outlet.	Road Commissioner	Deferred/Lack of Funds	44.47537	-69.46200
Kennebec	Belgrade	2	Chandler Road	$4,200	Short Term	Chandler Road: Ditch 1,200'.	Road Commissioner	Deferred/Lack of Funds	44.54030	-69.42660
Kennebec	Belgrade	3	Dunn Road	$16,000	Long Term	Dunn Road: Ditch 1,200' and line with fractured stone, upsize 24'' x 40 CMP with 36'' x 40' HDPE culvert.	Road Commissioner	Deferred/Lack of Funds	44.42138	-69.88360
Kennebec	Benton	1	East Benton Road	$60,000	Long Term	East Benton Road: Upsize 60'' x 30' CMP with 4' x 8' x 40' bottomless box culvert and elevate 150' x 21' x 2' and repave.	Road Commissioner	Deferred/Lack of Funds	44.58259	-69.48520
Kennebec	Benton	2	McCarthy Road	$37,000	Long Term	McCarthy Road: Upgrade twin 24'' x 40' culverts with 4' x 6' x 40' bottomless box culvert and riprap intake and outlet (dirt road. Beaver problem exacerbates flooding).	Road Commissioner	Deferred/Lack of Funds	44.59280	-69.47110
Kennebec	Benton	3	Bog Road	$15,000	Short Term	Bog Road: Elevate 300' x 21' x 18'' on average, armor road and shoulders.	Road Commissioner	Deferred/Lack of Funds	44.51071	-69.86340
Kennebec	Benton	4	Hanscomb Road	$4,000	Short Term	Handscomb Road: Ditch 1,200'.	Road Commissioner	Deferred/Lack of Funds	44.58498	-69.44900
Kennebec	Benton	5	Foss Hill Road	$40,000	Short Term	Foss Hill Road: Remove ledge from ditch line 2,000' x 3' x 2' and repave (Dirt road and surrounding area is very flat – hence the name Bog Road).	Road Commissioner	Deferred/Lack of Funds	44.62049	-69.49390
Kennebec	Chelsea	1	Searless Mills Road	$75,000	Long Term	Searles Mills Road: Upsize existing 12' squash culvert with 14' x 10' x 60' bottomless box culvert, riprap intake and outlet and repave.	Town Manager	Ongoing	44.24605	-69.70500
Kennebec	Chelsea	2	Beech Street	$9,500	Long Term	Beech Street: Upsize existing 36'' x 60' culvert with 48'' x 60' HDPE culvert, riprap intake and outlet and repave.	Town Manager	Completed 2018	44.56420	-69.49250
Kennebec	Chelsea	3	Wellmen Road	$9,500	Long Term	Wellmen Road: Upsize existing 12' squash culvert with 14' x 10' x 60' bottomless box culvert, riprap intake and outlet and repave.	Town Manager	Deferred/Lack of Funds	44.28833	-69.76620
Kennebec	Chelsea		Nelson Road	$48,000	Long Term	Nelson Road: Upsize stone box 6' x 10' x 21' with 10' x 12' x 24' bottomless box culvert and riprap intake and outlet and repave.	Town Manager		44.23723	-69.67430
Kennebec	China	1	Parameter Road	$31,000	Long Term	Parameter Road: Ditch and line with fractured stone 2,000', and add check dams as needed. Add (2) 18'' x 40' HDPE culverts and riprap intake and outlets, install (2) plunge pools and upsize (2) 12'' x 20' CMP's with 15'' x 20' HDPE driveway culverts.	Town Manager	Deferred/Lack of Funds	44.38313	-69.52210
Kennebec	China	2	Western Ridge Road	$22,000	Long Term	Western Ridge Road: Stabilize down slope of roadway 600' x 10', upsize (2) 12'' x 40' CMP's with 18'' x 40' HDPE culverts, add (2) plunge pools.	Town Manager	Deferred/Lack of Funds	44.43797	-69.64590

Kennebec	China	3	Rockwood Drive	$40,000	Long Term	Rockwood Drive: Ditch and line with fractured stone 2500', and add check dams as needed. Add (2) 18'' x 40' HDPE culverts and riprap intake and outlets, install (2) plunge pools and upsize (2) 12'' x 20' CMP's with 15'' x 20' HDPE driveway culverts.	Town Manager	Deferred/Lack of Funds	44.41624	-69.58160
Kennebec	China	4	Hanson Road/Cross Road	$26,000	Long Term	Hanson Road/Cross Road: Ditch and line with fractured stone 2,500', add (1) 15'' x 20' HDPE culvert and riprap intake and outlets.	Town Manager	Deferred/Lack of Funds	44.46142	-69.47810
Kennebec	China	5	Pleasant View Ridge Road	$58,000	Long Term	Pleasant View Ridge Road: Ditch and line with fractured stone 5,000' and upsize (8) 12'' x 20' CMP's with 15'' x 20' HDPE driveway culverts.	Town Manager	Deferred/Lack of Funds	44.40361	-69.47220
Kennebec	China	6	Dirgo Road	$600,000	Long Term	Dirgo Road: Rebuild road sub base and base 3 miles, repave. Establish ditch 15,000'.	Town Manager	Deferred/Lack of Funds	44.43237	-69.51210
Kennebec	China	7	Branch Mill Road	$125,000	Long Term	Branch Mill Road: Rebuild road sub base and base 3,000, repave. Ditch and line 1,200', upsize (3) 15'' x 40' CMP's with 18'' x 40' HDPE and (1) 15'' x 40' CMP 18'' x 40' HDPE culvert.	Town Manager	Deferred/Lack of Funds	44.43296	-69.46030
Kennebec	China	8	Clark Road	$12,000	Long Term	Clark Road: Ditch and line with fractured stone 1,000', add (1) 15'' x 20' HDPE driveway culvert and crown road.	Town Manager	Deferred/Lack of Funds	44.38034	-69.59420
Kennebec	China	9	Bog Road	$2,800	Short Term	Bog Road: Upsize existing 15'' x 40' CMP with 24'' x 40' HDPE culvert and riprap intake and outlet.	Town Manager	Deferred/Lack of Funds	44.42366	-69.47610
Kennebec	Clinton	1	Johnson Flats Road	$150,000	Long Term	Johnson Flats Road: Elevate roadway 600' x 21' x 2' on average and stabilize shoulders with geotextile and fractured stone.	Hwy Foreman	Ongoing	44.70958	-69.47950
Kennebec	Clinton	2	True Road	$72,000	Long Term	True Road: Upsize existing 72'' x 40' CMP with 12'' x 8' x 40' bottomless box culvert with integrated headwalls.	Hwy Foreman	Deferred/Lack of Funds	44.71720	-69.50870
Kennebec	Clinton	3	Rogers Road	$35,000	Medium Term	Rogers Road: Armor ditches 500' and line with fractures stone. Install check dams as needed, add 8'' x 20' x 4,000' surface gravel, shape and crown road. (Site may have had PA funds in the past; verbiage to be added).	Hwy Foreman	Deferred/Lack of Funds	44.68043	-69.52370
Kennebec	Clinton	4	Pease Road	$1,500	Short Term	Pease Road: Add 15'' x 40' HDPE culvert.	Hwy Foreman	Jun-Oct 2022	44.64291	-69.53260
Kennebec	Farmingdale	1	305 Water Street	$65,000	Long Term	305 Water Street: Acquire and remove house.	Town Manager	Deferred/Lack of Funds	44.66108	-70.15310
Kennebec	Farmingdale	2	Water Street	$1,000,000	Long Term	Water Street: Farmingdale Town Hall and Fire Station relocate away from the Kennebec River 8,000 sq'. (This is a critical facility.)	Town Manager	Deferred/Lack of Funds	44.40721	-70.03920
Kennebec	Farmingdale	3	Access Road	$45,000	Medium Term	Access Road: Build access road connecting Greely Drive, Hill Street, Riverside Drive and Kennebec Street 1,400' x 20'. (Could be part of relocating Town Hall and Fire Station – Project #2.)	Town Manager	Deferred/Lack of Funds	44.66090	-70.15300
Kennebec	Farmingdale	4	Northern Avenue	$165,000	Long Term	Northern Avenue: Replace existing drainage system with 1,900' x 18'' underground drainage system and relocate (22) catch basins and repave.	Road Commissioner	Deferred/Lack of Funds	44.67474	-70.14640

Kennebec	Fayette	1	Richmound Mills Road at Hales Brook	$40,000	Long Term	Richmond Mills Road at Hales Brook: Upgrade twin 36'' x 40' CMP culverts to 4' x 6' x 40' concrete bottomless box culvert. Ditch (200'), riprap and repave. (Multiple project worksheets – PA funds – exist for this site).		Deferred/Lack of Funds	44.18275	-69.79760
Kennebec	Fayette	2	Bamford Hill Road	$47,000	Long Term	Bamford Hill Road: Elevate 1,000' x 2' x 24', stabilize shoulders and add (2) 24'' x 40' HDPE culverts and riprap outlet and intake.		Deferred/Lack of Funds	44.42589	-70.10300
Kennebec	Fayette	3	Jackman Mill Road	$38,000	Long Term	Jackman Mill Road: Upsize 60'' x 40' CMP with 5' x 6' x 40' bottomless box culvert with integrated headers.		Deferred/Lack of Funds	44.19979	-69.78160
Kennebec	Fayette		Fayette Central School	$56,000	Medium Term	Fayette Central School (Shelter): Upgrade school/shelter to accommodate overnight stays (showers, lighting, food storage, etc; this is a critical facility).		Deferred/Lack of Funds	44.42593	-70.10310
Kennebec	Fayette		Fayette Country Store	$2,000	Short Term	Fayette Country Store: Purchase generator for store so it can provide emergency supplies to citizens of Fayette in event of power outages. (This is not a FEMA fundable project, but can be town funded.)		Deferred/Lack of Funds	44.46237	-70.06970
Kennebec	Fayette		Bamford Hill Road	$47,000	Long Term	Bamford Hill Road: Elevate 1,000' x 2' x 24', stabilize shoulders and add (2) 24'' x 40' HDPE culverts and riprap outlet and intake.		Deferred/Lack of Funds	44.42589	-70.10297
Kennebec	Gardiner	1	Marston Road (Site 1)	$40,000	Long Term	Marston Road (Site 1): Install 600' x 15'' HDPE underground drainage culvert, add (2) catch basins and upsize existing 36'' x 40' CMP with 60'' x 40' HDPE culvert and riprap intake and outlet.	Director of Public Works	Deferred/Lack of Funds	44.17036	-69.80590
Kennebec	Gardiner	2	Marston Road (Site 2)	$50,000	Long Term	Marston Road (Site 2): Elevate 600' x 20' x 3' on average, repave and upsize existing 24'' x 50' HDPE culvert with 5' x 4' x 50' bottomless box culvert.	Director of Public Works	Deferred/Lack of Funds	44.17863	-69.75630
Kennebec	Gardiner	3	Marston Road (Site 3)	$45,000	Long Term	Marston Road (Site 3): Elevate 200' x 20' x 2' on average, repave and upsize existing 24'' x 50' and 36'' x 50' HDPE culvert with 6' x 4' x 50' bottomless box culvert.	Director of Public Works	Deferred/Lack of Funds	44.17360	-69.75800
Kennebec	Gardiner	4	Marston Road, Libby Hill and Costello Road	$90,000	Long Term	Marston Road, Libby Hill and Costello Road: Elevate 3,000' x 20' x 4' on average, repave and upsize existing 36'' x 50' HDPE culvert with 6' x 4' x 50' bottomless box culvert, add 36'' x 50' HDPE overflow culvert.	Director of Public Works	Deferred/Lack of Funds	44.22903	-69.77930
Kennebec	Gardiner	5	Riverside Drive (Site 1)	$12,000	Long Term	Riverside Drive (Site 1): Upsize 24'' x 40' CMP with 36'' x 40' HDPE culvert and riprap intake and outlet. Ditch and line 500' and stabilize downstream road shoulder 150' x 3'.	Director of Public Works	Deferred/Lack of Funds	44.23060	-69.77740
Kennebec	Gardiner	6	Riverside Drive (Site 2)	$7,000	Long Term	Riverside Drive (Site 2): Upsize and reset 36'' x 40' CMP with 36'' x 40' HDPE culvert and tow and pave 100' x 20' low water crossing.	Director of Public Works	Deferred/Lack of Funds	44.29029	-69.78860
Kennebec	Gardiner	7	Harden Hill Road	$24,000	Long Term	Harden Hill Road: Install 400' x 24" underground drainage.	Director of Public Works	Deferred/Lack of Funds	44.15046	-69.81440
Kennebec	Gardiner	8	Summer Street	$2,500	Medium Term	Summer Street: Construct concrete berm behind garage on private property 20' x 3' x 12''.	Director of Public Works	Deferred/Lack of Funds	44.28576	-69.79290
Kennebec	Hallowell	1	Water Street at Second Street	$100,000	Long Term	Water Street at Second Street (Drainage): Upsize 300' x 24" underground pipe. Add (6) catch basins.	Director of Public Works	Deferred/Lack of Funds	44.37019	-69.83370

Kennebec	Hallowell	2	Union Street at Central Street	$65,000	Long Term	Union Street at Central Street (Drainage): Upsize 300' x 24" underground pipe. Add (10) catch basins.	Director of Public Works	Deferred/Lack of Funds	44.31552	-69.83100
Kennebec	Hallowell	3	Chestnut Street	$30,000	Long Term	Chestnut Street (Drainage): Upsize 200' x 18" underground pipe. Add (4) catch basins.	Director of Public Works	Deferred/Lack of Funds	44.28523	-69.79510
Kennebec	Hallowell	4	Academy Street	$110,000	Long Term	Academy Street (Drainage): Upsize 1,000' x 24" underground pipe. Add (10) catch basins.	Director of Public Works	Deferred/Lack of Funds	44.28449	-69.79290
Kennebec	Hallowell	5	Central Street	$100,000	Long Term	Central Street: Upsize culvert 30' x 6'.	Director of Public Works	New	44.28402	-69.79430
Kennebec	Hallowell	6	Lincoln Street from Hubbard Lane to Second Street	$100,000	Long Term	Lincoln Street from Hubbard Lane to Second Street (Drainage): Upsize 2,000' x 18" underground pipe. Add (6) catch basins.	Director of Public Works	New	44.36337	-69.86930
Kennebec	Hallowell	6	Lincoln Street from Hubbard Lane to Second Street	$100,000	Long Term	Lincoln Street from Hubbard Lane to Second Street (Drainage): Upsize 2,000' x 18" underground pipe. Add (6) catch basins.	Director of Public Works	New	44.36337	-69.86930
Kennebec	Hallowell	7	High Street from Central Street to Mayflower Road	$65,000	Long Term	High Street from Central Street to Mayflower Road (Drainage): Upsize 500' x 18" underground pipe. Add (5) catch basins.	Director of Public Works	New	44.17679	-69.94060
Kennebec	Hallowell	8	Page Street from Pleasant Street to Second Street	$85,000	Long Term	Page Street from Pleasant Street to Second Street (Drainage): Upsize 1,500' x 18" underground pipe. Add (6) catch basins.	Director of Public Works	New	44.35902	-69.84970
Kennebec	Hallowell		Winter Street	$69,000	Long Term	Winter Street (Drainage): Upsize 400' x 36" underground pipe. Add (4) catch basins.		Deferred/Lack of Funds	44.27807	-70.05119
Kennebec	Litchfield	1	Hallowell/Litchfield Road	$28,000	Short Term	Hallowell/Litchfield Road: Build retaining wall 4' x 50' to protect road from Tacoma Lake overspill.	Director of Public Works	Deferred/Lack of Funds	44.23024	-69.98140
Kennebec	Manchester		Foye Road	$50,000	Medium Term	Foye Road: Ditch and line 5,000'.		Deferred/Lack of Funds	44.31542	-69.83110
Kennebec	Manchester		Prescott Road	$60,000	Medium Term	Prescott Road: Ditch 6,500', stabilize shoulders.		Deferred/Lack of Funds	44.35884	-69.84959
Kennebec	Manchester		Scribner Hill Road	$60,000	Short Term	Scribner Hill Road: Ditch 4,000', stabilize shoulder, install geosynthetics to fix spring under roadway.		Deferred/Lack of Funds	44.27806	-70.05112
Kennebec	Manchester		Summer Haven Road	$80,000	Long Term	Summer Haven Road: Ditch and line 7,000' and upsize culverts as needed.		Deferred/Lack of Funds	44.37026	-69.83372
Kennebec	Monmouth	1	Wilson Pond Road (Site 1)	$4,000	Long Term	Wilson Pond Road (Site 1): Add 36'' x 40' HDPE overflow culvert and riprap intake and outlet.	Town Manager/Road Commissioner	Deferred/Lack of Funds	44.13747	-69.67870
Kennebec	Monmouth	2	Sandborn Road	$5,000	Long Term	Sandborn Road: Add 36'' x 50' HDPE overflow culvert and riprap intake and outlet.	Town Manager/Road Commissioner	Deferred/Lack of Funds	44.55490	-69.70950
Kennebec	Monmouth	3	Placard Road (Site 1)	$15,000	Short Term	Placard Road (Site 1): Ditch and stone line 1,500' and add check dams as needed.	Town Manager/Road Commissioner	Deferred/Lack of Funds	44.48731	-69.93750
Kennebec	Monmouth	4	Placard Road (Site 2)	$6,000	Short Term	Placard Road (Site 2): Add (2) 30'' x 40' HDPE cross culverts and riprap intake and outlets.	Town Manager/Road Commissioner	Deferred/Lack of Funds	44.44327	-69.99050
Kennebec	Monmouth	5	Wilson Pond Road (Site 2)	$4,000	Short Term	Wilson Pond Road (Site 2): Add 36'' x 40' HDPE overflow culvert and riprap intake and outlet.	Town Manager/Road Commissioner	Deferred/Lack of Funds	44.22708	-69.71590

Kennebec	Monmouth	6	Bormen Road	$5,000	Short Term	Bormen Road: Add 36'' x 50' HDPE overflow culvert and riprap intake and outlet.	Town Manager/Road Commissioner	Deferred/Lack of Funds	44.21842	-70.02130
Kennebec	Monmouth	7	Gilman Hill Road	$12,000	Short Term	Gillman Hill Road: Ditch and stone line 1,200' and add check dams as needed.	Town Manager/Road Commissioner	Deferred/Lack of Funds	44.48394	-69.94120
Kennebec	Mount Verno	1	Bean Road	$27,000	Long Term	Bean Road: Add 36'' x 40' HDPE overflow culvert, Moor Hill Road elevate 600' x 20' x 1' and stabilize shoulders, upsize 36'' x 40' CMP with 48'' x 40' HDPE culvert and (2) 15'' x 40' CMP's with 24'' x 40' HDPE culverts.		Deferred/Lack of Funds	44.14935	-69.70180
Kennebec	Mount Verno	2	Journeys End	$23,000	Long Term	Journeys End: Elevate 400' 21' x 2', stabilize shoulders and upsize (2) 15'' x 40' culverts with 24'' x 40' HDPE culverts.	Road Commissioner	Deferred/Lack of Funds	44.14000	-69.74630
Kennebec	Mount Verno	3	Desert Point Road	$75,000	Long Term	Desert Point Road: Elevate 1,000' x 21' x 2', stabilize shoulder, upsize (3) 15'' x 40' CMP's with 36'' x 40' HDPE culverts and add (3) 36'' x 40' HDPE overflow culverts.	Road Commissioner	Deferred/Lack of Funds	44.12621	-69.66830
Kennebec	Oakland	1	Broom Handle Road	$25,000	Long Term	Broom Handle Road: Upsize (3) culverts; sizes unknown. Ditch 75'.	Road Commissioner	Deferred/Lack of Funds	44.22981	-69.76630
Kennebec	Pittston	1	Blinn Hill Road	$105,000	Long Term	Blinn Hill Road: Upsize and lengthen existing culvert with a 10' x 14' x 50' bottomless box culvert with integrated headwalls.	Board of Selectmen	Completed for 2021 Plan	44.22538	-69.76060
Kennebec	Pittston	2	Pinkham Street	$145,000	Long Term	Pinkham Street: Elevate road bed 1,800' x 3' x 20' on average, stabilize shoulders with fractured stone, upsize (2) 15'' x 40' CMP's with 18'' x 40' HDPE culverts and (1) 12'' x 20' CMP with 18'' x 20' HDPE driveway culvert and remove ledge from ditch line as needed approximately 75 cubic yards.	Board of Selectmen	Deferred/Lack of Funds	44.41211	-69.92040
Kennebec	Pittston	3	Blodgett Road	$65,000	Long Term	Blodgett Road: Upsize 8' x 40' oval culvert with 10' x 8' x 40' bottomless box culvert and rip rapintake and outlet.	Board of Selectmen	Deferred/Lack of Funds	44.22544	-69.75850
Kennebec	Pittston	4	Palmer Road	$20,000	Long Term	Palmer Road: Ditch 4,000' and remove ledge as needed and add (2) 18'' x 40' HDPE cross culverts.	Board of Selectmen	Completed for 2021 Plan	44.39010	-69.97560
Kennebec	Pittston	5	Crocker Road	$43,000	Short Term	Crocker Road: Ditch and stone line 4,000'.	Board of Selectmen	Deferred/Lack of Funds	44.41545	-69.94030
Kennebec	Randolph	1	Water Street	$350,000	Long Term	Water Street: Remove Fire Station 3,800+/- sq' and remove Public Works Garage 1,200+/-sq' out of the floodplain (critical facility).	Road Commissioner	Deferred/Lack of Funds (should be started soon)	44.59648	-69.83910
Kennebec	Randolph	2	Lower Water Street	$2,500,000	Long Term	Lower Water Street: Acquire and demolish (9) properties from the floodplain.	Board of Selectmen	Deferred/Lack of Funds	44.61599	-69.88790
Kennebec	Randolph	3	Mill Street	$25,000	Short Term	Mill Street: Create hardened low water crossing 500' x 23'.	Board of Selectmen	Deferred/Lack of Funds	44.54687	-69.91840
Kennebec	Readfield	1	Sadie Dunn Road	$18,000	Long Term	Sadie Dunn Road: Upsize 36'' x 50' CMP with 48'' x 50' HDPE, riprap intake and outlet and ditch and line 500' of road and add check dams as needed.	Director of Public Works	Deferred/Lack of Funds	44.54515	-69.88220
Kennebec	Readfield	2	Giles Road	$165,000	Long Term	Giles Road: Replace bridge 21' x 35'.	Director of Public Works	Deferred/Lack of Funds	44.57274	-69.84230
Kennebec	Readfield	3	Wings Mills Road	$50,000	Long Term	Wings Mills Road: Upsize existing twin 24'' x 50' culverts with 4' x 6' x 50' bottomless box culvert with integrated headwalls.	Director of Public Works	Deferred/Lack of Funds	44.47922	-69.70270

Kennebec	Rome	1	Ladd Road	$225,000	Long Term	Ladd Road: Ditch 6,500', elevate 7,500' x 18' x 10'' on average and upsize (6) 12'' x 40' CMP's with 18'' x 40' HDPE culverts.	Road Commissioner	Completed for 2021 Plan	44.40433	-69.76050
Kennebec	Rome	2	Watson Pond Road	$11,000	Long Term	Watson Pond Road: Ditch 2,000', upsize (1) 12'' x 40' CMP with 18'' x 40' HPDE culvert and (2) 12'' x 20' driveway CMP's with 15'' x 20' HDPE culverts and riprap intake and outlets.	Road Commissioner	Completed for 2021 Plan	44.44306	-69.74660
Kennebec	Rome	3	Oak Ridge Road	$55,000	Long Term	Oak Ridge Road: Elevate 4,000' x 18' x 12'' on average, ditch 600' and add (3) 18'' x 40' HDPE cross culverts.	Road Commissioner	Completed for 2021 Plan	44.44990	-69.76040
Kennebec	Rome	4	Jamacia Point Road	$7,500	Short Term	Jamaica Point Road: Ditch and line 500' and remove ledge as needed.	Road Commissioner	Deferred/Lack of Funds	44.41624	-69.78240
Kennebec	Rome	5	Mountain Drive	$6,000	Short Term	Mountain Drive: Install (2) dry hydrants with 200' x 6'' and 600' x 6'' PVC.	Road Commissioner	Completed for 2021 Plan	44.42183	-69.81360
Kennebec	Sidney	1	Drummond Road	$65,000	Long Term	Drummond Road: Upsize (2) 24'' x 40' culverts to 4' x 8' x 40' bottomless box culvert. Stabilize road shoulders with gabion baskets 100' x 3' x 18'.	Board of Selectmen	Deferred/Lack of Funds	44.43797	-69.64590
Kennebec	Sidney	2	Quaker Road	$58,000	Long Term	Quaker Road: Ditch 1,400' and upsize (13) 15'' x 30' and (2) 18'' x 30' driveway CMP's with (13) 24'' x 30' HDPE and (2) 24'' x 40' HDPE culverts.	Board of Selectmen	Deferred/Lack of Funds	44.53748	-69.99160
Kennebec	Sidney	3	Reynold Hill Road	$74,000	Long Term	Reynold Hill Road: Ditch 2,500', stone line and add check dams as needed. Upsize (10) 12'' x 30' driveway CMP's with (10) 18'' x 30' HDPE culverts and add (5) 18'' x 30' HDPE driveway culverts and upsize existing 12'' x 115' CMP with 18'' x 115' HDPE culvert.	Board of Selectmen	Deferred/Lack of Funds	44.60515	-69.92650
Kennebec	Sidney	4	Mills Road	$55,000	Medium Term	Mills Road: Elevate road bed 3,000' x 2' x 20' and stabilize shoulders.	Board of Selectmen	Deferred/Lack of Funds	44.37192	-69.63500
Kennebec	Sidney	5	Philbrook, Tiffany, Blake Roads	$260,000	Long Term	Philbrook, Tiffany, Blake Roads: Elevate road bed 12,000' x 2' x 21', stabilize shoulders. Upsize (9) 15'' x 40' to 18'' x 40' HDPE culverts and add (3) 18'' x 40' HDPE cross culverts.	Board of Selectmen	Deferred/Lack of Funds	44.48096	-69.64720
Kennebec	Sidney		Public Works	$2,000	Short Term	Public Works: Install underground feed from generator to fuel pump (not a FEMA fundable project).	Board of Selectmen	Deferred/Lack of Funds	44.45770	-69.68280
Kennebec	Vassalboro	1	Bog Road	$3,000	Short Term	Bog Road: Upsize 15'' x 40' CMP to 24'' x 40' HDPE culvert (problem may be a result of a farmer’s man-made pond).	Public Works	Completed for 2021 Plan	44.56871	-69.98910
Kennebec	Vassalboro	2	Midget Hill Road	$6,000	Short Term	Midget Hill Road: Ditch and stone line 400' and add check dams as needed.	Public Works	Deferred/Lack of Funds	44.57745	-69.61770
Kennebec	Vassalboro	3	Cook Hill Road	$5,000	Short Term	Cook Hill Road: Ditch and stone line 300' and add check dams as needed.	Public Works	Deferred/Lack of Funds	44.56871	-69.98910
Kennebec	Vassalboro	4	Dunham Road	$1,100	Short Term	Dunham Road: Ditch and seed 200'.	Public Works	Completed for 2021 Plan	44.55201	-70.05220
Kennebec	Vienna	1	Town Road	$60,000	Long Term	Town Road: Elevate 500' x 20' x 2' on average, install 10' x 4' x 40' bottomless box culvert, riprap intake and outlet and repave .	Road Commissioner	Completed for 2021 Plan	44.53866	-69.99900
Kennebec	Vienna	2	Mountain Road	$45,000	Long Term	Mountain Road: Upsize existing CMP with 8' x 4' x 40' bottomless box culvert and riprap intake and outlet.	Road Commissioner	Ongoing, wating on funds	44.53828	-69.65160
Kennebec	Vienna	3	Kimble Pond Road (Site 1)	$2,000	Long Term	Kimble Pond Road (Site 1): Add 24'' x 40' HDPE culvert .	Road Commissioner	Deferred/Lack of Funds	44.58018	-69.67030

Kennebec	Vienna	4	Kimble Pond Road (Site 2)	$25,000	Long Term	Kimble Pond Road (Site 2): Add 4' x 3' x 40' bottomless box culvert, riprap intake and outlet and elevate road bed 200' x 20' x 2'.	Road Commissioner	Completed for 2021 Plan	44.52117	-69.66800
Kennebec	Vienna	5	Stream Road	$4,000	Short Term	Stream Road: Add 24'' x 60' HDPE overflow culvert and riprap intake and outlet.	Road Commissioner	Deferred/Lack of Funds	44.56713	-69.62330
Kennebec	Waterville	1	Drummond Road	$9,200	Short Term	Drummond Road: Ditch 2,300' and reset 18'' x 50' culvert.	Public Works	Deferred/Lack of Funds	44.21754	-69.81250
Kennebec	Waterville	2	County Road	$4,000	Short Term	County Road: Riprap intake and outlet of existing 48'' culvert and add 4' x 6' x 6' stone lined plunge pool.	Public Works	Culvert was replaced, unable to find plunge pool	44.19271	-69.87220
Kennebec	Waterville	3	West River Road	$45,000	Long Term	West River Road: Upsize 18'' x 100' culvert with 3' x 2' x 100' bottomless box culvert.	Public Works	Deferred/Lack of Funds	44.19916	-69.89030
Kennebec	Waterville Sewer Dstri		College Avenue	$73,000	Long Term	College Avenue: Upsize existing 12'' underground drainage system with 18'' x 1400' HDPE and repave.		Deferred/Lack of Funds	44.21166	-69.80640
Kennebec	Waterville Sewer Dstri		Roland Street between Colette and West River Road	$17,000	Long Term	Roland Street between Colette and West River Road: Upsize existing 12'' underground drainage system with 18'' x 300' HDPE underground drainage system and repave.		Deferred/Lack of Funds	44.21709	-69.81510
Kennebec	Wayne	1	Hardscrabble Road	$45,000	Long Term	Hardscrabble Road: Widen road and improve drainage for additional distance of 1 mile.	Town and Contractor	Deferred/Lack of Funds	44.54108	-69.62510
Kennebec	Wayne	2	House Road	$22,000	Long Term	House Road: Improve drainage and riprap for distance of 1/2 mile.	Town and Contractor	Deferred/Lack of Funds	44.53665	-69.63390
Kennebec	Wayne	3	Dexter Pond Road	$30,000	Long Term	Dexter Pond Road: Widen road and improve drainage for distance of ½ mile.	Town and Contractor	Deferred/Lack of Funds	44.26112	-69.88290
Kennebec	Wayne		Wayne	UNK	Long Term	Other: Identify and upgrade drainage systems as necessary.		Deferred/Lack of Funds	44.28480	-69.56700
Kennebec	West Gardin	1	Indiana Road	$36,000	Long Term	Indiana Road: Elevate 900' x 22' x 2' on average and repave, upsize 15'' x 40' CMP to 24'' x 40' HDPE culvert.	Board of Selectmen	Deferred/Lack of Funds	44.34343	-69.59450
Kennebec	West Gardin	2	Stoneham Drive (Site 1)	$6,500	Long Term	Stoneham Drive (Site 1): Replace 24'' x 40' CMP with 24'' x 40' HDPE culvert and remove ledge 36'' x 40' x 24'' and reset 24'' x 40' culvert.	Board of Selectmen	Deferred, Current culvert working well, will replace with updated one when needed	44.33919	-69.88870
Kennebec	West Gardin	3	Bog Hill Road	$45,000	Long Term	Bog Hill Road: Upsize 48'' x 40' CMP with 4' x 6' x 40' bottomless box culvert and elevate 500' x 22' x 2' and repave.	Board of Selectmen	Deferred/Lack of Funds	44.29085	-69.53880
Kennebec	West Gardin	4	Old Lewiston Road	$5,000	Short Term	Old Lewiston Road: Stabilize 500' x 4' with geotextile fabric and fractured stone and upsize existing 18'' x 40' CMP with 24'' x 40' HDPE culvert.	Board of Selectmen	Deferred; current culvert working well. Will replace with upgraded culvert wieh required	44.39830	-69.56700
Kennebec	West Gardin	5	Stoneham Drive (Site 2)	$67,000	Long Term	Stoneham Drive (Site 2): Elevate 2,000' x 22' x 2' and upsize (10) 12'' x 30' CMP's with 18'' x 30' HDPE driveway culverts.	Board of Selectmen	Deferred/Lack of Funds	44.28165	-70.00870
Kennebec	West Gardin	6	Benson Road	$2,600	Long Term	Benson Road: Upsize 15'' x 40' CMP with 24'' x 40' HDPE culvert.	Board of Selectmen	Deferred/Lack of Funds	44.33609	-69.56810
Kennebec	West Gardin	7	Hinkley Road	$76,000	Long Term	Hinkley Road: Elevate 1,000' x 22' x 12'' and upsize 12'' x 40' CMP with 18'' x 40' HDPE culvert.	Board of Selectmen	Deferred; current culvert working well. Will replace with upgraded culvert wieh required	44.30217	-69.60100
Kennebec	Windsor	1	Griffin Road	$42,000	Long Term	Griffin Road: Ditch 10,000', remove ledge as needed 50 cubic yards +/- in two spots, add (3) 18'' x 40' HDPE cross culverts and riprap intake and outlets.	Town Manager	Completed for 2021 Plan	44.29043	-69.81250

Kennebec	Windsor	2	Choate Road at Choate Bridge	$15,000	Long Term	Choate Road at Choate Bridge: Stabilize road shoulder 20' x 10' with geotextile fabric and fractured stone, ditch and line 1,000' and add check dams as needed. Upsize (1) 12'' x 20' CMP with 15'' x 20' HDPE driveway culvert.	Town Manager	Completed for 2021 Plan	44.25947	-69.68880
Kennebec	Windsor	3	Wingood Road	$24,000	Long Term	Wingood Road: Elevate 3,000' x 16' x 12'', add (3) 18'' x 40' HDPE cross culverts and (1) 15'' x 20' HPDE driveway culvert, and riprap intake and outlets.	Town Manager	Completed for 2021 Plan	44.32026	-70.04700
Kennebec	Windsor	4	Reed Road	$33,000	Long Term	Reed Road: Cut back road banks 5' and ditch 5,000'. Add (3) 15'' x 40' HDPE culverts and upsize (2) 18'' x 40' CMP's with 30'' x 40' HDPE culverts.	Town Manager	Completed for 2021 Plan	44.28898	-69.79110
Kennebec	Windsor	5	Weeks Mill Road	$65,000	Long Term	Weeks Mill Road: Replace 96'' x 40' CMP with 10' x 8' x 50' bottomless box culvert and riprap intake and outlet.	Town Manager	Completed for 2021 Plan	44.30675	-69.78540
Kennebec	Winslow	1	Fort Hill Cemetery	$200,000	Medium Term	Fort Hill Cemetery: Stabilize slope of cemetery 80' x 90' x 2' with large fractured stone.	Town Manager	Deferred/Lack of Funds	44.30929	-69.77090
Kennebec	Winslow	2	Lithgow Street	$250,000	Long Term	Lithgow Street: Add 24'' x 4000' HDPE underground drainage culvert +/- to Chafe Brook.	Town Manager	Deferred/Lack of Funds	44.31445	-69.77100
Kennebec	Winthrop	1	Memorial Drive	$3,000	Short Term	Memorial Drive: Reditch and stone line 300'.	Town Manager	Deferred/Lack of Funds	44.32093	-69.71370
Kennebec	Winthrop	2	Case Road	$25,000	Long Term	Case Road: Upsize 36'' x 40' CMP with 4' x 4' x 40' concrete bottomless box culvert, riprap intake and outlet. Add 24'' x 40' HDPE overflow culvert.	Town Manager	Completed for 2021 Plan	44.30550	-69.75350
Kennebec	Winthrop	3	Old Lewiston Road	$40,000	Long Term	Old Lewiston Road: Upsize existing culvert 48'' x 40' with 5' x 4 ' x 30' bottomless box culvert.	Town Manager	Deferred/Lack of Funds	44.32822	-69.78120
Knox	Appleton		Peabody Rd	$4,500	Short Term	Peabody Rd: Ditch 1,000' and add (1) 18' x 40' HDPE culvert	Road Commissioner	Plan Phase	44.29391	-69.22495
Knox	Appleton		Pettengill Stream Crossing/W. Apleton Road	$10,000	Long Term	(2) Improve drainage, upsize culvert projects as needed (1.a) Update flood risk impact of Knox Mill Dam, Knowlton Dam and one additional abandoned barrier	Road Commissioner	New- deferred pending funding	44.32255	-69.25870
Knox	Camden		Ragged Mountain	$10,000	Short Term	(1.a) Update flood profiles for the Megunticook River drainage basin and determine flow capacity at various sites prone to flooding	Fire Chief/ ME Forestry	Pending funding	44.21433	-69.14533
Knox	Camden		Camden Hills State Park	$10,000	Short Term	Evaluate Wildland Fire Hazard/WUI Study		Pending funding	44.24482	-69.06362
Knox	Camden		Curtis Ave	$125,000	Short Term	Curtis Ave: Replace rotted and heavened storm drain and extend	Public Works	Plan FY-21 Pending funding	44.20210	-69.07181
Knox	Camden		Park St	$125,000	Short Term	Park Street: Replace existing deteriorating storm drain	Public Works	Plan FY-20 Pending Funding	44.20503	-69.07274
Knox	Camden		See Project List	UNK	Short Term	(1.b) Determine flood risk impact of Knox Mill Dam, Knowlton Dam, and one additional abandoned barrier	TM and PDD	Pending funding	44.22344	-69.07960
Knox	Camden		See Project List	UNK	Short Term	Implement recommendations of Montgomery Dam Feasibility Study	TM and PDD	Pending funding	44.21055	-69.06433
Knox	Camden		Public Landing & Infrastructure Redsign	UNK	Short Term	Public land and infrastructure redesign in preperation for sea level rise and increased flooding	TM and PDD	Pending funding	44.20973	-69.06326
Knox	Camden		Curtis Island	$10,000	Short Term	Evaluate Wildland Fire Hazard/WUI Study	Fire Chief/ ME Bureau of Parks and Lands	Pending funding	44.20192	-69.04996
Knox	Cushing		Salt Pond Road	$50,000	Long Term	Elevate 180' x 21' x 3' on average, upsize 18" x 40" CMP with 24" x 50' HDPE repave	Road Commissioner	In planning phase- pending funding	43.99750	-69.28769

Knox	Friendship		Friendship Long Island Town Road: selective wildland timber fuel reduction/fire break. Road drainage improvements	UNK	Long Term	Friendship Long Island Town Road: selective wildland timber fuel reduction/fire break. Road drainage improvements	Road Commissioner	Deferred; pending funding	43.96271	-69.33825
Knox	Friendship		Harbor Rd	$8,000	Short Term	Ditching/Erosion Control	Road Commissioner	Deferred; pending funding	43.97934	-69.33754
Knox	Friendship		Timber Rd	$8,000	Short Term	Ditching/Erosion Control	Road Commissioner	Deferred; pending funding	44.00782	-69.34941
Knox	Hope		Hope Elementary	$50,000	Long Term	Access Facility. Procure and install generator and ancillary equipment at municipal shelter Hope Elementary School	EMA Director/ School Committee/ Select Board	New- deferred pending funding	44.22390	-69.22350
Knox	Isle au Haut		Loop Road @ Pat's Brook	UNK	Medium Term	Culverts/Road Elevation	Road Commissioner	In planning phase- pending funding	44.05205	-68.60759
Knox	Isle au Haut		Loop Road @ Town Brook	UNK	Short Term	Culvert	Road Commissioner	In planning phase- pending funding	44.05657	-68.64315
Knox	Isle au Haut		Richs Cove Brook	$7,000	Short Term	Culvert/riprap	Road Commissioner	In planning phase- pending funding	44.07720	-68.60606
Knox	Isle au Haut		Point Lookout Road	$40,000	Medium Term	Culvert/Riprap	Road Commissioner	In planning phase- pending funding	44.08378	-68.62644
Knox	Isle au Haut		Loop Road @ Duck Harbor cross road	UNK	Short Term	Culvert	Road Commissioner	In planning phase- pending funding	44.02417	-68.61917
Knox	Isle au Haut		Eastern Head Road	$2,500	Short Term	Culvert	Road Commissioner	In planning phase- pending funding	44.02563	-68.61757
Knox	Isle au Haut		Loop Road at Poor Cylbil Install Driveway	UNK	Short term	Culvert	Road Commissioner	In planning phase- pending funding	44.07439	-68.63554
Knox	Isle au Haut		Dewitt drainage	$125,000	Long Term	Stormwater drainage system improvement/upgrade	Road Commissioner	In planning phase- pending funding	44.07228	-68.63630
Knox	Matinicus		At island shelter/municipal office	$21,500	Short Term	Install Emergency Generator	Assessors	Phase 2: Planned FY-19	43.86213	-68.89200
Knox	North Haven		Fire Station	$22,000	Short Term	Generator	Selectboard	Preparing request for bid	44.14477	-68.87178
Knox	North Haven		Pulpit Harbor Pier	$40,000	Long Term	Headland Stabilization/Erosion Control	Selectboard	Exploration Phase	44.15670	-68.88103
Knox	Owls Head		implementation item in schoo/airport emergency plans	UNK	Long Term	Obtain Generator	Selectboard	In planning phase- pending funding	44.06327	-69.09228
Knox	Owls Head		reduce washouts from severe storms/current poor ramp design	UNK	Long Term	Reengineer/construct new boat ramp	Selectboard	In planning phase- pending funding	44.08437	-69.05367
Knox	Owls Head		replace existing tidal guides Piles and connections to float to wharf with stronger units	$10,000	Medium Term	Town wharf	Harbor Mastor	Pending funding	44.08478	-69.05314
Knox	Rockland		Tolman Rd	$19,000	Medium Term	Ditching/Check Dam Addition	Services	Deferred; pending funding	44.12950	-69.12962
Knox	Rockland		Meadow Rd (West Meadow)	$35,000	Medium Term	Ditching/Culvert Addition	Services	Deferred; pending funding	44.12516	-69.13078

Knox	Rockland		Mountain Rd	$12,500	Medium Term	Ditching/Culvert Addition	Services	Deferred; pending funding	44.12071	-69.14329
Knox	Rockland		Bog Rd	$24,000	Medium Term	Ditching/Culvert Addition	Services	Deferred; pending funding	44.13589	-69.13923
Knox	Rockland		Thompson Rd	$60,000	Long Term	Bridge Upgrade	Services	Deferred; pending funding	44.11181	-69.13917
Knox	Rockland		Rockland Harbor Park	$300,000	Long Term	Seawall Damage Control	Harbor and Waterfront	Deferred; pending funding	44.10191	-69.10667
Knox	Rockland		Municipal Fish Pier	$250,000	Long Term	Seawall Damage Control	Harbor and Waterfront	Deferred; pending funding	44.10308	-69.10343
Knox	Rockland		Sandy Beach Park	$50,000	Long Term	Erosion Control	Harbor and Waterfront	Deferred; pending funding	44.09811	-69.10500
Knox	Rockland		Warrenton Street	$14,000	Short Term	Ditching/Culvert Upsize	Public Works	In progress	44.12719	-69.08500
Knox	Rockland		West St. Ext/Tolman's Pond	$100,000	Short Term	Grub Out/Stone Line/Repave/Install Culverts	Public Works	New- Planning phase	44.17515	-69.15094
Knox	Rockland		Old Rockland Road	$60,000	Short Term	Road Elevation/Repave & CMP Update with Culvert	Public Works	Project planned for 2018-2019	44.15542	-69.11626
Knox	Rockland		Annis Lane	$4,000	Short Term	Over flow pipe replacement	Public Works	New (2018-2019)	44.19996	-69.11023
Knox	Rockland		Park St.	$3,000	Short Term	Over flow pipe replacement	Public Works	New - Planning Phase	44.18656	-69.13050
Knox	Rockland		Assess facility, procure and install generator and ancillary equipment at city shelter	$55,000	Long Term	Generator and ancilary equipment	City Manager/Public Service EMA	New- deferred pending funding	44.10527	-69.11227
Knox	South Thompson		Island Road	$168,000	Medium Term	Road Elevation/Erosion Control	Selectboard/LEMD/Road Commissioner	New- deferred pending funding	44.00572	-69.12413
Knox	Thomaston		Meadow Rd (West Meadow Rd)	$181,102	Long Term	Culvert Upsize/Erosion Control	Public Works	Deferred; pending funding	44.10457	-69.15305
Knox	Thomaston		Watts Hall	$55,000	Long Term	Shelter Generator/Equipment Procure/Install	Town Manager/Select board	New- deferred pending funding	44.07872	-69.18290
Knox	Union		Clarry Hill Rd	$42,000	Medium Term	Road Elevation	Public Works	Deferred; pending funding	44.19958	-69.30545
Knox	Union		Carroll Rd	$375,000	Long Term	Road Rebuild/Washout Prevention	Public Works	Deferred; pending funding	44.25044	-69.33691
Knox	Vinalhaven	13	North Haven Rd (south of Loud's Pit Rd)	$150,000	Long Term	Road Elevation/Culvert Upsize Cost Range: $100,000-150,000	MDOT State Aid/ Road Commissioner	New	44.06653	-68.83670
Knox	Vinalhaven		Poor Farm Rd	$20,000	Medium Term	Ditiching/Culvert Upsize/Road Improvements	Road Commissioner	Deferred; pending funding	44.07476	-68.79846
Knox	Vinalhaven		Zeke's Point Rd	$67,000	Long Term	Road Elevation	Road Commissioner	Deferred; pending funding	44.11509	-68.84200
Knox	Vinalhaven		School St	$40,000	Medium Term	Road Elevation	Road Commissioner	Deferred; pending funding	44.04804	-68.82882
Knox	Vinalhaven		Pequot Rd	$65,000	Long term	Road Elevation/Culvert Upsize	Road Commissioner	New	44.04906	-68.81728
Knox	Vinalhaven		North Haven Road @ Folly Pond	$25,000	Medium Term	Road elevation/upsize culvert	Road Commissioner	New	44.07718	-68.84460
Knox	Vinalhaven		Round the Island Rd (deadman's corner)	$4,000	Medium Term	Culvert Upsize/Riprap	Road Commissioner	Deferred; pending funding	44.07546	-68.80909
Knox	Warren		Sandy Shore Rd	$320,000	Short Term	Culvert Upsize	Road Commissioner	Planned for FY-19	44.09059	-69.24893

Knox	Warren		Town Office/Fire Station	$35,000	Medium Term	Shelter Generator Replacement	EMA Director/ Town Manager	New Pending Funding	44.11719	-69.25338
Knox	Washington		Fitch Rd @ Davis Stream	$180,000	Long Term	Culvert Upsize	Contract/ Selectmen/ Public Works	New Phase 1 in process. Phase 2 deferred pending funding	44.23497	-69.43112
Knox	Washington		Maple Grove Cemetery	$10,000	Short Term	Wind Damage Mitigation	Contract/ Selectmen	New- deferred pending funding	44.27119	-69.37171
Knox	Washington		McDowell Cemetery	$10,000	Short Term	Wind Damage Mitigation	Contract/ Selectmen	New- deferred pending funding	44.29646	-69.36254
Knox	Washington		Skidmore Rd	$45,000	Medium Term	Upsize Culverts	Public Works/ Selectmen	Deferred; pending funding	44.25976	-69.33494
Lincoln	Alna	1	Egypt Rd	$12,000	Medium Term	1) Egypt Rd; Install cast in place headwalls on intake and outlet.	Road Commissioner	Deferred — lack of funds	44.12685	-69.58012
Lincoln	Alna	2	Baily, Lothrop, and Sheepscot Rd	$2,000	Short Term	2) Baily, Lothrop, and Sheepscot Rd; Stone line plunge pool 40' x 8' x 3'.	Road Commissioner	Deferred — lack of funds	44.10934	-69.65393
Lincoln	Alna	3	Baily Rd	$20,000	Medium Term	3) Baily Rd; Add 48" x 40' HDPE culvert and elevate road 18' x 60' x 2' and stabilize shoulders.	Road Commissioner	Deferred — lack of funds	44.10934	-69.65391
Lincoln	Alna	4	Lothrop Rd	$12,000	Medium Term	4) Lothrop Rd; Add (4) 24" x 40' HDPE cross culverts and rip rap intake and outlets.	Road Commissioner	Deferred - lack of funds	44.09845	-69.64494
Lincoln	Boothbay	1	Dover Rd	$14,000	Medium Term	1) Dover Rd; Upsize (4) 8" x 40' culverts with 15" x 40' HDPE culverts and rip rap intake and outlets.	Road Commissioner	Deferred - lack of funds	43.91257	-69.63753
Lincoln	Boothbay	2	East & West Side Rd. on Barters Island	$52,000	Long Term	2) East & West Side Rd. on Barters Island; Ditch 8,000' and add check dams as needed, upsize (8) culverts with 18" x 40' HDPE culverts and remove ledge as needed.	Road Commissioner	Deferred — lack of funds	43.88486	-69.67281
Lincoln	Boothbay	3	Ocean Point Rd (shore Rd.	$90,000	Long Term	3) Ocean Point Rd (shore Rd.) Stabilize banks 7,500' x 20' on average.	Road Commissioner	Deferred — lack of funds	43.85823	-69.58551
Lincoln	Boothbay	4	Back River Cross Rd	$45,000	Long Term	4) Back River Cross Rd; Upsize existing 36" x 40' culvert with 8' x 4' x 40' bottomless box and riprap intake and outlet.	Road Commissioner	Deferred — lack of funds	43.90388	-69.65502
Lincoln	Boothbay	5	Pension Ridge Rd	$3,000	Short Term	5) Pension Ridge Rd; Upsize 12" x40' culvert with 24" x 40' HDPE culvert and rip rap intake and outlet.	Road Commissioner	Deferred - lack of funds	43.90830	-69.60491
Lincoln	Boothbay	6	King Philips Trail	$35,000	Medium Term	6) King Philips Trail; Stabilize shoulders 2,500' x 20' and upsize existing Culvert with 24" x 40' HDPE and rip rap intake and outlet.	Road Commissioner	Deferred — lack of funds	43.83276	-69.57858
Lincoln	Boothbay Ha	1	Townsend Ave, Atlantic Ave, and Union St	$275,000	Long Term	1) Townsend Ave, Atlantic Ave, and Union St; Upsize underground drainage 5,000' x 12" with 5,000' x 28" and add (30) catch basins.	Public Works.	Deferred - lack of funds	43.86189	-69.62722
Lincoln	Boothbay Ha	2	Spruce world Beach Rd	$5,000	Medium Term	2) Spruce world Beach Rd; Upsize 24" x 40' cmp with 36" x 40' HDPE culvert and rip rap intake and outlet.	Public Works.	Deferred - lack of funds	43.83736	-69.61661
Lincoln	Bremen	1	Rial Herald Rd	$25,000	Medium Term	1) Rial Herald Rd; Ditch 5,000', upsize and realign existing cmp with 24" x 40' squash pipe.	Road Commissioner	Deferred - lack of funds	43.97126	-69.47081
Lincoln	Bremen	2	Town Hall	$4,000	Short Term	2) Town Hall; Install French drains 100' and reseed.	Road Commissioner	Deferred — lack of funds	44.03684	-69.41407
Lincoln	Bremen			UNK	Short term	Tree pruning to cut down on power outages on Fogler Road.	Fire Department	Ongoing	44.01402	-69.42107
Lincoln	Bristol	1	Split Rock Road	UNK	Short term	1) Split Rock Road; Upsize culverts and lift road above flood level.	Road Commissioner	Newly Listed	43.95167	-69.52790
Lincoln	Bristol	2	Route 130	UNK	Short term	2) Route 130; In conjunction with MaineDOT, elevate road above flood stage.	Road Commissioner	Newly Listed	43.94667	-69.51873

Lincoln	Bristol			UNK	2022	Install fixed generator at Bristol Town Office	Selectboard	Ongoing		
Lincoln	Damariscotta	1	Miles St	$40,000	Medium Term	1) Miles St; Stabilize road shoulder with fracture stone 500’ x 10’.	Public Works.	Engineering cost estimates prepared	44.02615	-69.52812
Lincoln	Damariscotta	2	Egypt Rd	$32,000	Medium Term	2) Egypt Rd; Elevate road 300’ x 21’ x 2’, add 36" x 40’ HDPE culvert and repave.	Public Works.	Engineering cost estimates prepared	44.04399	-69.45990
Lincoln	Damariscotta	3	Back Meadow Rd	$18,000	Short term	3) Back Meadow Rd; Elevate 100’ x 5’ x 21’ stabilize shoulders and repave.	Public Works	Engineering cost estimates prepared	44.05259	-69.48378
Lincoln	Damariscotta	4	Chapman St	$45,000	Long Term	4) Chapman St; Divert water away from homes behind shopping center.	Public Works.	As part of $750,000 CDBG grant, new box culvert installed near Church Street to improve storm water drainage on Chapman, Hodgdon, Church and Pleasant Streets.	44.03313	-69.52223
Lincoln	Damariscotta	5	Vine Street	UNK	Long Term	5) Vine Street; Construct drainage system to reduce flooding of adjacent residential & commercial properties.	Public Works	New	44.03180	-69.52822
Lincoln	Damariscotta	6	Belvedere Road	UNK	Medium Term	6) Belvedere Road; Upsize 4 culverts to improve drainage	Public Works	New; one culvert close to Route 1 bypass upsized. 2 culverts to be upsized in 2017; one in 2018.	44.05665	-69.50829
Lincoln	Damariscotta	9	Areas vulnerable to sea level rise	UNK	Long Term	9) Areas vulnerable to sea level rise; Fortify areas subject to flooding due to sea level rise including downtown, Miles Road, Oyster Creek (on Belvedere).	Public works	New		
Lincoln	Damariscotta	10	Great Salt Bay School Shelter	$50,000	Short Term	10) Great Salt Bay School Shelter; Install generator.	Public works	New	44.04165	-69.50834
Lincoln	Damariscotta	11	YMCA Shelter	$21,887	Short Term	11) YMCA Shelter; Install generator	Public works	New	44.03980	-69.50845
Lincoln	Damariscotta			UNK	TBD	Schooner Street Culvert	Miles Health	New. Culvert is too small to handle flash flooding		
Lincoln	Damariscotta			UNK	TBD	Church Street Bridge	Town. Possible help from Fish Passage	New		
Lincoln	Dresden	1	Bog Rd	$35,000	Long Term	1) Bog Rd; Upsize existing multiple culverts with 10’ bottomless HDPE culvert with precast footing and rip rap intake and outlets	Road Commissioner	Deferred — lack of funds	44.07799	-69.72266
Lincoln	Dresden	1	. Project scoping costs/pre-construction costs to identify best solutions for Orchard Hills road flood prevention.	UNK	Medium Term - 2022	1). Project scoping costs/pre-construction costs to identify best solutions for Orchard Hills road flood prevention.	Road Commissioner	Deferred – lack of funds	44.07798	-69.72252
Lincoln	Dresden	2	Calls Hill Rd	$12,000	Long Term	2) Calls Hill Rd; Upsize existing 48" x 40’ cmp with 60" x 50’ HDPE culvert and rip rap intake and outlet.	Road Commissioner	Deferred - lack of funds	44.07227	-69.73070

Lincoln	Dresden	2	. Road stabilization of Orchard Hills Road to prevent flooding during heavy down pours and shows. 3 culverts with precast footing and rip rap intake and outlets.	UNK	Medium Term – 2022	2). Road stabilization of Orchard Hills Road to prevent flooding during heavy down pours and shows. 3 culverts with precast footing and rip rap intake and outlets.	Road Commissioner	Deferred – Lack of funds	44.07183	-69.73257
Lincoln	Edgecomb	1	Mount Hunger Rd Site 1	$8,000	Short Term	1) Mount Hunger Rd Site 1; Ditch 1,200' and remove ledge in ditch line as needed Approx. 150 cyd.	Road Commissioner	Deferred — lack of funds	43.96772	-69.59275
Lincoln	Edgecomb	2	Spring Hill Farms Rd	$9,000	Short Term	2) Spring Hill Farms Rd; Ditch 1,500' and remove ledge in ditch line as needed approx. 150 cyd.	Road Commissioner	Deferred — lack of funds	43.99071	-69.59448
Lincoln	Edgecomb	3	Mount Hunger Rd Site 2	$40,000	Long Term	3) Mount Hunger Rd Site 2; Elevate 1,000' x 21' x 12" and upsize (4) existing culverts with 24" x 40 HDPE culverts..	Road Commissioner	Deferred - lack of funds	43.98741	-69.60085
Lincoln	Edgecomb	4	Parsons Point Rd	$12,000	Short Term	4) Parsons Point Rd; Ditch 1,500' and remove ledge in ditch line as needed approx. 300 cyd.	Road Commissioner	Deferred — lack of funds	43.94425	-69.63922
Lincoln	Edgecomb	5	Old County Rd	$16,000	Long Term	5) Old County Rd; Ditch 1,200' and remove ledge in ditch line as needed approx. 100 cyd. And upsize 36" x 40' cmp with 48" x 40 HDPE culvert.	Road Commissioner	Deferred — lack of funds	43.96784	-69.61750
Lincoln	Edgecomb			UNK	TBD	Mill Road, east side of bridge approach	Road Commissioner	Diring extreme tides with strong south winds, some erosion around boulders under road. May need addressing at some point in the future, monitoring. Not a concern in short term.		
Lincoln	Edgecomb			UNK	TBD	McKay Rd	State aided road	One section (couple hundred feet) floods periodically during heavy rain storms.		
Lincoln	Jefferson	1	Goose Hill Rd	$8,000	Medium Term	1) Goose Hill Rd; Ditch and line 600' and add 18" x 40' HDPE cross culvert.	Road Commissioner	Deferred - lack of funds	44.20149	-69.42910
Lincoln	Jefferson	2	Hodgkin's Hill Rd	$6,000	Medium Term	2) Hodgkin's Hill Rd; Upsize existing twin 15" x 40' cmps with 36" x 40' HDPE culvert. and berm upstream side of road 100' x 12" x 12".	Road Commissioner	Deferred — lack of funds	44.19506	-69.43613
Lincoln	Jefferson	3	Hinks Rd	$3,500	Short Term	3) Hinks Rd; Upsize existing 18" x 40' cmp with 24" x 40' HDPE culvert.	Road Commissioner	Deferred — lack of funds	44.19229	-69.52377
Lincoln	Jefferson	4	401 Hinks Rd	$2,000	Short Term	4) 401 Hinks Rd; Elevate furnace and circuit breaker box in basement.	Town Selectmen	Deferred — lack of funds	44.19293	-69.52227
Lincoln	Jefferson	5	Sennett Rd	$3,000	Long Term	5) Sennett Rd; Ditch 500' and remove ledge as needed.	Road Commissioner	Deferred — lack of funds	44.22036	-69.54630
Lincoln	Jefferson			UNK	Short term	New culverts removed ledge as needed building the road up. Munsey Road	Road Commissioner	Working on		
Lincoln	Jefferson			UNK	Long term	Egypt Road – ditching, remove ledge, building road up	Road Commissioner	Planning Stages		

Lincoln	Monhegan A	2	350 acres of 513 Acre Monhegan Island - Fuel reduction forest fire prevention activities	UNK	Short Term	2) 350 acres of 513 Acre Monhegan Island - Fuel reduction forest fire prevention activities	MAI Board of Trustees	New - Planning Phase	43.76890	-69.30990
Lincoln	Monhegan A		350 acres of 513 Acre Monhegan Island - Project Scoping for fuel reduction forest fire prevention activities	UNK	Short Term	NEW-1) 350 acres of 513 Acre Monhegan Island - Project Scoping for fuel reduction forest fire prevention activities	MAI Board of Trustees	New - Planning Phase	43.76050	-69.31720
Lincoln	Monhegan Is	1	Lighthouse Hill Rd	$104,000	Long Term	1) Lighthouse Hill Rd; Elevate 2,000' x 10' x 2' shape and add 15" x 20' cross culvert	Road Commissioner	Deferred — lack of funds	43.76535	-69.31611
Lincoln	Monhegan Is	2	Fire Station/ Emergency shelter	$120,000	Long Term	2) Fire Station/ Emergency shelter; Replace existing 30' x 24' building with two story building of same detentions and add backup generator.	Town Selectmen	Deferred — lack of funds	43.96584	-69.21302
Lincoln	Monhegan Is	3	Monhegan Cemetery	$42,000	Medium Term	3) Monhegan Cemetery; Stabilize wall 800' x 4'with geotextile, stone and indigenous plantings.	Plantation Board of Assessors	Deferred - lack of funds	43.76508	-69.31732
Lincoln	Monhegan Is	4	Horn's Hill / Burnt Head Rd	$16,000	Long Term	4) Horn's Hill / Burnt Head Rd; Elevate 200' x 10' x 2' upsize existing 12" 20' cmp with 15" x 20' HDPE culvert, add 15" x 20' HDPE cross culvert and rip rap 50' x 1' x 1'	Road Commissioner	Deferred — lack of funds	43.76216	-69.31876
Lincoln	Monhegan Li	1	Lighthouse Hill at or near Monhegan Museum	UNK	Short-Medium Term	NEW-1) Lighthouse Hill at or near Monhegan Museum; Project Scoping for installation of underground fire suppression system	Museum Board of Trustees	new - planning phase	43.76527	-69.31556
Lincoln	Monhegan Li	1	Lighthouse Hill at or near Monhegan Museum	UNK	Short-Medium Term	NEW-1) Lighthouse Hill at or near Monhegan Museum; Project Scoping for installation of underground fire suppression system	Museum Board of Trustees	new - planning phase	43.76527	-69.31556
Lincoln	Monhegan Li	2	Lighthouse Hill at or near Monhegan Museum	UNK	Short-Medium Term	NEW-2) Lighthouse Hill at or near Monhegan Museum; Installation of underground fire suppression system	Museum Board of Trustees	new - planning phase	43.76527	-69.31556
Lincoln	Monhegan Li	2	Lighthouse Hill at or near Monhegan Museum	UNK	Short-Medium Term	NEW-2) Lighthouse Hill at or near Monhegan Museum; Installation of underground fire suppression system	Museum Board of Trustees	new - planning phase	43.76527	-69.31556
Lincoln	Monhegan Pl	1	Mooring Chain Road	UNK	Short Term	1) Mooring Chain Road; Remove bridge, replace with 1 of __" x 20' HDPE culvert and build road with 44 cyds. fill (per DOT recommendation)	Road Commissioner	$2718 spent in 2020; budgeted for $8736 in 2021	43.75954	-69.32105
Lincoln	Monhegan Pl	3	Monhegan Avenue at Tribler Road Intersection: Replace CMP with 4 of __" x 20' HDPE culverts	UNK	Short Term	3) Monhegan Avenue at Tribler Road Intersection: Replace CMP with 4 of __" x 20' HDPE culverts	Road Commissioner	on Roads Dept. list since 2010, budgeting for 2022	43.76532	-69.31824
Lincoln	Monhegan Pl	5	Water Lane	UNK	Short Term	5) Water Lane; Install chlorinator pump system	Monhegan Water Company	New - Planning Phase	44.03056	-69.53145
Lincoln	Monhegan Pl	6	Bog Meadow near Water Lane	UNK	Short Term	6) Bog Meadow near Water Lane; Install well point(s)	Monhegan Water Company	New - Planning Phase	43.76131	-69.31927

Lincoln	Monhegan Pl	8	Monhegan Wharf near Wharf Road	UNK	Short Term	8) Monhegan Wharf near Wharf Road; Project Scoping for Elevating and stabilizing wharf surface	Plantation Board of Assessors	new - planning phase	43.76519	-69.32153
Lincoln	Monhegan Pl	8	Monhegan Wharf near Wharf Road	UNK	Short Term	8) Monhegan Wharf near Wharf Road; Project Scoping for Elevating and stabilizing wharf surface	Plantation Board of Assessors	new - planning phase	43.76505	-69.32109
Lincoln	Monhegan Pl	8	Monhegan Wharf near Wharf Road	UNK	Short Term	8) Monhegan Wharf near Wharf Road; Project Scoping for Elevating and stabilizing wharf surface	Plantation Board of Assessors	new - planning phase	43.76519	-69.32153
Lincoln	Monhegan Pl	10	Monhegan Breakwater near & at Fish Beach Lane - Project Scoping for Breakwater design & feasibility of emergency stockpiling for Breakwater repairs	UNK	Medium Term	10) Monhegan Breakwater near & at Fish Beach Lane - Project Scoping for Breakwater design & feasibility of emergency stockpiling for Breakwater repairs	Plantation Board of Assessors	New - Planning Phase	43.76315	-69.32112
Lincoln	Monhegan Pl	11	Monhegan Breakwater near & at Fish Beach Lane - Project Scoping for Elevation & Stabilization of Fish Beach Lane	UNK	Short Term	11) Monhegan Breakwater near & at Fish Beach Lane - Project Scoping for Elevation & Stabilization of Fish Beach Lane	Plantation Board of Assessors	New - Planning Phase	43.76316	-69.32112
Lincoln	Monhegan Pl	12	Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage	UNK	Short Term	12) Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage; Project Scoping for Flood Mitigation	Plantation Board of Assessors	New - Planning Phase	43.76365	-69.32118
Lincoln	Monhegan Pl	12	Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage	UNK	Short Term	12) Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage; Project Scoping for Flood Mitigation	Plantation Board of Assessors	New - Planning Phase	43.76141	-69.31740
Lincoln	Monhegan Pl	13	Monhegan Breakwater near & at Fish Beach Lane	$1,735,925	Medium Term	13) Monhegan Breakwater near & at Fish Beach Lane; Attach Monhegan Breakwater to shoreline with approx. 50 ft. granite fill/armor extension, Elevate Monhegan Breakwater with armoring granite block, Elevate & stabilize Fish Beach Lane roadway & corridor. Cost Range: $899,800-$1,735,925	Plantation Board of Assessors	New - Planning Phase	43.76316	-69.32110
Lincoln	Monhegan Pl	14	Monhegan Harbor near Fish Beach Lane	$350,000	Medium Term	14) Monhegan Harbor near Fish Beach Lane; Stockpile stone armor for emergency breakwater repairs (estimated 2100 CY) Cost Range: $325,000-300,000	Plantation Board of Assessors	New - Planning Phase	43.76317	-69.32150
Lincoln	Monhegan Pl	15	Monhegan Island	UNK	Long Term	15) Monhegan Island; Project Scoping for dry hydrant & pump installations and Lighthouse Hill fire suppression system	Fire Chief & Plantation Board of Assessors	new - planning phase	43.76529	-69.31394
Lincoln	Monhegan Pl	16	Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage	UNK	Long Term	16) Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage; Install tidal check valve & make subsurface stormwater improvements including resetting culvert and installing catch basin, outfall pipe and riprap & elevate nearby structures, Elevate & Stabilize Monhegan Avenue roadway & corridor	Plantation Board of Assessors	New - Planning Phase	43.76365	-69.32118

Lincoln	Monhegan Pl	16	Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage	$1,203,400	Long Term	16) Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage; Install tidal check valve & make subsurface stormwater improvements including resetting culvert and installing catch basin, outfall pipe and riprap & elevate nearby structures, Elevate & Stabilize Monhegan Avenue roadway & corridor. Cost Range: $426,600- $1,203,400	Plantation Board of Assessors	New - Planning Phase	43.76141	-69.31740
Lincoln	Monhegan Pl	17	Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage	UNK	Long Term	17) Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage; Install tidal check valve & make subsurface stormwater improvements including resetting culvert and installing catch basin, outfall pipe and riprap and elevate nearby structures, Elevate & Stabilize Monhegan Avenue roadway & corridor, Construct flood wall and opening gate	Plantation Board of Assessors	New - Planning Phase	43.76365	-69.32118
Lincoln	Monhegan Pl	17	Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage	$1,190,600	Long Term	17) Monhegan Avenue/Swim Beach Lane/Bog Meadow Drainage; Install tidal check valve & make subsurface stormwater improvements including resetting culvert and installing catch basin, outfall pipe and riprap and elevate nearby structures, Elevate & Stabilize Monhegan Avenue roadway & corridor, Construct flood wall and opening gate. Cost Range: $346,900- $1,190,600	Plantation Board of Assessors	New - Planning Phase	43.76141	-69.31740
Lincoln	Monhegan Pl	18	Monhegan Cemetery at Tribler Road	UNK	Medium Term	18) Monhegan Cemetery at Tribler Road; Project Scoping for wall stabilization	Plantation Board of Assessors	new - planning phase	43.76498	-69.31737
Lincoln	Monhegan Pl	19	Lighthouse Hill at or near Tower Lane	UNK	Long Term	19) Lighthouse Hill at or near Tower Lane; Installation of fire suppression system using pumps connected to existing or new water storage tank(s)	Fire Chief & Plantation Board of Assessors	new - planning phase	43.76527	-69.31556
Lincoln	Monhegan Pl	20	Monhegan Wharf near Wharf Road	UNK	Long Term	20) Monhegan Wharf near Wharf Road; install dry hydrant & pump(s) (salt water application)	Fire Chief & Plantation Board of Assessors	new - planning phase	43.76519	-69.32153
Lincoln	Monhegan Pl	20	Monhegan Wharf near Wharf Road	UNK	Long Term	20) Monhegan Wharf near Wharf Road; install dry hydrant & pump(s) (salt water application)	Fire Chief & Plantation Board of Assessors	new - planning phase	43.76505	-69.32109
Lincoln	Monhegan Pl	20	Monhegan Wharf near Wharf Road	UNK	Long Term	20) Monhegan Wharf near Wharf Road; install dry hydrant & pump(s) (salt water application)	Fire Chief & Plantation Board of Assessors	new - planning phase	43.76519	-69.32153
Lincoln	Monhegan Pl	21	Ice Pond near Ice Pond Road	UNK	Long Term	21) Ice Pond near Ice Pond Road; install dry hydrant	Fire Chief & Plantation Board of Assessors	new - planning phase	43.76672	-69.31705
Lincoln	Monhegan Pl	22	Monhegan Avenue South Fire Station	UNK	Medium Term	22) Monhegan Avenue South Fire Station; Install generator	Plantation Board of Assessors	Planning Phase Deferred until Fire Station building needs addressed	43.82659	-69.67098
Lincoln	Monhegan Pl	23	Monhegan Avenue School EOC/Shelter	UNK	Long Term	23) Monhegan Avenue School EOC/Shelter; Install generator)	Plantation Board of Assessors	New - Planning Phase	43.76594	-69.31821
Lincoln	Monhegan Pl	24	Monhegan Village: Project Scoping for capturing/storin g/using surface water and grey water sources	UNK	unknown	NEW-24) Monhegan Village: Project Scoping for capturing/storing/using surface water and grey water sources	Plantation Board of Assessors	New - Planning Phase		

Lincoln	Monhegan Pl	25	Monhegan Village: installation of systems for capturing/storing/using surface water and grey water sources	UNK	unknown	NEW-25) Monhegan Village: installation of systems for capturing/storing/using surface water and grey water sources	Plantation Board of Assessors	New - Planning Phase		
Lincoln	Monhegan Pl		Monhegan Avenue at Swim Beach Lane	$2,015	Medium Term	N/A) Monhegan Avenue at Swim Beach Lane; Build retaining wall and elevate road to prevent large-scale saltwater intrusion into island's sole source aquifer - SEE NEW ENTRIES 10)-14) and 16)-17)	Plantation Board of Assessors	Deferred - lack of funds	43.76407	-69.32054
Lincoln	Monhegan Pl	4a	Monhegan village outside coastal flood hazard zone plus 1-3 ft. sea level rise	UNK	Short Term	4a) Monhegan village outside coastal flood hazard zone plus 1-3 ft. sea level rise; Project Scoping for Drought Mitigation of Public Water Supply	Monhegan Water Company	New - Planning Phase	43.76664	-69.31419
Lincoln	Monhegan Pl	4b	Bog Meadow Aquifer, Monhegan Village to limits of Water Company Distribution System	UNK	Short Term	NEW-4b) Bog Meadow Aquifer, Monhegan Village to limits of Water Company Distribution System; Project Scoping for public water supply adaptation, contingency & mitigation plan addressing water company operations in the face of new drought conditions and other emerging natural hazards	Monhegan Water Company	New - Planning Phase	43.76313	-69.31985
Lincoln	Monhegan Pl	4b	Bog Meadow Aquifer, Monhegan Village to limits of Water Company Distribution System	UNK	Short Term	NEW-4b) Bog Meadow Aquifer, Monhegan Village to limits of Water Company Distribution System; Project Scoping for public water supply adaptation, contingency & mitigation plan addressing water company operations in the face of new drought conditions and other emerging natural hazards	Monhegan Water Company	New - Planning Phase	43.76313	-69.31985
Lincoln	Monhegan Pl	4c	Bog Meadow Aquifer, Monhegan Village to limits of Water Company Distribution System	UNK	Short Term	NEW-4c) Bog Meadow Aquifer, Monhegan Village to limits of Water Company Distribution System; Implementation of public water supply adaptation, contingency & mitigation plan addressing water company operations in the face of new drought conditions and other emerging natural hazards	Monhegan Water Company	New - Planning Phase	43.76313	-69.31985
Lincoln	Monhegan Pl	4c	Bog Meadow Aquifer, Monhegan Village to limits of Water Company Distribution System	UNK	Short Term	NEW-4c) Bog Meadow Aquifer, Monhegan Village to limits of Water Company Distribution System; Implementation of public water supply adaptation, contingency & mitigation plan addressing water company operations in the face of new drought conditions and other emerging natural hazards	Monhegan Water Company	New - Planning Phase	43.76313	-69.31985
Lincoln	Monhegan Pl	7a	Monhegan village outside coastal flood hazard zone plus 1-3 ft. sea level rise	UNK	Short Term	7a) Monhegan village outside coastal flood hazard zone plus 1-3 ft. sea level rise; relocate origin of public fresh water supply by installation of well points in area with reduced saltwater intrusion vulnerability	Monhegan Water Company	New - Planning Phase	43.76664	-69.31419

Lincoln	Monhegan Pl	7b	Monhegan Village: Project Scoping for education, identification and mitigation of chemical contamination of wells to avoid exacerbated contamination situations triggered via drought, sea level rise, and/or flood-induced groundwater level changes	UNK	Short Term	NEW-7b) Monhegan Village: Project Scoping for education, identification and mitigation of chemical contamination of wells to avoid exacerbated contamination situations triggered via drought, sea level rise, and/or flood-induced groundwater level changes	Monhegan Water Company	New - Planning Phase		
Lincoln	Monhegan Pl	7c	education, identification and mitigation of chemical contamination of wells to avoid exacerbated contamination situations triggered via drought, sea level rise, and/or flood-induced groundwater level changes	UNK	Short Term	NEW-7c) education, identification and mitigation of chemical contamination of wells to avoid exacerbated contamination situations triggered via drought, sea level rise, and/or flood-induced groundwater level changes	Monhegan Water Company	New - Planning Phase		
Lincoln	Monhegan Pl	9a	Monhegan Wharf near Wharf Road	UNK	Short to Medium Term	9a) Monhegan Wharf near Wharf Road; Elevate and stabilize wharf surface	Plantation Board of Assessors	new - planning phase	43.76519	-69.32153
Lincoln	Monhegan Pl	9a	Monhegan Wharf near Wharf Road	UNK	Short to Medium Term	9a) Monhegan Wharf near Wharf Road; Elevate and stabilize wharf surface	Plantation Board of Assessors	new - planning phase	43.76505	-69.32109
Lincoln	Monhegan Pl	9a	Monhegan Wharf near Wharf Road	UNK	Short to Medium Term	9a) Monhegan Wharf near Wharf Road; Elevate and stabilize wharf surface	Plantation Board of Assessors	new - planning phase	43.76519	-69.32153
Lincoln	Monhegan Pl	9b	Monhegan Village bordering Monhegan Associates (land trust	UNK	Short to Medium Term	NEW-9b) Monhegan Village bordering Monhegan Associates (land trust); Project Scoping for fuel reduction forest & structure fire prevention activities	Plantation Board of Assessors	new - planning phase	43.76295	-69.32055
Lincoln	Monhegan Pl	9b	Monhegan Village bordering Monhegan Associates (land trust	UNK	Short to Medium Term	NEW-9b) Monhegan Village bordering Monhegan Associates (land trust); Project Scoping for fuel reduction forest & structure fire prevention activities	Plantation Board of Assessors	new - planning phase	43.76205	-69.32068
Lincoln	Monhegan Pl	9c	Monhegan Village bordering Monhegan Associates (land trust	UNK	Short to Medium Term	NEW-9c) Monhegan Village bordering Monhegan Associates (land trust); fuel reduction forest & structure fire prevention activities	Plantation Board of Assessors	new - planning phase	43.76295	-69.32055
Lincoln	Monhegan Pl	9c	Monhegan Village bordering Monhegan Associates (land trust	UNK	Short to Medium Term	NEW-9c) Monhegan Village bordering Monhegan Associates (land trust); fuel reduction forest & structure fire prevention activities	Plantation Board of Assessors	new - planning phase	43.76205	-69.32068

Lincoln	Newcastle	1	East Old County Rd	$36,000	Long Term	1) East Old County Rd; Ditch and line 2,400' upsize (2) 12" x 40' cmps with 18" x 40' HDPE culverts and add (2) 18" x 40' HDPE cross culverts.	Road Commissioner	Deferred — lack of funds	44.04747	-69.55810
Lincoln	Newcastle	1	West Old County Rd	$311,000	Current	1) West Old County Rd; Replace all cross pipes, ditch & grade	Road Commissioner	In progress	44.04913	-69.59478
Lincoln	Newcastle	2	North Dyer Neck Rd	$40,000	Long Term	2) North Dyer Neck Rd; Ditch and line 2,200' and add (5) 18" x 40' HDPE cross culverts.	Road Commissioner	Deferred — lack of funds	44.06167	-69.60426
Lincoln	Newcastle	2	Station Rd	$400,000	2022	2) Station Rd; Replace all cross pipes, ditch & grade	Road commissioner	Waiting funding	44.01130	-69.61237
Lincoln	Newcastle	2	Station Rd	$38,000	2022	2) Station Rd; Replace all cross pipes, ditch & grade	Road commissioner	Waiting funding	44.00996	-69.61276
Lincoln	Newcastle	3	Kings Highway	$250,000	Long Term	3) Kings Highway; Replace all cross pipes, ditch & grade	Road Commissioner	Deferred - lack of funds	44.04644	-69.61058
Lincoln	Newcastle	3	Station Rd	$400,000	Long Term	3) Station Rd; Ditch and line 2,600' and add (2) 18" x 40' HDPE cross culverts.	Road Commissioner	Deferred - lack of funds	44.01130	-69.61237
Lincoln	Newcastle	3	Station Rd	$38,000	Long Term	3) Station Rd; Ditch and line 2,600' and add (2) 18" x 40' HDPE cross culverts.	Road Commissioner	Deferred - lack of funds	44.00996	-69.61276
Lincoln	Newcastle	4	Glidden Street	UNK	Long Term	4) Glidden Street; Replace subsurface drainage, basins, & road reconstruction	Road Commissioner	Deferred — lack of funds	44.03737	-69.53155
Lincoln	Newcastle	4	Indian Trail Rd	$16,000	Long Term	4) Indian Trail Rd; Ditch 1,600' and add (4) 18" x 40' HDPE culverts and rip rap intake and outlets.	Road Commissioner	Deferred — lack of funds	44.03469	-69.57756
Lincoln	Nobleboro	1	Bremen / Duck Puddle Rd	$150,000	Long Term	1) Bremen / Duck Puddle Rd; Elevate 300' x 21' x 5' upsize existing culvert with 10' x 8' x 50' box culvert and rip rap intake and outlet' and repave.	Joint project with Nobleboro and Waldoboro	2021 Deferred — lack of funds	44.07870	-69.45126
Lincoln	Nobleboro	1	Bremen / Duck Puddle Rd	$65,000	Long Term	1) Bremen / Duck Puddle Rd; Elevate 300' x 21' x 5' upsize existing culvert with 10' x 8' x 50' box culvert and rip rap intake and outlet' and repave.	Joint project with Nobleboro and Waldoboro	2021 Deferred — lack of funds	44.07870	-69.45126
Lincoln	Nobleboro	1	Install fixed generator at Nobleboro Municipal facility/Fire Station	$35,196	Short Term	1) Install fixed generator at Nobleboro Municipal facility/Fire Station	Select Board Electrician	New — DR-4108 HMGP grant; expect summer 2016 installation	44.09956	-69.45426
Lincoln	Nobleboro	2	Bremen / Duck Puddle Rd	$150,000	Long Term	2) Bremen / Duck Puddle Rd; Elevate 300' x 21' x 5' upsize existing culvert with 10' x 8' x 50' box culvert and rip rap intake and outlet' and repave.	Joint project with Nobleboro and Waldoboro	Deferred — lack of funds	44.07870	-69.45126
Lincoln	Nobleboro	2	Bremen / Duck Puddle Rd	$65,000	Long Term	2) Bremen / Duck Puddle Rd; Elevate 300' x 21' x 5' upsize existing culvert with 10' x 8' x 50' box culvert and rip rap intake and outlet' and repave.	Joint project with Nobleboro and Waldoboro	Deferred — lack of funds	44.07870	-69.45126
Lincoln	Nobleboro	2	Upper Cross Rd	$150,000	Long Term	2) Upper Cross Rd; Ditch 7,000' add (2) 24" x 40' HDPE cross culverts and (7) 15" x 20' HDPE driveway culverts.	Road Commissioner	Deferred - lack of funds	44.10167	-69.49172
Lincoln	Nobleboro	2	Upper Cross Rd	$21,000	Long Term	2) Upper Cross Rd; Ditch 7,000' add (2) 24" x 40' HDPE cross culverts and (7) 15" x 20' HDPE driveway culverts.	Road Commissioner	Deferred - lack of funds	44.10167	-69.49172
Lincoln	Nobleboro	3	Upper Cross Rd	$150,000	Long Term	3) Upper Cross Rd; Ditch 7,000' add (2) 24" x 40' HDPE cross culverts and (7) 15" x 20' HDPE driveway culverts.	Road Commissioner	Deferred - lack of funds	44.10167	-69.49172
Lincoln	Nobleboro	3	Upper Cross Rd	$21,000	Long Term	3) Upper Cross Rd; Ditch 7,000' add (2) 24" x 40' HDPE cross culverts and (7) 15" x 20' HDPE driveway culverts.	Road Commissioner	Deferred - lack of funds	44.10167	-69.49172

Lincoln	Nobleboro	3	north side of Belvedere Rd, and Oyster Creek	$200,000	Short Term	NEW 3). Repair 150’ of water erosion on the north side of Belvedere Rd, and Oyster Creek with Rip Rap and gravel. Replace 150’ of guardrail. Hot top area of construction.	Road Commissioner	Ongoing	44.05821	-69.50864
Lincoln	Somerville	1	SomervilleFire Station	$32,000	Long term	1)Install fixed generator the SomervilleFire Station	Select Board Electrician	New	44.26093	-69.45808
Lincoln	Somerville	2	Crummett Mountain Rd	$25,000	Long Term	2) Crummett Mountain Rd; Elevate 250’ x 21’ x 2’ and add 24" x 40’ HDPE overflow culvert.	Road Commissioner	Deferred - lack of funds	44.27673	-69.48454
Lincoln	Somerville	3	Colby Rd	$26,000	Long Term	3) Colby Rd; Relocate roadway 250’ x 5’ and add driveway culvert 15" x 20’, ditch 1,000' and add check dams as needed.	Road commissioner	Deferred — lack of funds	44.32811	-69.49177
Lincoln	Somerville			UNK	ASAP	Easements for communications tower	LC Communications	Pending		
Lincoln	Somerville			UNK	ASAP	S. Colby road – Generator for transmitter	SVFD	Pending		
Lincoln	Somerville			UNK	ASAP	Additional hydrant for wildfire mitigation	SVFD	Pending		
Lincoln	Somerville			UNK	2021 -2022	Permanent generators for north and south stations	SVFD	Pending		
Lincoln	Somerville			UNK	Prior to commencement of broadband service to town	Generator for broadband command center at RSU-12 town owned office	Somerville Selectboard	Pending		
Lincoln	Somerville			UNK	ASAP after broadband connection	Broadband connections at Somerville Fire North and South stations	Somerville Selectboard	Pending		
Lincoln	Somerville			UNK	ASAP	Beaver damn clearing and culvert removal	Somerville Road Commissioner	Pending		
Lincoln	Somerville			UNK	ASAP	Tree removal and trimming at salt shed – North SVFD Station	Somerville Road Commissioner	Pending		
Lincoln	South Bristol	1	Carl Baily Road	$2,500	Short Term	1) Carl Baily Road; Ditch east side of road.	Road Commissioner	New	43.93528	-69.52875
Lincoln	South Bristol			UNK	June	Ditch along Route 129 from John Gay Road to Coveside Road	Selectmen	new		
Lincoln	South Bristol			UNK	ASAP	Ditch top of hill at Split Rock Rd from #233 to stop ice from forming on road	Selectmen	new		
Lincoln	South Bristol			UNK	July	Raise road on Split Rock Road east of Sproul Road to prevent flooding	Selectmen	new		
Lincoln	Southport	1	Campbell Rd	$12,000	Short Term	1) Campbell Rd; Upsize existing 15" x 50’ cmp with 24" x 50’ HDPE culvert and stabilize road shoulder 150’ x 20’ on average.	Road Commissioner	Deferred — lack of funds	43.80939	-69.67259
Lincoln	Unorganized			UNK	Long term	Improve ditches and drainage on county roads	County Commissioners	Deferred – lack of funds		
Lincoln	Waldoboro	1	Bremen / Duck Puddle Rd	$85,000	Long term	1) Bremen / Duck Puddle Rd; Elevate 300' x 21' x 5' upsize existing culvert with 10' x 8' x 50' box culvert and rip rap intake and outlet' and repave.	Joint project with Nobleboro Road Commissioner	Deferred – lack of funds	44.07785	-69.44599
Lincoln	Waldoboro	2	Feyler’s Corner / Old Augusta Rd	$75,000	long term	2) Feyler’s Corner / Old Augusta Rd; Elevate 1,000' x 21' x 2' Upsize (3) 24'' x 40'cmps with 36'' x 40' HDPE culverts, add (2) 48'' x 40' HDPE culverts and repave.	Public Works.	In Progress	44.17992	-69.35693

Lincoln	Waldoboro	3	Elm St. Upsize existing culvert with 10' x 6' x 40' box culvert and rip rap intake and outlet.	$45,000	long term	3) Elm St. Upsize existing culvert with 10' x 6' x 40' box culvert and rip rap intake and outlet.	Public Works.	Deferred – lack of funds	44.10049	-69.38011
Lincoln	Waldoboro	4	Storer Mountain Rd	$12,000	short term	4) Storer Mountain Rd; Ditch and line 1,000' and add check dams as needed.	Public Works.	Deferred – lack of funds	44.18862	-69.34729
Lincoln	Waldoboro	5	Jackson Rd	$4,000	short term	5) Jackson Rd; Improve ditches 1,000' and add check dams as needed.	Public Works.	Deferred – lack of funds	44.18671	-69.33567
Lincoln	Waldoboro	6	Storer Mountain Road	$60,000	long term	6) Storer Mountain Road; Upsize existing 5'x36" CMP culvert with 5'x36" HDPE and lower 12-18".	Public Works	New	44.18862	-69.34729
Lincoln	Waldoboro	7	Marble Avenue	$80,000	Medium term	7) Marble Avenue; Install (2) 48" x 40' HDPE culverts, rip rap intake and outlet and 800' of ditches	Public Works	New	44.09586	-69.37234
Lincoln	Waldoboro	8	Wagner Bridge Road	$40,000	short term	8) Wagner Bridge Road; Elevate 300' x 32' x 4'. Upsize existing 4' x 36' CMP culvert with 5' x 40' HDPE culvert, rip rap intake and outlet and repave.	Public Works	New	44.13639	-69.40295
Lincoln	Westport Isla	1	Install fixed generator at the Westport Island Fire Station.	$45,000	Short term	1) Install fixed generator at the Westport Island Fire Station.	Select Board Fire Dept.	Applied for HMGP grant Jan. 2016	43.93523	-69.69194
Lincoln	Westport Isla	2	West Shore Rd	$25,000	Long Term	2) West Shore Rd; Ditch and line 2,000', remove ledge as needed and add 15" x 30' HDPE cross culvert.	Road commissioner	Deferred — lack of funds	43.88776	-69.72402
Lincoln	Westport Isla	3	East shore Rd	$20,000	Long term	3) East shore Rd; Ditch and line 2,000', remove ledge as needed.	Road Commissioner	Deferred - lack of funds	43.88806	-69.70238
Lincoln	Westport Isla	4	Main (town portion	$5,000	Short term	4) Main (town portion) Rd; Ditch 1,000' (near Jewett Cove Road)	Road Commissioner	Deferred — lack of funds	43.97898	-69.63371
Lincoln	Westport Isla			UNK	Short term	Arborist survey of roads to develop vegetation management plan for the prevention of downed power lines and obstructed roads (5.48 miles State road; 18.95 miles town roads; 18.48 miles private roads)	Select Board / Road Commissioner			
Lincoln	Westport Isla			UNK	Short term	Feasibility/engineering study with implementation guidelines for developing the most cost-effective, practical options for a reliable firefighting water supply: dry hydrants, fire cisterns, equipment to allow the use of salt water without sacrificing the useful life of expensive firefighting equipment, etc.	Select Board /Fire Dept		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Short term	Feasibility/engineering study with implementation guidelines for developing the most cost-effective, practical options for a reliable firefighting water supply: dry hydrants, fire cisterns, equipment to allow the use of salt water without sacrificing the useful life of expensive firefighting equipment, etc.	Select Board /Fire Dept		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Short term	Public awareness campaign re fire safety and outside burns, specifically addressing duff	Fire Dept / EMA		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Short term	Public awareness campaign re fire safety and outside burns, specifically addressing duff	Fire Dept / EMA		43.95510	-69.67553

Lincoln	Westport Isla			UNK	Short term	Installation of new water source to serve south end of island	Select Board /Fire Dept		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Short term	Installation of new water source to serve south end of island	Select Board /Fire Dept		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Engineering study re installation of box culvert on West Shore Road at Squam Creek	Select Board / Road Commissioner		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Engineering study re installation of box culvert on West Shore Road at Squam Creek	Select Board / Road Commissioner		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Installation of box culvert on West Shore Road at Squam Creek Crossing	Select Board / Road Commissioner		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Installation of box culvert on West Shore Road at Squam Creek Crossing	Select Board / Road Commissioner		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Engineering study re installation of box culvert on West Shore Road at Heal Cove Crossing	Select Board / Road Commissioner		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Engineering study re installation of box culvert on West Shore Road at Heal Cove Crossing	Select Board / Road Commissioner		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Installation of box culvert on West Shore Road at Heal Cove	Select Board / Road Commissioner		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Installation of box culvert on West Shore Road at Heal Cove	Select Board / Road Commissioner		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Engineering study re installation of box culvert on Post Office Road at Squam Creek Crossing	Select Board / Road Commissioner		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Engineering study re installation of box culvert on Post Office Road at Squam Creek Crossing	Select Board / Road Commissioner		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Installation of box culvert on Post Office Road	Select Board / Road Commissioner		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Installation of box culvert on Post Office Road	Select Board / Road Commissioner		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Vegetation management plan and a year of cutting the most at-risk trees/limbs for damaging power lines/obstructing roads with an initial evaluation of benefits	Select Board/Private contractor		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Vegetation management plan and a year of cutting the most at-risk trees/limbs for damaging power lines/obstructing roads with an initial evaluation of benefits	Select Board/Private contractor		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Short term	Installation of solar power source and digital sign at the head of the island	Select board / EMA		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Short term	Installation of solar power source and digital sign at the head of the island	Select board / EMA		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Doggett Rd: Building up the roadbed and installing a small box culvert	Select Board / Road Commissioner		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Doggett Rd: Building up the roadbed and installing a small box culvert	Select Board / Road Commissioner		43.95510	-69.67553

Lincoln	Westport Isla			UNK	Long term	Engineering/architectural plan for renovating or building new fire department to meet current equipment and safety needs and public accessibility for warming center	Select Board /Fire Dept		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Engineering/architectural plan for renovating or building new fire department to meet current equipment and safety needs and public accessibility for warming center	Select Board /Fire Dept		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Short term	Development of a map with all roadways identifying emergency access routes, vulnerabilities to flooding & other access limitations	Select board / EMA (LCEMA D4H?)		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Short term	Development of a map with all roadways identifying emergency access routes, vulnerabilities to flooding & other access limitations	Select board / EMA (LCEMA D4H?)		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Short term	Architectural/construction evaluation of Town Office for all-seasons walk-up window solution	Select board / EMA		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Short term	Architectural/construction evaluation of Town Office for all-seasons walk-up window solution	Select board / EMA		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Long term	Construction of Town Office all-seasons walk-up window solution for more adaptable service delivery during pandemic or similar events that require adaptable public service solutions	Select board / EMA		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Long term	Construction of Town Office all-seasons walk-up window solution for more adaptable service delivery during pandemic or similar events that require adaptable public service solutions	Select board / EMA		43.95510	-69.67553
Lincoln	Westport Isla			UNK	Short term	Small automatic generator for sand & salt shed – can be pulled up manually – very strenuous and time-consuming – lights and fans	Select board / EMA		43.87395	-69.71288
Lincoln	Westport Isla			UNK	Short term	Small automatic generator for sand & salt shed – can be pulled up manually – very strenuous and time-consuming – lights and fans	Select board / EMA		43.95510	-69.67553
Lincoln	Whitefield	1	Devine Rd	$12,000	Medium Term	1) Devine Rd; Ditch and line 2,000, add check dams as needed and add 30" x 40' HDPE cross culvert.	Road Commissioner	Deferred - lack of funds	43.90541	-69.71287

Lincoln	Whitefield		gravel base has to be put in and geotextile fabric put over the base, and then a foot of gravel put over that. We are redoing 1400' on Hollywood Blvd this year and hope to repair small sections of 2 other roads in town as well. This project will demonstrate how well the reconstructed roads stand up for many years and the need for patching should diminish significantly.	$25,000	Long term	Town has started a gravel reconstruction program. Several of our gravel roads become impassable for 2-3 weeks in the Spring. This affects emergency vehicle response, mail, schoolbus traffic, as well as residential traffic. It is costly to reconstruct these roads correctly. A solid (new) gravel base has to be put in and geotextile fabric put over the base, and then a foot of gravel put over that. We are redoing 1400' on Hollywood Blvd this year and hope to repair small sections of 2 other roads in town as well. This project will demonstrate how well the reconstructed roads stand up for many years and the need for patching should diminish significantly.	Selectboard	Deferred – Lack of Funds	44.13211	-69.60227
Lincoln	Whitefield			UNK	Long term as funding is prohibitive	The parking area at our Sand/Salt shed is in need of repaving. To do this job correctly, 2-3 feet of current surface has to be removed and new gravel put in and compacted before it can be paved. Reason for this is each year we put up to 3500 yards of sand and salt in the shed and the same amount is removed and used on the winter roads. This requires many truckloads of very heavy vehicle traffic on this surface. Therefore, a good foundation should allow it to last much longer. This is something we realize needs to be done, but we just don't have the funding necessary.	Selectboard	Deferred – lack of funds		
Lincoln	Whitefield			UNK	Medium Term	Town is in the process of acquiring a speed readout sign that can be placed at different locations through the year to help decrease speeding in town. Town will take ownership of this equipment and will have to purchase a trailer to allow it to be relocated easily. Not sure of the cost of the trailer or other equipment needed yet.	Selectboard	Deferred – Lack of Funds		
Lincoln	Whitefield			UNK	Long term	Town would also like to install a flashing light system at our elementary school. DOT says it is not their responsibility and the RSU can't/won't do it because of cost and possibly setting a precedent. It appears that for this to happen, the town will have to pay for it. A grant for this would be most appreciated.	Selectboard	Deferred – Lack of Funds		
Lincoln	Wiscasset	1	Foley Rd	$3,000	Short Term	1) Foley Rd; Add 24" x 40' overflow HDPE culvert.	Public Works.	Deferred — lack of funds	44.01742	-69.67981

Lincoln	Wiscasset	2	Loweltown Rd	$35,000	Long Term	2) Loweltown Rd; Upsize existing twin 30" x 40' HDPE culverts with 8' x 4' x 40'bottomless box culvert.	Public Works.	Deferred - lack of funds	44.02590	-69.71128
Lincoln	Wiscasset	3	Potties Cove Rd	$4,000	Short Term	3) Potties Cove Rd; Ditch 200' and add 15" x 40' HDPE cross culvert.	Public Works.	Deferred — lack of funds	43.99682	-69.67914
Lincoln	Wiscasset	4	Old Dresden Rd	$3,500	Short Term	4) Old Dresden Rd; Add (1) 15" x 40' HDPE cross culvert.	Public Works	Deferred — lack of funds	44.04421	-69.70953
Lincoln	Wiscasset	5	Pinewood Dr	$3,500	Short Term	5) Pinewood Dr; Upsize and realign with 15" x 40' HDPE cross culvert.	Public Works.	Deferred - lack of funds	43.98839	-69.69593
Lincoln	Wiscasset	6	Public Works Garage	$30,000	Long term	6) Public Works Garage; Upsize 400' x 24" culvert with 30" x 400' HDPE culvert.	Public Works.	Deferred - lack of funds	44.00761	-69.66517
Lincoln	Wiscasset			$600,000	Long term	Replace culvert on Ferry Landing Road	Public Works	Schedule – passed with town vote	43.96287	-69.70137
Lincoln	Wiscasset			$100,000	Long term	Replace culvert on Ferry Landing Road	Public Works	Schedule – passed with town vote	44.02029	-69.68968
Lincoln	Wiscasset			$600,000	Short term	Tree removal on Willow Lane	Public Works	Deferred – lack of funds	43.96287	-69.70137
Lincoln	Wiscasset			$100,000	Short term	Tree removal on Willow Lane	Public Works	Deferred – lack of funds	44.02029	-69.68968
Oxford	Andover		Covered Bridge Road at Ellis River	$100,000	Long Term	Covered Bridge Road at Ellis River Bank Stabilization: Reshape slope, stabilize bank, install erosion control, repave. Materials: Riprap, hay, seed, gravel, silt fence, geosynthetics, pavement, etc.		Deferred/Lack of Funds	44.59337	-70.73341
Oxford	Andover		Upton Road (Section 2)	$50,000	Short Term	Upton Road Bank Stabilization (Section 2): Reshape slope, stabilize bank (50' x 40'), hay and seed, repave, realign guardrail. Materials: Riprap, gravel, hay, seed, geosynthetics , silt fence, guardrail, pavement		Deferred/Lack of Funds	44.63727	-70.79356
Oxford	Bethel		Baker Road	$40,000	Short Term	Baker Road: Upsize a 4' x 20' CMP culvert with a 6' x 30' bottomless concrete box culvert. Materials: Culvert, gravel, geotex, riprap, seed, hay, asphalt		Deferred/Lack of Funds	44.36252	-70.78486
Oxford	Bethel		Intervale Road	$57,000	Medium Term	Intervale Road: Elevate road (900'), improve drainage by increasing culvert sizes, ditching and riprap.		Deferred/Lack of Funds	44.46593	-70.72513
Oxford	Bethel		Kimball Hill Road	$35,000	Short Term	Kimball Hill Road: Ditch and stone line 2,000' of roadyway, upsize (3) culverts. Materials: Gravel, riprap, geotex, culverts		Deferred/Lack of Funds	44.45526	-70.70426
Oxford	Bethel		Paradise Road	$85,000	Medium Term	Paradise Road: Remove trees, ditch and shoulder work, riprap 7,300', upsize (3) culverts. Materials: Gravel, riprap, geotex, culverts		Deferred/Lack of Funds	44.39069	-70.77340
Oxford	Bethel		Skillings Road	$15,000	Short Term	Skillings Road: Ditch and stone line 800', upgrade culvert sizes. Materials: Riprap, geotex, gravel, culverts		Deferred/Lack of Funds	44.37117	-70.80181
Oxford	Brownfield		Brownfield	UNK	Long Term	Improve ditching, upsize culverts as needed.		New		
Oxford	Buckfield		Purkis Road	$40,000	Short Term	Purkis Road: Upsize an 8' CMP to a 12' concrete box culvert, elevate road to accommodate culvert, repave. Materials: (1) 12' concrete box culvert, gravel, riprap, pavement, hay, seed		Project underway in 2013; slightly modified. Using twin culverts instead of (1) box culvert with town funds.	44.30323	-70.31830
Oxford	Byron		Dingle Hill Road	$72,000	Medium Term	Dingle Hill Road: Ditch 7,500' and add cross culverts as needed, widen narrow section of road.		Deferred/Lack of Funds	44.73063	-70.62142
Oxford	Byron		Garland Pond Road	$80,000	Medium Term	Garland Pond Road: Upgrade surface and base gravel, ditch and add cross culverts.		Deferred/Lack of Funds	44.69465	-70.68946

Oxford	Byron		Lohanes Farm Road	$195,000	Long Term	Lohanes Farm Road: Improve drainage, ditch and upsize culverts on 4 miles of road.		Deferred/Lack of Funds	44.68716	-70.70771
Oxford	Canton		Access Road to Pinacle Health and Rehab	$14,000	Short Term	Access Road to Pinacle Health and Rehab: Develop new access road to Pinacle Health and Rehab to eliminate the need to evacuate the facility if Route 108 is flooded. Flooding in December 2003 forced the evacuation of 104 elderly residents because there is no access during significant flooding. This facility was also evacuated in 1987. Cost of evacuation and sheltering in 2003 was $15,000.		Deferred/Lack of Funds	44.44162	-70.31729
Oxford	Canton		Bixby Road	$50,000	Medium Term	Bixby Road: Elevate road (1.5' x 200'). Equipment: Back hoe, grader, trucks, compactor		Deferred/Lack of Funds	44.44711	-70.31038
Oxford	Canton		Canton Mountain Road	$30,000	Short Term	Canton Mountain Road: Elevate road (6' x 1,000'), recrown, ditch (1,000'). Materials: Gravel, riprap, geosynthetics, etc.		Deferred/Lack of Funds	44.51801	-70.27700
Oxford	Canton		Farrand Hill Road	$300,000	Medium Term	Farrand Hill Road: Upsize (2) culverts, recrown and repave ½ mile, ditch. Materials: Gravel, geosynthetics, pavement, riprap, hay, seed		New	44.40442	-70.28691
Oxford	Canton		Riveer Road	$250,000	Long Term	Riveer Road: Relocate road due to proximity of road to the Androscoggin River. Materials: Acquire property, gravel, pavement. Equipment: Grader, trucks, compactor		New	44.48582	-70.34330
Oxford	Denmark		Allen Road	$78,000	Medium Term	Allen Road: Ditch 6,000', stone line 3,000' and install check dams on 1,500'.		Deferred/Lack of Funds	43.93834	-70.78887
Oxford	Denmark		Bushrow Road	$38,000	Short Term	Bushrow Road: Ditch 2,000', line stone line 1,000' and install check dams.		Deferred/Lack of Funds	43.95891	-70.78056
Oxford	Dixfield		Holt Hill Road	$50,000	Medium Term	Holt Hill Road: Recrown. Materials: Gravel, hay, seed		Paved	44.54505	-70.44481
Oxford	Dixfield		Norton Road	$50,000	Medium Term	Norton Road: Recrown. Materials: Gravel, hay, seed		Under Construction	44.55678	-70.38547
Oxford	Dixfield		Rollins Ridge Road (Section 1)	$100,000	Long Term	Rollins Ridge Road (Section 1): Ditch and reshape road. Materials: Riprap, culverts, geotextile, hay and seed		Deferred/Lack of Funds	44.55482	-70.31067
Oxford	Dixfield		Town Garage	$1,000,000	Long Term	Relocation of Town Garage: Relocate Highway and Police Departments out of floodplain.		Deferred/Lack of Funds	44.53103	-70.45550
Oxford	Fryeburg		Old River Road	$72,000	Medium Term	Old River Road: Elevate 4,000' x 21' x 3' on average, stabilize shoulders, ditch 6,000' and upsize (2) cross culverts.		Deferred/Lack of Funds	44.12354	-70.95215
Oxford	Gilead		Bog Road	$15,000	Short Term	Bog Road: Upgrade culverts, ditching, riprap to improve drainage.		Deferred/Lack of Funds	44.38212	-70.90498
Oxford	Gilead		Lary Bridge	$120,000	Long Term	Lary Bridge: Armoring abutments, improve drainage.		Deferred/Lack of Funds	44.39868	-70.99489
Oxford	Gilead		North Road (Section 2)	$8,000	Short Term	Northern Road (Section 2): Upsize and lengthen (2) 18'' x 20' CMP's with 24'' x 40' HDPE's and riprap intake and outlet and install plunge pool at outlet.		Deferred/Lack of Funds	44.40003	-71.00518
Oxford	Greenwood		Dunham Road	$20,000	Short Term	Dunham Road: Elevate road (1' x 800'), recrown, ditch (800'). Materials: Gravel, riprap, hay, seed		One side of road ditched and lined with stone with town funds.	44.36635	-70.65709
Oxford	Greenwood		Equipment Storage and Sand/Salt Building	$25,000	Short Term	Relocate the equipment storage and sand/salt building to a place not susceptible to flooding.		Deferred/Lack of Funds	44.40185	-70.69207
Oxford	Greenwood		Greenwood	UNK	Short Term	Install dry hydrants for fire protection.		Deferred/Lack of Funds		

Oxford	Greenwood		Greenwood Road	$250,000	Long Term	Greenwood Road: Upgrade approximately 1/2 mile of road north of Martin Road, including culvert improvement.		Deferred/Lack of Funds	44.32815	-70.65417
Oxford	Greenwood		Greenwood Road at Howe Brook	$80,000	Medium Term	Greenwood Road at Howe Brook: Upgrade twin 5' x 40' CMP's to concrete, box culvert (10-12' x 40'), elevate road, repave. Materials: (1) 10-12' x 40' concrete box culvert, gravel, geosynthetics, pavement		Deferred/Lack of Funds	44.33461	-70.66167
Oxford	Greenwood		Howe Hill Road (Section 1)	$300,000	Long Term	Howe Hill Road (Section 1): Upsize (2) 48' x 40' CMP's to concrete box culverts, upsize (2) 36' x 40' CMP's to concrete box culverts, ditch (4,500'), elevate road (3' x 500'), armor ditches. Materials: (4) concrete box culverts, gravel, riprap, hay, seed, geosynthetics		TIF funds being saved up for project .	44.31787	-70.65051
Oxford	Greenwood		Howe Hill Road at Howe Brook (Section 3)	$70,000	Medium Term	Howe Hill Road at Howe Brook (Section 3): Upsize bottomless, cement box culvert from 6' x 5' x 30' to 6' x 8' x 40'. Materials: (1) 6' x 8' x 40' concrete bottomless box culvert, etc.		TIF funds being saved up for project .	44.31787	-70.65051
Oxford	Greenwood		Kangas Road	$25,000	Short Term	Kangas Road: Upgrade 3' x 2' x 20' metal arch culvert to 4' x 3' x 30' arch, elevate road. Materials: Gravel, riprap, culvert		Deferred/Lack of Funds	44.32844	-70.63304
Oxford	Greenwood		Kangas Road	$40,000	Short Term	Kangas Road: Upgrade 3' x 2' x 20' metal arch culvert to 4' x 3' x 30' arch, elevate road. Materials: Gravel, riprap, culvert		Deferred/Lack of Funds	44.33238	-70.63577
Oxford	Greenwood		Kangas Road	$25,000	Short Term	Kangas Road: Upgrade culvert and build up a 1/4 mile area .		Deferred/Lack of Funds	44.32844	-70.63304
Oxford	Greenwood		Kangas Road	$40,000	Short Term	Kangas Road: Upgrade culvert and build up a 1/4 mile area .		Deferred/Lack of Funds	44.33238	-70.63577
Oxford	Greenwood		Rowe Hill Road	$300,000	Long Term	Rowe Hill Road: Ditch (2,700'), armor ditches, widen road (10' x 2,700'), add (6) cross culverts (24' x 50'), upsize (10) driveway pipes from 15' to 18', elevate road. Materials: Riprap, gravel, (6) 24' by 50ft HDPE culverts, (10) 18' driveway culverts, hay, seed		TIF funds being saved up for project .	44.36612	-70.63929
Oxford	Greenwood		Town Hall	$30,000	Short Term	Town Hall Mold: Bleach and scrub basement, fill in with concrete, install French drains.		Deferred/Lack of Funds	44.40166	-70.69181
Oxford	Greenwood		Town Halll	$20,000	Short Term	Town Hall: Improve drainage and stabilize soils around the Town Hall.		Municipal building sold; Town Hall deferred; lack of funds.	44.40166	-70.69181
Oxford	Greenwood		Town-owned Bridges	UNK	Long Term	Ames Brook Bridge on Greenwood Road: Abutment improvements. Sanborn River Bridge on Patch Mountain Road: West abutment and girder improvements. School Brook Bridge on Irish Neighborhood Road; Rail and surface repair.		Deferred/Lack of Funds		
Oxford	Greenwood		Young Hill Road	$100,000	Long Term	Young Hill Road: Improve drainage and build up road surface .		Deferred/Lack of Funds	44.31798	-70.60472
Oxford	Hanover		Davis Road	$25,000	Short Term	Davis Road: Recrown road, ditch (400'). Materials: Gravel, hay, seed, riprap		Deferred/Lack of Funds	44.48638	-70.75900
Oxford	Hanover		Howard Pond Road (Stage 2)	$21,000	Short Term	Howard Pond Road (Stage 2): Ditch (1,300'), armor ditches, culverts, pave. Materials: Gravel, culverts, riprap		Deferred/Lack of Funds	44.50434	-70.71145
Oxford	Hanover		Howard Pond Road (Stage 3)	$40,000	Short Term	Howard Pond Road (Stage 3): Ditch (1,600'), armor ditches, culverts, pave. Materials: Gravel, culverts, riprap		Deferred/Lack of Funds	44.50434	-70.71145

Oxford	Hanover		Howard Pond Road (Stage 4)	$40,000	Short Term	Howard Pond Road (Stage 4): Ditch (1,600'), armor ditches, culverts, pave. Materials: Gravel, culverts, riprap		Deferred/Lack of Funds	44.50434	-70.71145
Oxford	Hanover		Second Bridge	$100,000	Long Term	Second Bridge: Upgrade 6' CMP to bottomless, concrete, box culvert, armor slope. Materials: 8' box culvert, gravel, geosynthetics, hay, seed, fill, riprap…		Deferred/Lack of Funds	44.50089	-70.67392
Oxford	Hanover		South Shore Road (Section 2)	$25,000	Short Term	South Shore Road (Section 2): Regrade, recrown road, stabilize small portion of bank. Materials: Gravel, geosynthetics, riprap, hay, seed, small drains		Deferred/Lack of Funds	44.50385	-70.71181
Oxford	Hartford		Bear Mountain Road	$5,000	Short Term	Bear Mountain Road: Restore stream channel 75'.		Deferred/Lack of Funds	44.36215	-70.28982
Oxford	Hartford		Carey Hill Road	$9,500	Short Term	Carey Hill Road: Ditch 3,000' and add check dams.		Deferred/Lack of Funds	44.35277	-70.37190
Oxford	Hartford		Cowett Road	$7,000	Short Term	Cowett Road: Lengthen 5' x 6' x 11' stone bottomless box culvert by having mason extend stone work 4' on both ends.		Deferred/Lack of Funds	44.34032	-70.29837
Oxford	Hartford		Darrington Road	$28,000	Short Term	Darrington Road: Upsize existing 60'' x 24' culvert with 6' x 8' x 40' bottomless box culvert with wingwalls.		Deferred/Lack of Funds	44.43425	-70.37406
Oxford	Hartford		Davenport Road (Site 2)	$28,000	Short Term	Davenport Road (Site 2): Upsize existing 60'' x 24' culvert with 6' x 8' x 40' bottomless box culvert with wingwalls.		Deferred/Lack of Funds	44.43425	-70.37406
Oxford	Hartford		Goding Road	$28,000	Short Term	Goding Road: Upsize existing 60'' x 24' culvert with 6' x 8' x 40' bottomless box culvert with wingwalls .		Deferred/Lack of Funds	44.42773	-70.35290
Oxford	Hartford		Gurney Hill Road	$18,000	Short Term	Gurney Hill Road: Ditch 3,000' and stone line 1,000'.		Deferred/Lack of Funds	44.35771	-70.34121
Oxford	Hebron		Allen Road	$75,000	Medium Term	Allen Road: Upsize existing 8' x 30' CMP with 10' x 8' x 40' bottomless box culvert with headwalls. Size to be determined by H&H study.		Deferred/Lack of Funds	44.21051	-70.32883
Oxford	Hebron		Back Street	$65,000	Medium Term	Back Street: Ditch and stone line 2,500', upsize (5) 15'' x 40' culverts to 18'' x 40'.		Deferred/Lack of Funds	44.21385	-70.41806
Oxford	Hebron		Hebron Center Road	$48,000	Short Term	Hebron Center Road: Ditch 10,000', upsize (8-10) cross culverts from 15'' x 40' to 18'' x 40' and from 24'' x 40' to 36'' x 40', riprap intake and outlets and repave.		Deferred/Lack of Funds	44.21446	-70.38791
Oxford	Hiram		River Road (Section 1)	$85,000	Medium Term	River Road (Section 1): Elevate road (1,150') 3', add (3) culverts, (2) 18", (1) 24" due to recurring erosion. Rebuild road and pave. Materials: Gravel, hay, seed, pavement		Deferred/Lack of Funds	43.80644	-70.79867
Oxford	Hiram		River Road at Jim Sargeants Brook (Section 2)	$130,000	Long Term	River Road at Jim Sargeants Brook (Section 2): Elevate road 2.5' x 250', upgrade twin 4' CMP's to bottomless box culvert, repave. Materials: Gravel, riprap, geosynthetics, concrete, bottomless box culvert, hay, seed, pavement, erosion control		Deferred/Lack of Funds	43.84540	-70.79789
Oxford	Hiram		Tripptown Road near Stanley Pond	$175,000	Long Term	Tripptown Road near Stanley Pond: Elevate 250' of road, 5' box culvert, repave. Materials: Gravel, riprap, geosynthetics, concrete, bottomless box culvert, hay, seed, pavement		Deferred/Lack of Funds	43.84041	-70.86077
Oxford	Lincoln Plantation		Bennett Road, aka North Road	$22,000	Short Term	Bennett Road, aka North Road: Elevate three sections of roadway 150' x 20' x 2' on average, 100' x 20 x 2' on average and 150' x 20' x 2' on average, stabilize shoulders.		Deferred/Lack of Funds	44.92894	-71.03861

Oxford	Lincoln Plantation		Bennett Road, aka North Road	$10,000	Short Term	Bennett Road, aka North Road: Move 150' of road away from eroding riverbank.		Deferred/Lack of Funds	44.92320	-71.03796
Oxford	Lincoln Plantation		Dam Road	$15,000	Short Term	Dam Road: Improve drainage, including ditching and larger culverts, and elevate road base and pave.		Deferred/Lack of Funds	44.94513	-70.99785
Oxford	Lincoln Plantation		Mt. View Road	$150,000	Long Term	Mt. View Road: Improve drainage, including ditching and larger culverts and elevate road base.		Deferred/Lack of Funds	44.94306	-71.01472
Oxford	Lovell		Lovell	UNK	Long Term	Upgrade culverts and ditches. Assess and prioritize problem areas for improvements.		New		
Oxford	Magalloway Plantation		Magalloway Plantation	UNK	Short Term	Install a second dry hydrant for fire fighting.		Deferred/Lack of Funds		
Oxford	Mexico		Coburn Avenue	$100,000	Long Term	Coburn Avenue: Upsize (8) 12' x 20' CMP's to 15' x 30' HDPE pipes, elevate road 1' x 2,600', ditch (2,500'). Materials: (8) 15' x 30' HDPE culverts, gravel, riprap, geotextile fabric, hay, seed		Deferred/Lack of Funds	44.55378	-70.46411
Oxford	Mexico		Mexico	UNK	Long Term	Acquisition/Demolition in Mexico Flats: Acquire/Demolish 80 structures in floodplain, relocate Fire Station.		Acquired three properties, tore down buildings, retained lot.		
Oxford	Mexico		Mexico	UNK	Long Term	Relocate Police and Fire Stations: Both in floodplain.		Police Station relocated with town funds. Fire Station to be determined.		
Oxford	Mexico		Thompson Hill Road	$350,000	Long Term	Thompson Hill Road: Ditch (2,000'), upgrade from small bridge to concrete, box culvert, reshape road. Materials: (1) 8' concrete, bottomless box culvert, gravel, riprap, geosynthetics, hay, seed		Deferred/Lack of Funds	44.57231	-70.55247
Oxford	Mexico		Thurston Dam	$10,000	Short Term	River Gauge at Thurston Dam: Install river gauge.		Deferred/Lack of Funds	44.58847	-70.56276
Oxford	Newry		Sunday River Road (Section 2)	$250,000	Long Term	Sunday River Road Bank Stabilization (Section 2):- Stabilize and armor road bank, install perforated pipe to draw water away from road, reshape road and install geosynthetics, upgrade 36' CMP. Materials: Geosynthetics material, gabion baskets, boulders, riprap, gravel, perforated pipe (300'), (1) 36' x 50' HDPE culvert		Deferred/Lack of Funds	44.48046	-70.83490
Oxford	Norway		Norway	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funds		
Oxford	Otisfield		Cobbs Hills Road	$45,000	Short Term	Cobbs Hill Road: Ditch, upsize culverts, and provide phosphorous treatment. Materials: Riprap, hay, seed, culverts (size?)		Deferred/Lack of Funds	44.08239	-70.51726
Oxford	Otisfield		Forest Edwards Road	$25,000	Short Term	Forest Edwards Road: Ditching, resurface, upsize culverts.		Deferred/Lack of Funds	44.05110	-70.49467
Oxford	Otisfield		Ivory Hill	$150,000	Long Term	Ivory Hill: Armor ditches, recrown road, upsize (1) culvert. Materials: Riprap, gravel, (1) HDPE culvert, hay, seed		Deferred/Lack of Funds	44.07239	-70.51323
Oxford	Otisfield		Jesse Mills Road	$100,000	Long Term	Jesse Mills Road: Armor ditches and upsize culverts where needed. Materials: Multiple culverts (size?), riprap, hay, seed		Deferred/Lack of Funds	44.09638	-70.60076
Oxford	Otisfield		Powhatan Road	$100,000	Short Term	Powhatan Road: Casco to Coon Road, rebuild ditches, culverts, base material, surface.		Deferred/Lack of Funds	44.05419	-70.52350
Oxford	Otisfield		Scribner Hill	$27,000	Short Term	Scribner Hill: Blast ledge, ditch (600'), armor ditches. Materials: Explosive, riprap, hay, seed		Deferred/Lack of Funds	44.07297	-70.52380

Oxford	Otisfield		Shore Road	$20,000	Short Term	Shore Road: Reshape ditches, reshape road, armor ditches. Materials: Gravel, hay, seed, riprap, geotextile		Deferred/Lack of Funds	44.05970	-70.49143
Oxford	Otisfield		Tamworth Road	$300,000	Long Term	Tamworth Road: Ditch, upsize culverts, elevate road. Materials: Riprap, gravel, hay, seed, culverts, geosynthetics		Deferred/Lack of Funds	44.07183	-70.59587
Oxford	Otisfield		West Andrews Road	$40,000	Short Term	West Andrews Road: Armor ditches, upsize culverts. Materials: Riprap, hay, seed, culverts		Deferred/Lack of Funds	44.14242	-70.58561
Oxford	Oxford		Cold Water Brook Road	$35,000	Short Term	Cold Water Brook Road: Improve drainage and build up road surface.		Deferred/Lack of Funds	44.18689	-70.52827
Oxford	Oxford		East Oxford Road	$60,000	Medium Term	East Oxford Road: Reshape ditches, install stone check dams. Materials: Riprap, hay, seed		Deferred/Lack of Funds	44.17525	-70.46358
Oxford	Oxford		Hebron Road	$35,000	Short Term	Hebron Road: Improve drainage and build up road surface.		Deferred/Lack of Funds	44.18672	-70.44556
Oxford	Oxford		Noble Road	$50,000	Medium Term	Noble Road: Reshape ditch line (3,600'), realign/upsize culverts, armor. Materials: Riprap, hay, seed, geosynthetics, new culvert(s)		Deferred/Lack of Funds	44.19523	-70.45573
Oxford	Oxford		Number Six Road	$70,000	Medium Term	Number Six Road: Add new culvert, elevate road (2.5' x 50'), armor. Materials: (1) 36' by 40' HDPE culvert, gravel, riprap, geotextile fabric, hay, seed		Deferred/Lack of Funds	44.15396	-70.47300
Oxford	Oxford		Paine Road	$85,000	Medium Term	Paine Road: Upgrade twin culverts with concrete, bottomless box culvert, regrade embankment slope. Materials: (1) 8-10' bottomless box culvert, riprap, gravel, hay, seed, geosynthetics		Deferred/Lack of Funds	44.15841	-70.43243
Oxford	Oxford		Robinson Hill Road	$96,000	Medium Term	Robinson Hill Road: Ditch (1,000'), upsize (3) 18' culverts, armor. Materials: Riprap, hay, seed, geosynthetics, (3) 24' HDPE culverts, gravel		Deferred/Lack of Funds	44.14583	-70.43380
Oxford	Oxford		Webber Brook Road	$35,000	Short Term	Webber Brook Road: Improve drainage and build up road surface.		Deferred/Lack of Funds	44.17895	-70.53283
Oxford	Paris		King Hill	$9,630	Short Term	King Hill: Upgrade (2) 18" culverts to 24" culverts, repair 20' x 40' section of road. Materials: Culvert, gravel, geotex, riprap, seed, hay, asphalt		New	44.23053	-70.45194
Oxford	Paris		Mink Farm Road	$10,000	Short Term	Mink Farm Road: Upgrade to a 36" box culvert. Materials: 36" box culvert, gravel, geosynthetics, pavement		New	44.25307	-70.50175
Oxford	Paris		Streaked Mountain Road	$5,735	Short Term	Streaked Mountain Road: Upgrade a 24" culvert to 36" culvert. Materials: Culvert, gravel, geotex, riprap, seed, hay, asphalt		New	44.26817	-70.41701
Oxford	Peru		Dickvale Road	$90,000	Medium Term	Dickvale Road: Blast, ditch (1,000'), repave, install erosion control. Materials: Explosive, riprap, gravel, geotextile		Deferred/Lack of Funds	44.47490	-70.49602
Oxford	Peru		East Shore and Packard Road (Intersection)	$65,000	Medium Term	East Shore and Packard Road (Intersection): Enlarge (4) culverts (various sizes), repave. Materials: (4) new HDPE culverts, riprap, gravel, hay, seed, geosynthetics, pavement		Deferred/Lack of Funds	44.47043	-70.38560
Oxford	Peru		Holman Road	$45,000	Short Term	Holman Road: Upsize from 24' to 36' x 40' HDPE culvert, armor ditches (1,800'). Materials: (1) 36' x 40' HDPE culvert, riprap, gravel, geotextile		Deferred/Lack of Funds	44.48422	-70.37730

Oxford	Peru		Lacroix Road	$50,000	Medium Term	LaCroix Road: Upsize culvert from 36' to 48' x 30' HDPE, elevate road, armor culvert. Materials: (1) 4' x 20' HDPE culvert, gravel, geotextile, hay, seed, riprap		Deferred/Lack of Funds	44.46299	-70.47011
Oxford	Peru		Tower Road	$50,000	Medium Term	Tower Road: Blast, ditch (1,200'), armor ditches, upsize culverts (various sizes). Materials: Explosive, riprap, gravel, multiple HDPE culverts, geosynthetics, hay, seed		Deferred/Lack of Funds	44.47042	-70.36575
Oxford	Peru		Valley Road	$50,000	Medium Term	Valley Road: Riprap slope (300'), lengthen culvert (10'), armor shoulder. Materials: Riprap, new culvert (24"), gravel		Deferred/Lack of Funds	44.50081	-70.43043
Oxford	Porter		Pine Street	$34,000	Short Term	Pine Street: Upsize existing bridge with 8' x 10' x 40' bottomless box culvert with wingwalls.		Deferred/Lack of Funds	43.81414	-70.88395
Oxford	Porter		Porterfield Road	$149,000	Long Term	Porterfield Road: Upsize twin 36'' x 40' culverts with 6' x 10' x 40' bottomless box culvert with wingwalls.		Deferred/Lack of Funds	43.86642	-70.91193
Oxford	Porter		Speck Pond Road	$30,000	Short Term	Speck Pond Road: Upsize twin 36'' x 40' culverts with 6' x 10' x 40' bottomless box culvert with wingwalls.		Deferred/Lack of Funds	43.82001	-70.90156
Oxford	Roxbury		Old County Road area near campground	$350,000	Short Term	Old County Road area near campground: Stabilize stream bank to reduce or eliminate erosion.		New	44.68085	-70.64940
Oxford	Roxbury		Horseshoe Valley Road	$43,000	Short Term	Horseshoe Valley Road: Ditch 7,000' and upsize (20) existing culverts to 18'' x 40'.		Deferred/Lack of Funds	44.60397	-70.63953
Oxford	Roxbury		Old County Road	$17,500	Short Term	Old County Road: Upsize twin 24'' x 40' with 4' x 3' x 40' bottomless box culvert.		Deferred/Lack of Funds	44.68085	-70.64940
Oxford	Roxbury		Town Office	$45,000	Short Term	Purchase and install generator at Town Office.		New	44.62167	-70.58055
Oxford	Rumford		Swain Road at Bean Brook (Section 2)	$75,000	Medium Term	Swain Road at Bean Brook (Section 2): Reshape and stabilize banking of Bean Brook (300'), elevate road (400'), repave road. Materials: Gravel, riprap, filter fabric, hot mix asphalt, loam		Deferred/Lack of Funds	44.55239	-70.56849
Oxford	Rumford		Hall Hill Road	$65,000	Medium Term	Hall Hill Road: Ditch (1,600'), riprap ditches, pave 2' shoulder. Materials: Riprap, filter fabric, hot mix asphalt, hay, grass seed, gravel		Deferred/Lack of Funds	44.51088	-70.54796
Oxford	Rumford		Holyoke Avenue	$30,000	Short Term	Holyoke Avenue: Upsize existing culvert to 36" x 40', add 24" x 30' relief culvert, repave. Materials: 36" x 40' culvert, 24" x 30' culvert, gravel, hot mix asphalt, loam, hay, grass seed		Deferred/Lack of Funds	44.54475	-70.55803
Oxford	Rumford		Martin Road	$20,000	Short Term	Martin Road: Ditch (150'), rip rap ditches, upsize driveway culvert from 18" to 30". Materials: 30" x 20' oval culvert, gravel, riprap, loam, hay, grass seed		Deferred/Lack of Funds	44.51822	-70.65892
Oxford	Rumford		Milton Road	$40,000	Short Term	Milton Road: Install additional culvert. Materials: 36" x 60' culvert, geotextile, gravel, hot mix asphalt, riprap, loam, hay, grass seed		Deferred/Lack of Funds	44.46925	-70.61035
Oxford	Rumford		Red Hill Road	$175,000	Long Term	Reed Hill Road: Ditch (1,500'), upsize (5-8) culverts (various sizes), blasting of ledge in ditch, pave road. Materials: Riprap, gravel, culverts (HDPE), geosynthetics, dynamite		Deferred/Lack of Funds	44.54822	-70.64048
Oxford	Rumford		Rumford	UNK	Medium Term	Install fixed generator and connect to electrical system.		Deferred/Lack of Funds		

Oxford	Rumford		Swain Road (Section 3)	$100,000	Long Term	Swain Road (Section 3): Install additional culvert to prevent flooding of road. Materials: 30" x 40' culvert, gravel, riprap, filter fabric, hot mix asphalt, hay, grass seed		Deferred/Lack of Funds	44.55504	-70.58038
Oxford	Rumford		Swift River Bank	$100,000	Long Term	Swift River Bank Stabilization: Reshape and stabilize bank, install erosion control. Materials: Riprap, filter fabric, gravel, loam, grass seed, hay		Deferred/Lack of Funds	44.64167	-70.58817
Oxford	Stoneham		Adams Road	$4,000	Short Term	Adams Road: Upsize (2) 12'' x 32' culverts with 18'' x 40' HDPE's and riprap intake and outlet.		Deferred/Lack of Funds	44.25254	-70.91201
Oxford	Stoneham		Allen Road	$1,200	Short Term	Allen Road: Upsize culvert 12'' x 20' to 18'' x 30' HDPE, and riprap intake and outlet.		Deferred/Lack of Funds	44.24362	-70.82519
Oxford	Stoneham		Hut Road	$18,000	Short Term	Hut Road: Ditch 2,500' and upsize (4) 12'' x 32' cross culverts to 18'' x 40' and riprap inlet and outlet.		Deferred/Lack of Funds	44.25943	-70.89680
Oxford	Stow		Waley Road	$9,000	Short Term	Waley Road: Elevate 1,000' x 14' x 10''.		Deferred/Lack of Funds	44.16181	-70.97988
Oxford	Sumner		Black Mountain Road	$58,000	Medium Term	Black Mountain Road: Ditch (1,500'), upgrade culverts (multiple sizes). Materials: Gravel, multiple culverts (unknown sizes), riprap, hay, seed, geotextile		Deferred/Lack of Funds	44.41669	-70.46419
Oxford	Sumner		Bradeen Road	$28,000	Short Term	Bradeen Road: Ditch (1,500'), armor ditches. Materials: Riprap, hay, seed		Deferred/Lack of Funds	44.34316	-70.39455
Oxford	Sumner		DeCoster Road	$105,000	Long Term	DeCoster Road: Elevate road (2,500'), install culverts (various sizes). Materials: Gravel, multiple culverts (unknown sizes), riprap, hay, seed		Deferred/Lack of Funds	44.33298	-70.44804
Oxford	Sumner		Heath Hill Road	$55,000	Medium Term	Heath Hill Road: Elevate road (2' x 1,500'), install geotextile. Materials: Gravel, geotextile		Deferred/Lack of Funds	44.37977	-70.47061
Oxford	Sumner		Redding Road	$64,000	Medium Term	Redding Road: Ditch, armor ditches, elevate road by 1'. Materials: Gravel, riprap, geotextiles, grass seed		Deferred/Lack of Funds	44.41140	-70.50026
Oxford	Sweden		Berry Road	$20,000	Short Term	Berry Road: Improve drainage and upgrade culverts.		Deferred/Lack of Funds	44.08382	-70.83300
Oxford	Sweden		Black Mountain Road	$28,000	Short Term	Black Mountain Road: Ditch 6,000', elevate 100' x 20' x 2' on average, remove gravel and install geotextile in wet spot in road 50' x 20'.		Deferred/Lack of Funds	44.11510	-70.82969
Oxford	Sweden		Fern Drive	$16,000	Short Term	Fern Drive: Improve drainage and upgrade culverts.		Deferred/Lack of Funds	44.14202	-70.87383
Oxford	Sweden		Hardscrabble Road	$52,000	Medium Term	Hardscrabble Road: Ditch 13,000', grub 1,000' of ditch, add (6) 18" x 40" culverts and upsize (2) 12" x 40" culverts to 18" x 40".		Deferred/Lack of Funds	44.12647	-70.77317
Oxford	Sweden		Haskell Hill Road	$35,000	Short Term	Haskell Hill Road: Improve drainage, including riprap ditches and larger culverts. These roads are steep and mountainous; blasting may be required.		Deferred/Lack of Funds	44.14857	-70.78252
Oxford	Sweden		Ledge Hill Road	$7,000	Short Term	Ledge Hill Road: Ditch 1,000' and add (3) 15" x 30' driveway culverts.		Deferred/Lack of Funds	44.15696	-70.80254
Oxford	Sweden		Lee Gray Road	$25,000	Short Term	Gray Road: Improve drainage, including riprap ditches and larger culverts. These roads are steep and mountainous; blasting may be required.		Deferred/Lack of Funds	44.09707	-70.79628
Oxford	Sweden		Lee Road	$30,000	Short Term	Lee Road: Improve drainage, including riprap ditches and larger culverts. These roads are steep and mountainous; blasting may be required.		Deferred/Lack of Funds	44.09969	-70.79132
Oxford	Sweden		Marr Road	$18,000	Short Term	Marr Road: Improve drainage and upgrade culverts.		Deferred/Lack of Funds	44.12706	-70.77262

Oxford	Sweden		Perry Hill Road	$22,000	Short Term	Perry Hill Road: Ditch 5,000', remove ledge from ditch line as needed, add (2) 18" x 40" cross culverts and (1) 15" x 30' driveway culvert.		Deferred/Lack of Funds	44.16197	-70.81867
Oxford	Sweden		Plummers School Road	$65,000	Medium Term	Plumbers School Road: Ditch 20,000' and add (4) 18" x 40" cross culverts.		Deferred/Lack of Funds	44.14563	-70.81305
Oxford	Sweden		Ridlonville Road	$18,000	Short Term	Ridlonville Road: Improve drainage and upgrade culverts.		Deferred/Lack of Funds	44.11726	-70.76673
Oxford	Sweden		Sam Ingalls Road	$20,000	Short Term	Sam Ingalls Road: Improve drainage and upgrade culverts.		Deferred/Lack of Funds	44.09121	-70.80035
Oxford	Sweden		Smart's Hill Road	$30,000	Short Term	Smart's Hill Road: Improve drainage, including riprap ditches and larger culverts. These roads are steep and mountainous; blasting may be required.		Deferred/Lack of Funds	44.11269	-70.88955
Oxford	Sweden		Tapawingo Road	$30,000	Short Term	Tapawingo Road: Improve drainage, including riprap ditches and larger culverts. These roads are steep and mountainous; blasting may be required.		Deferred/Lack of Funds	44.13949	-70.82604
Oxford	Sweden		Webber Pond Road	$35,000	Short Term	Webber Pond Road: Improve drainage, including riprap ditches and larger culverts. These roads are steep and mountainous; blasting may be required.		Deferred/Lack of Funds	44.12486	-70.81468
Oxford	Sweden		Wint Road	$16,000	Short Term	Wint Road: Improve drainage and upgrade culverts.		Deferred/Lack of Funds	44.12604	-70.78401
Oxford	Unorganized Territory		Albany Township on Fernald Mills Bridge Road	$28,000	Short Term	Albany Township on Fernald Mills Bridge Road: Replace south abutment to restore stream channel and increase flow area.		Deferred/Lack of Funds	44.33156	-70.84356
Oxford	Unorganized Territory		Mason Township on Smith Road	$20,000	Short Term	Mason Township on Smith Road: Grade and pave 940' low water crossing, stabilize banks to allow high flow, low velocity water to cross the road, minimizing damage from flooding.		(lack of) Low water crossing graded but not paved. Project not successful without paving and keying in toe of road.	44.34050	-70.84028
Oxford	Upton		Upton	UNK	Long Term	Upsize culverts and improve ditching. Assess areas that are problematic and prioritize for improvements.		New		
Oxford	Waterford		Cider Mill Bridge on Back Street	$30,000	Short Term	Cider Mill Bridge on Back Street: Build up, reinforce and pour concrete slab similar to Scoggins Brook Bridge project on Bear Pond Road.		Deferred/Lack of Funds	44.16433	-70.71718
Oxford	Waterford		Five Kezars Road	$75,000	Medium Term	Five Kezars Road: Build up road, upgrade culverts, ditching and tree removal.		Deferred/Lack of Funds	44.20824	-70.79719
Oxford	Waterford		Hunts Corner Road Bridge	$250,000	Long Term	Hunts Corner Road Bridge: Building up road and bridge to mitigate flooding.		Deferred/Lack of Funds	44.27067	-70.72884
Oxford	Waterford		Purdy Road Bridge	$150,000	Long Term	Upgrade Purdy Road Bridge.		Deferred/Lack of Funds	44.18612	-70.70826
Oxford	Waterford		Rice Road	$75,000	Medium Term	Rice Road: Build up road, upgrade culverts, ditching and tree removal.		Deferred/Lack of Funds	44.21732	-70.72556
Oxford	West Paris		Ellingwood Road at Moody Brook	$70,000	Medium Term	Ellingwood Road at Moody Brook: Upgrade (2) sets of twin CMP culverts to 6-8' concrete box culverts, realign channel to eliminate 90 degree turn. Materials: (2) 6-8' bottomless, concrete box culverts, crane		Deferred/Lack of Funds	44.30932	-70.48853
Oxford	West Paris		Porter Road	$20,000	Short Term	Porter Road: Upgrade stone culvert to 4' x 60' HDPE, armor outlet. Materials: (1) 4' x 60' HDPE culvert, riprap, geotextile, excavator		Deferred/Lack of Funds	44.28942	-70.56124
Oxford	West Paris		Stearns Hill Road	$40,000	Short Term	Stearns Hill Road: Upgrade (2) stone culverts with (2) 4' x 60' HDPE culverts, armor outlets.		Deferred/Lack of Funds	44.30574	-70.51534

Oxford	West Paris		Tuelltown Road at Bog Brook	$15,000	Short Term	Tuelltown Road at Bog Brook: Add 36' by 40' relief pipe (HDPE), armor outlet. Materials: (1) 36' x 40' HDPE culvert, riprap		Deferred/Lack of Funds	44.33773	-70.50047
Oxford	Woodstock		Billings Hill Road	$60,000	Medium Term	Billings Hill Road: Ditch 7,500', stone line 3,750', remove ledge in travel lanes (2) areas.		Have removed some ledge and replaced 4-5 culverts.	44.42301	-70.60652
Oxford	Woodstock		Concord Pond Road	$25,000	Short Term	Concord Pond Road: Upsize existing 48'' x 40' CMP with a 4' x 5' x 30' bottomless box culvert with headwalls. Equipment: Crane		Deferred/Lack of Funds	44.44117	-70.56012
Oxford	Woodstock		Farnum Road	$28,000	Short Term	Farnum Road: Upsize existing 48'' x 40' CMP with a 4' x 5' x 30' bottomless box culvert with headwalls, ditch 1,500'. Equipment: Crane		Deferred/Lack of Funds	44.43318	-70.59221
Oxford	Woodstock		Railroad Street	$25,000	Short Term	Railroad Street: Upsize existing 48'' x 40' CMP with a 4' x 5' x 30' bottomless box culvert with headwalls. Equipment: Crane		Deferred/Lack of Funds	44.37795	-70.64569
Penobscot	Alton	1	Alton	$40,000	3-5 years	Upgrade ditches and culverts, elevate road for drainage purposes.	Selectmen	Deferred/No Funds		
Penobscot	Bangor	1	Waste Water Treatment facility	$2,300,000	3-5 years	Install emergency generator for Bangor Waste Water Treatment Plan.		Deferred/No Funds	44.77972	-68.78350
Penobscot	Bangor	2	Birch Stream	$100,000	1-3 years	Birch Stream Bank Stabilization.		Deferred/No Funds	45.09029	-68.76120
Penobscot	Bangor	4	Bangor	UNK	1-3 years	Upgrade catch basins and refine monitoring system to provide advance warning.		Deferred/No Funds		
Penobscot	Bangor	5	Bangor	UNK	1-3 years	Upgrade ditches, culverts and roadway drainage systems.	City Engineer and Public Works Director	Deferred/No Funds		
Penobscot	Bangor	6	Bangor	$25,000	1-3 years with the use of Town Funds	Update and institute Hazard Mitigation Planning program.	City EMA, City Engineering, CEO, City Mgr. and PW	Deferred/No Funds		
Penobscot	Bangor	7	Bangor	$10,000	Annual support needed to fully implement	Refine and update GIS mapping system for application to EMA.		Deferred/No Funds		
Penobscot	Bangor	8	Downtown	$50,000	1-3 years	Survey downtown buildings impacted by flooding and storm surges.		Deferred/No Funds	44.80729	-68.76870
Penobscot	Bangor	9	Bangor	$25,000	1-3 years	Create and develop rural water supply (fire ponds and dry hydrants).		Deferred/No Funds		
Penobscot	Bangor	10	City Trail	$25,000	1-3 years	Install beaver control structure to prohibit damage to city trail system.		Deferred/No Funds	44.86299	-68.74010
Penobscot	Bangor	11	Penjajawoc Stream	$100,000	1-3 years	Penjajawoc Stream Bank Stabilization (behind Sam's Club, Mt. Avenue, Young Street, and Meadow Brook Road).		Deferred/No Funds	44.83914	-68.74870
Penobscot	Bangor	12	14th Street	$65,000	1-3 years	Stabilization of the 14th Street storm water discharge outlet.		Deferred/No Funds	44.80657	-68.79160
Penobscot	Bangor	13	Bangor	$50,000	1-3 years with the use of Town Funds	Implement and refine a stormwater and non-point source pollution control program.		Deferred/No Funds		
Penobscot	Bradford	2	Fire Department	$350,000	5-10 years	Upgrades to new fire department building to meet need and use as a shelter. Cost Range: $100,000-350,000		Deferred/No Funds	45.07002	-68.91540
Penobscot	Bradford	3	Lagrange Road	$45,000	1-3 years	Replace/resize bridge on Lagrange Road.		Deferred/No Funds	45.12077	-68.94250
Penobscot	Bradford	4	Middle Road Bridge	$25,000	1-3 years	Middle Road Bridge: Replace/resize.		Deferred/No Funds	45.08978	-68.92250
Penobscot	Bradford	5	Lagrange Road	$10,000	1-3 years	Replace/resize culverts on Lagrange Road.		Completed 2013	45.12086	-68.94240

Penobscot	Bradley	1	Bradley	UNK	3-5 years	Acquire/relocate/elevate flood prone homes.		Deferred/No Funds		
Penobscot	Brewer	3	Eastern Road	$750,000	3-5 years	Upgrade culvert on Eastern Road 16' wide x 10' high x 90' long.	Public Works Director	Deferred/No Funds	44.78816	-68.71890
Penobscot	Burlington	1	Sibley Road	$30,000	1-3 years	Sibley Road: Elevate two cottages.	Board of Selectmen	Deferred/No Funds	45.17865	-68.39850
Penobscot	Carmel	3	Garland Road Bridge	$100,000	3-5 years	Garland Road Bridge improvement.	Road Commissioner	Deferred/No Funds	44.83476	-68.99690
Penobscot	Carroll Planta	1	Osgood Road	$54,000	1-3 years	Osgood Road: Ditch 25,000' and add (4) 18" x 32' culverts.	Board of Selectmen	Deferred/No Funds	45.43722	-68.10650
Penobscot	Carroll Planta	3	Ricker Road	$10,000	1-3 years	Ricker Road: Drainage, ditching for length of road.	Board of Selectmen	Deferred/No Funds	45.36594	-68.07680
Penobscot	Carroll Planta	5	Danforth Road	$10,000	1-3 years	Danforth Road: More drainage for 1 mile of road.	Board of Selectmen	New Project	45.42344	-68.04000
Penobscot	Carroll Planta	7	Brown Road	$21,500	1-3 years	Ditch 1,200' and add (4) 18" x 32' culverts. Brown Road and reset culverts.	Board of Selectmen	Deferred/No Funds	45.38747	-68.06460
Penobscot	Charleston	5	Charleston	$10,000	1-3 years	Monitor roadway drainage systems and study areas of need for upgrades.	Road Commissioner	New Project		
Penobscot	Chester	8	Chester	$10,000	1-3 years	Monitor roadway drainage systems and study areas of need for upgrades.	Road Commissioner	New Project		
Penobscot	Clifton	2	Clifton	$1,500,000	5-10 years	Extend Bangor water district lines into community.	Town manager, EMA Director	Deferred/No Funds		
Penobscot	Clifton	2	Hopkins Pond	$350,000	3-5 years	Create dry hydrants for fire protection around Hopkins Pond.	Town manager, EMA Director	Deferred/No Funds	44.78920	-68.45630
Penobscot	Clifton	4	Clifton	$100,000	5-10 years	Develop emergency public water source.		Deferred/No Funds		
Penobscot	Clifton	5	Clifton	$50,000	3-5 years	Create a fire substation for Eddington Fire Department.		Deferred/No Funds		
Penobscot	Clifton	6	Clifton	$100,000	3-5 years	Create a town or regional shelter for local community use.		Deferred/No Funds		
Penobscot	Clifton	7	Clifton	$50,000	3-5 years with the use of Town Funds	Create Emergency Operations and hazards plan, training and equipment.	Town manager, EMA Director	Deferred/No Funds		
Penobscot	Corinna	1	Sunken Bridge Road	$85,000	1-3 years	Sunken Bridge Road: Upsize, elevate, and pave roadway.	Road Commissioner	Deferred/No Funds	44.98173	-69.32290
Penobscot	Corinth	3	Corinth	$10,000	1-3 years	Monitor roadway drainage systems and study areas of need for upgrades.	Road Commissioner	Deferred/No Funds		
Penobscot	Dexter	2	Dexter	$1,500,000	3-5 years	Upgrades to town storm water drainage system. Monitor and study improvements needed.	Town Manager, Dept. of Public Works	Deferred/No Funds		
Penobscot	Dixmont	6	Shelter	$5,000	3-5 years	Install generator at Shelter.	Select Board	Redesigning plan.	44.69482	-69.14140
Penobscot	Drew Plantat	2	Drew Plantation	$500	1-3 years with the use of Town Funds	Develop winter storm educational material.	Selectmen	Deferred/No Funds		
Penobscot	East Millinoc	1	East Millinocket	$1,000	5-10 years Town Funds	Conduct public education on flooding and wildfires.	EMA Director, School Dept.	Deferred/No Funds		
Penobscot	East Millinoc	2	East Millinocket	$500	5-10 years	Conduct Stormwater Runoff Education.	Public Works Director	Deferred/No Funds		
Penobscot	East Millinoc	3	East Millinocket	UNK	3-5 years	Acquire/relocate/elevate flood prone homes.	Town Manager	Deferred/No Funds		
Penobscot	East Millinoc	4	Western Avenue	$69,000	1-3 years	Western Avenue: Storm drain system.	Public Works, MDOT	Deferred/No Funds	45.63000	-68.57760
Penobscot	Eddington	1	Rooks Road/David Pond Road	$100,000	3-5 years	Raise level of Rooks Road, improve drainage at David Pond (road flooded in 2005 due to plugged culvert).	Town Manager	Deferred/No Funds	44.79167	-68.60430
Penobscot	Eddington	5	Davis Road Bridge	$100,000	1 year	Replace Davis Road Bridge.	Town Manager	Funds Appropriated	44.83486	-68.64410
Penobscot	Eddington	6	Clewleyville	$50,000	3-5 years	Construct new fire station at Clewleyville in conjunction with Holden.	Fire Chief, Town Manager, Board of Selectmen	Deferred/No Funds	44.80993	-68.68440

Penobscot	Edinburg		Edinburg	UNK		Not participating.				
Penobscot	Enfield	1	Enfield	$1,500	1-3 years with the use of Town Funds	Develop a Stormwater Management Plan.	Town Manager, Public works	Deferred/No Funds		
Penobscot	Enfield	2	Enfield	$40,000	1-3 years	Upgrade and increase size of culverts on town roads.	Town Manager, Public works	Deferred/No Funds		
Penobscot	Enfield	3	Enfield	$500	1-3 years with the use of Town Funds	Create and provide educational materials to community about dangers of wildfires.	Town Manager and Fire Department	Deferred/No Funds		
Penobscot	Enfield	4	Mohawk Road	$300,000	5-10 years	Mohawk Road: Relocate six homes located in flooding area.	Town Manager, Public works	Deferred/No Funds	45.31539	-68.61640
Penobscot	Etna	1	Town Hall	$5,000	3-5 years	Retrofit Town Hall to act as emergency and evacuation shelter.	Town Manager and Selectmen	Deferred/No Funds	44.81554	-69.11770
Penobscot	Exeter	1	Chamberlain Meeting House Road	$3,500	1-3 years	Chamberlain Meeting House Road: Upsize culvert 48" x 50'.	Road Commissioner	Deferred/No Funds	44.96225	-69.12280
Penobscot	Garland	1	Garland Pond Dam	$150,000	5-10 years	Elevate and retrofit Garland Pond Dam to elevate the potential flooding dangers in the community.	Board of Selectmen	Deferred/No Funds	45.03514	-69.15940
Penobscot	Garland	2	Garland	$50,000	1-3 years with the use of Town Funds	Complete floodplain study to determine effects of flooding upon community, involving updating and reevaluating FIRM maps, and surveying community involvement.	Board of Selectmen	Deferred/No Funds		
Penobscot	Garland	3	Whiting Road	$75,000	5-10 years	Whiting Road: Reconstruct, elevate 50' due to beaver dam.	Road Commissioner	New Project	45.09442	-69.11930
Penobscot	Garland	4	Garland	$85,000	1-3 years	Elevate and upgrading culverts to elevate flooding on necessary roads.	Board of Selectmen	Deferred/No Funds		
Penobscot	Glenburn		Lake View Road	$2,000	1-3 years	Lake View Road: Upsize (2) 24" x 30' culverts.	Road Commissioner	Completed 2019	44.91316	-68.83070
Penobscot	Greenbush	1	Olamon Stream Crossing	$4,000	1-3 years	Rebuild Olamon Stream Crossing, stabilize abutments and rebuild bridge.		Deferred/No Funds	45.11647	-68.58880
Penobscot	Greenbush	2	Greenbush	$5,000	3-5 years	Install antenna and base radio systems for emergency communications.		Deferred/No Funds		
Penobscot	Greenbush	3	Lower River Road	$20,000	3-5 years	Rebuild and elevate Lower River Road.		Deferred/No Funds	45.07588	-68.65630
Penobscot	Greenbush	5	Penobscot River Bank	$250,000	5-10 years	Penobscot River Bank Stabilization Project.		Deferred/No Funds	45.08257	-68.64870
Penobscot	Hampden	2	Meadow Road	$300,000	3-5 years	Upgrade culverts and raise roadway along Meadow Road.		Deferred/No Funds	44.71971	-68.92070
Penobscot	Hermon	1	Bangor Airport	UNK	1-3 years with the use of Town Funds	Develop safety plan for Bangor Airport event.		Deferred/No Funds	44.80998	-68.81770
Penobscot	Hermon	4	Hermon	$9,000	1-3 years	Generator for heat and power to diesel fuel pump.		Deferred/No Funds		
Penobscot	Holden	3	Holden	$10,000	3-5 years	Monitor roadway drainage systems and study areas of need for upgrades.	Public Safety Director	New Project		
Penobscot	Holden	4	Clewleyville	$50,000	3-5 years	Construct new fire station at Clewleyville in conjunction with Eddington.	Public Safety Director	Deferred/No Funds	44.80677	-68.68220
Penobscot	Howland	1	Howland	$50,000	1-3 years with the use of Town Funds	Develop a Stormwater Management Plan.	Town Manager, Public works	Deferred/No Funds	45.24431	-68.65540
Penobscot	Howland	2	Howland	$60,000	1-3 years	Upgrade and increase size of culverts on town roads.	Town Manager, Public works	Deferred	45.24431	-68.65540
Penobscot	Howland	4	Howland	$500	1-3 years with the use of Town Funds	Create and provide educational materials to community about dangers of wildfires.	Town Manager and Fire Department	Deferred/No Funds	45.24431	-68.65540

Penobscot	Hudson	2	Hudson	$500	1-3 years with the use of Town Funds	Create and provide educational materials to community about dangers of wildfires.	Town Manager	Deferred/No Funds		
Penobscot	Hudson	3	Hudson	UNK	3-5 years	Acquire/relocate/elevate flood prone homes and roads.	Town Manager	Deferred/No Funds		
Penobscot	Kenduskeag	4	Kenduskeag	UNK	3-5 years	Acquire/relocate/elevate flood prone homes and roads.	Town Manager	Deferred/No Funds		
Penobscot	Lagrange	1	South Lagrange Road	$16,000	1-3 years	S. Lagrange Rd. rip rap 1,000' x 6' upsize (2) 48" x 32' culverts.	Town Manager and Road Commissioner	Completed 2014	45.10091	-68.83060
Penobscot	Lagrange	3	Medford Road	$50,000	3-5 years	Geotextile fabric for 1 mile of Medford Road. 12" of gravel to build up road.	Town Manager and Road Commissioner	New Project	45.19289	-68.85280
Penobscot	Lagrange	4	South Lagrange Road	$6,000	1-3 years	1,000' x 16" raise So. Lagrange Road	Town Manager and Road Commissioner	New Project	45.10064	-68.83100
Penobscot	Lakeville	2	Duck Lake Road	$100,000	3-5 years	Duck Lake Road: Replace/resize culvert.	Board of Selectmen	Deferred/Lack of Funds	45.35622	-68.06300
Penobscot	Lee	1	Lee	$45,000	1-3 years	Upgrade and increase size of culverts on town roads.	Road Commissioner	Deferred/No Funds		
Penobscot	Levant	2	Levant	$5,000	1-3 years with the use of Town Funds	Complete engineering study to evaluate stormwater for retrofit and upgrades of culverts and roadways in flood zone.	Town Manager, Road Commissioner	Completed 2018		
Penobscot	Lincoln	1	Half Township Road	$58,000	1-3 years	Half Township Road: Ditch 30,000'.	Town Manager, public works and Road Commissioner	Deferred/No Funds	45.34355	-68.37950
Penobscot	Lincoln	2	Lincoln	UNK	3-5 years	Acquire/relocate/elevate flood prone homes and roads.	Town Manager	Deferred/No Funds		
Penobscot	Lowell	1	Lowell	$5,000	1-3 years with the use of Town Funds	Train firefighters in wildfire techniques.	Fire Department	Deferred/No Funds		
Penobscot	Lowell	2	Lowell	$2,000	1-3 years with the use of Town Funds	Educate homeowners on forest fire dangers and wildfire protection.	Board of Selectmen/Fire Department	Deferred/No Funds		
Penobscot	Mattawamke	1	River Road	$200,000	1-3 years	Rebuild 3 miles of River Road with ditching and additional culverts.	Board of Selectmen, Road Commissioner	Deferred/No Funds	45.51646	-68.33630
Penobscot	Maxfield	1	Katahdin View Road	$21,000	1-3 years	Katahdin View Road: Ditch 10,000', add 18" x 32' culvert.	Road Commissioner	Deferred/No Funds	45.27165	-68.77480
Penobscot	Medway	1	Nicatou Road	$500,000	Phases/Months	Nicatou Road: 2 miles of drainage and ditching.	Town Manager, Public works	Deferred/No Funds	45.61722	-68.52360
Penobscot	Medway	1	Turnpike Hill Road	$150,000	1-3 years	Turnpike Hill Road: Install 3,000' ditch and riprap 700' of ditch line.	Town Manager, Public works	Deferred/No Funds	45.60843	-68.52320
Penobscot	Milford	1	Milford	$150,000	3-5 years	Replace and upgrade existing storm water control systems with properly sized culverts and catch basins.	Town Manager, Public works, DOT	Deferred/No Funds		
Penobscot	Milford	2	Greenfield Road	$500,000	1-3 years	Greenfield Road: Elevate and upgrade roadway and culverts.	Town Manager, Public works	Deferred/No Funds	45.04088	-68.58900
Penobscot	Millinocket	1	Millinocket Stream between Central and Cherry Street	$48,000	1-3 years	Millinocket Stream: Restore stream bed 1,500' x 100' between Central and Cherry Street.	Town Manager, Public works	Deferred/No Funds	45.65485	-68.70580

Penobscot	Millinocket	2	Station Road	$175,000	1-3 years	Station Road: Replace bridge over Little Smith Brook, 40' x 35' x 5'.	Town Manager, Public works, DOT	Deferred/No Funds	45.66653	-68.71470
Penobscot	Millinocket	4	Millinocket	UNK	3-5 years	Acquire/relocate/elevate flood prone homes.	Town Manager, Public works	Deferred/No Funds		
Penobscot	Mount Chase	1	Owlsboro Road	$178,740	5 Years	Owlsboro Rd. upsize Crystal Brook culvert.	Road Commissioner, Contractor	Completed 2016	46.06521	-68.48600
Penobscot	Mount Chase	2	Owlsboro Road	$150,000	1-5 years	Owlsboro Road: Upsize (2) culverts.	Road Commissioner	Deferred/No Funds	46.06520	-68.48600
Penobscot	Newburgh	1	North Road Extension	$58,000	1-3 years	North Road Extension: Elevate 1,800' x 22' x 2', upsize (5) 36" x 30' culverts.	Road Commissioner	Deferred/No Funds	44.74386	-69.02730
Penobscot	Newport	2	Newport	$10,000	3-5 years	Monitor roadway drainage systems and study areas of need for upgrades.	Public Works Director	New Project		
Penobscot	Old Town	1	Kirkland Road	$8,000	1-3 years	Elevate and upgrade roadway and culvert to alleviate flooding on Kirkland Road.	Town Manager, Public works	Deferred/No Funds	44.94715	-68.73880
Penobscot	Old Town	2	Old Town	$500	1-3 years with the use of Town Funds	Develop public awareness materials, pamphlets, and brochures for winter storms.	Town Manager and Fire Department	Deferred/No Funds		
Penobscot	Orono	1	Orono	$30,000	3-5 years with the use of Town Funds	Complete study to find susceptible areas within community.	Director of EMA, Fire Department	Deferred/No Funds		
Penobscot	Orono	2	Orono	$18,000	3-5 years with the use of Town Funds	Create ordinances to develop setbacks and buffer zones to protect rural residential housing.	Director of EMA, Fire Department	Deferred/No Funds		
Penobscot	Orono	3	Orono	$2,500	Immediate with the use of Town Funds	Educate property owners about the importance of insurance for fire hazards.	Department of EMA, Fire Department, Police Department	Deferred/No Funds		
Penobscot	Orono	4	Orono	$6,000	3-5 years with the use of Town Funds	Complete a schedule for monitoring building codes.	Department of EMA, Fire Department, Police Department	Deferred/No Funds		
Penobscot	Orono	5	Orono	$500	Ongoing with the use of Town Funds	Create educational seminars about proper forestry practices.	Town manager, EMA Director	Deferred/No Funds		
Penobscot	Orono	6	Orono	$3,000	3-5 years with the use of Town Funds	Train all firefighters and EMT's in wilderness emergencies.	Town manager, EMA Director	Deferred/No Funds		
Penobscot	Orono	7	Orono	$8,000	3-5 years with the use of Town Funds	Create flyers for public distribution to increase awareness of emergency preparedness.	Town Manager	Deferred/No Funds		
Penobscot	Orono	8	Orono	$50,000	3-5 years	Create a system of shelters for public protection.	Town manager, EMA Director	Deferred/No Funds		
Penobscot	Orono	9	University of Maine	$1,200	Immediate with the use of Town Funds	Develop and maintain a relationship with the University of Maine Emergency Management Team.	Town Manager	Deferred/No Funds	44.90189	-68.66880
Penobscot	Orono	10	Orono	$500	5-10 years with the use of Town Funds	Create program of identification of special populations in need of emergency services.	Director of EMA	Deferred/No Funds		
Penobscot	Orono	11	Orono	$35,000	Ongoing	Purchase, maintain, and upgrade generators in town operated shelters.	Fire Dept / EMA	Deferred/No Funds		

Penobscot	Orono	12	Orono	$100,000	3-5 years	Purchase, maintain and upgrade adequate transportation.	Public Works, DOT, and Town Manager	Deferred/No Funds		
Penobscot	Orono	13	Orono	$600	Ongoing with the use of Town Funds	Issue Public Service Announcements regarding upcoming flood seasons.	Public Works, DOT, and Town Manager	Deferred/No Funds		
Penobscot	Orono	14	Orono	$150,000	5-10 years with the use of Town Funds	Encourage and assist in the relocation of home and business owners located within the affected area.	Public Works, DOT, and Town Manager, water district	Deferred/No Funds		
Penobscot	Orono	15	Orono	$500	1-3 years with the use of Town Funds	Hold seminars to inform the general public of the dangers and risks involved with flooding.	Town Manager and Fire Department	Deferred/No Funds		
Penobscot	Orono	16	Orono	$200,000	3-5 years	Raise roadbeds in areas affected by flood and erosion.	Public Works	Deferred/No Funds		
Penobscot	Orono	17	Orono	$35,000	3-5 years	Mitigate erosion by replacing and replanting soils and vegetation in susceptible areas.	Public Works	Deferred/No Funds		
Penobscot	Orono	18	Orono	$20,000	3-5 years	Increase stormwater management through culvert replacement, and roadway rebuilding in areas that are consistently susceptible.	Public Works	Deferred/No Funds		
Penobscot	Orrington	1	Orrington	$2,000	1-3 years with the use of Town Funds	Educate the community of the importance of fire safety.	Fire Department, Director of EMA	Deferred/No Funds	44.72777	-68.81460
Penobscot	Orrington	3	Orrington	$125,000	3-5 years	Elevate and redirect roadways to allow for access during flooding events.	Fire Department, Director of EMA	Deferred/No Funds	44.72777	-68.81460
Penobscot	Orrington	4	Orrington	$2,000,000	5-10 years	Construct a new centrally located fire department/public safety building to properly house firefighting equipment.	Fire Deoartment, Town Manager	Deferred/No Funds	44.72777	-68.81460
Penobscot	Orrington	5	Orrington	$5,000	1-3 years with the use of Town Funds	Train all firefighters in wilderness wildfire techniques.	Fire Department	Deferred/No Funds	44.72777	-68.81460
Penobscot	Passadumke	1	Community Building	$4,000	1-3 years	Community Building: Dig Artesian well to replace contaminated well. Building demolished.	Board of Selectman	Deferred/No Funds		
Penobscot	Passadumke	2	Passadumkeag	UNK	3-5 years	Acquire/relocate or elevate flood prone homes and roads.	Board of Selectman	Deferred/No Funds		
Penobscot	Patten	1	Happy Corner Road	$38,000	1-3 years	Happy Corner Road: Elevate 500' x '24' x 12" and repave, upsize 24" x 50' culvert.	Public Works, Town Manager	Deferred/No Funds	45.96766	-68.49880
Penobscot	Penobscot In	2	Penobscot Indian Nation Reservation	$10,000	3-5 years	Monitor roadway drainage systems and study areas of need for upgrades.	Tribal Director of Public Works	Completed		
Penobscot	Springfield	1	Moores Road	$30,000	3-5 years	Moores Road: Resize culvert/bridge.	Board of Selectman, Road Commissioner	New Project	45.36909	-68.12340
Penobscot	Springfield	3	Station Road	$6,000	3-5 years	Station Road: Elevate 200 yards of road, widen .3 mile.	Board of Selectman	New Project	45.89214	-68.42400
Penobscot	Springfield	4	Coffin Road	$100,000	3-5 years	Coffin Road: Resize culvert/bridge.	Board of Selectmen, Road Commissioner	New Project	45.41177	-68.11830
Penobscot	Stacyville	2	Stacyville	$10,000	3-5 years	Monitor roadway drainage systems and study areas of need for upgrades.	Road Commissioner	Deferred/No Funds		
Penobscot	Stetson	1	Stetson	$100,000	1-3 years	Elevate road surfaces.	Selectmen and Road Commissioner	Deferred/No Funds		

Penobscot	Stetson	2	Stetson	$250,000	1-3 years	Upgrade dam.	Board of Selectmen, Road Commissioner	Deferred/No Funds		
Penobscot	Stetson	3	Stetson	$20,000	1-3 years	Upgrade ditches and culverts for drainage purposes.	Board of Selectmen, Road Commissioner	Deferred/No Funds		
Penobscot	Stetson	4	Stetson	$1,000	1-3 years with the use of Town Funds	Create system of Identification of special needs population.	Board of Selectmen, Road Commissioner	Deferred/No Funds		
Penobscot	Stetson	5	Stetson	$30,000	3-5 years with the use of Town Funds	Develop emergency evacuation and operations plan.	Board of Selectmen, Road Commissioner	Deferred/No Funds		
Penobscot	Stetson	6	Fire Department	$5,000	1-3 years with the use of Town Funds	Train and equip Fire Department in wildland fire safety.	Road Commissioner	Deferred/No Funds	44.89314	-69.13710
Penobscot	Stetson	7	Stetson	$2,000	3-5 years with the use of Town Funds	Educate homeowners on dangers of forest fires and wildfire protection.	Selectmen and Fire Dept.	Deferred/No Funds		
Penobscot	Stetson	8	Stetson	$10,000	3-5 years with the use of Town Funds	Create fire ponds located to properly serve a majority of the community.	Board of Selectman	Deferred/No Funds		
Penobscot	Unorganized	1	Summitt Township - Greenfield Road	$7,230	1-3 years	Summitt Township - Greenfield Road: Ditching would improve drainage, approximately 1,800', north side.	UT Roads Director	Completed 2014	45.04155	-68.49950
Penobscot	Unorganized	2	Summitt Township - Greenfield Road	$7,400	1-3 years	Summitt Township - Greenfield Road: Ditching would improve drainage, approximately 1,800', north side.	UT Roads Director	New Project	45.04155	-68.49950
Penobscot	Unorganized	4	T6 R7 - Scraggly Lake Road	$27,680	1-3 years	T6 R7, Scraggly Lake Road: Elevate 1,250' where ditching is prohibited due to ledge and add riprap.	UT Roads Director	Deferred/No Funds	46.18183	-68.67460
Penobscot	Unorganized	5	T6 R7 - Scraggly Lake Road	$9,800	1-3 years	Upgrade road and drainage projects. EX: T6 R7, Scraggly Lake Road. Installing (3) new culverts would minimize washouts and improve drainage. Approximately 700-800' of ditching would be required at these locations with 12-18" of additional gravel to be installed.	UT Roads Director	Deferred/No Funds	46.18183	-68.67460
Penobscot	Unorganized	6	Maattamiscontis Township - Mattamiscontis Road	$197,111	3-5 years	Mattamiscontis Township - 3.5 miles of Mattamiscontis Road: Elevate road above flood stage.	UT Roads Director	New Project	45.35004	-68.57920
Penobscot	Unorganized	7	Prentiss Township - Tar Ridge Road	$46,088	1-3 years	Prentiss Township - Tar Ridge Road: Two sections of road need culvert upgrades and raise road levels to reduce flooding wash outs.	UT Roads Director	New Project	45.46775	-68.03310
Penobscot	Veazie	1	Public Works Facility	$750,000	3-5 years	Relocate Public Works Facility from floodplain. 2015 - no longer has public works department. Project N/A.	Town Manager	Deferred/No Funds	44.84130	-68.70180
Penobscot	Veazie	2	Veazie	$100,000	1-3 years	Upgrade storm drainage system in town.	Town Manager	New Project		
Penobscot	Webster Plan	1	Tucker Ridge Road	$27,000	1-3 years	Tucker Ridge Road: Elevate 200' x 22' x 12", upsize 24' x 32' culvert and repave.	Road Commissioner	Deferred/No Funds	45.46452	-68.14250
Penobscot	Webster Plan	2	Pickle Ridge Road	$1,200	1-3 years	Pickle Ridge Road: Upsize 18" x 32' culvert.	Road Commissioner	Deferred/No Funds	45.45199	-68.13010

Penobscot	Winn	2	Old Military Road	$20,000	1-3 years	Old Military Road: Ditch 10,000'.	Road Commissioner	Deferred/No Funds	45.44756	-68.42430
Penobscot	Woodville	3	Faloon Road	$50,000	1-3 years	Faloon Road: Reconstruct, elevate and repave 1/8 of mile.	Board of Selectman	New Project	45.56050	-68.44770
Piscataquis	Abbot	1	End of Pond Road	$125,000	Long Term	End of Pond Road: Ditching, culvert upgrades, riprap, paving, 1+ miles.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.31534	-69.05890
Piscataquis	Abbot	2	Pride Loop and Monson Junction Lane	$125,000	Long Term	Pride Loop and Monson Junction Lane: Ditching, culvert upgrades, riprap, paving, 1+ miles.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.23095	-69.30590
Piscataquis	Abbot	3	Howard Siding Lane and Back Road	$125,000	Long Term	Howard Siding Lane and Back Road: Ditching, culvert upgrades, riprap, paving, 1+ miles.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.31203	-69.03910
Piscataquis	Abbot	4	Monument Road, Gales Road and Monson Road	$175,000	Long Term	Monument Road, Gales Road and Monson Road: Ditching, culvert upgrades, riprap, paving, 1+ miles.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.11528	-69.15040
Piscataquis	Abbot		End of Pond Road	$125,000	Long Term	End of Pond Road: Ditching, culvert upgrades, riprap, paving, 1+ miles.		New	45.31534	-69.05894
Piscataquis	Atkinson	5	Dyer Road	$82,000	Long Term	Dyer Road: Elevate 4,000' x 24' x 2', add (4) 15" x 30' culverts.	Fire Department and/or Road Commissioner	Deferred/Lack of Funding	45.17871	-69.30400
Piscataquis	Atkinson		Maple Road	$117,000	Long Term	Maple Road: Elevate 5,000' x 24' x 3', upsize (2) 15" x 30' culverts.		Deferred/Lack of Funding	45.09663	-69.64060
Piscataquis	Beaver Cove	1	Beaver Cove	$15,000	Medium Term	Install (3) dry wells town wide.		Deferred/Lack of Funding	45.11329	-69.60180
Piscataquis	Beaver Cove		Fire Department	$100,000	Long Term	Build substation for fire department. 30' x 26'.		Deferred/Lack of Funding	45.02923	-69.60490
Piscataquis	Bowerbank		Bowerbank	$150,000	Long Term	Upgrade culverts, crossings and ditching to improved drainage as needed.		New	45.22276	-68.97885
Piscataquis	Brownville	1	Spencer Farm Road	$40,000	Medium Term	Spencer Farm Road: Ditch 6,000' riprap 500' ditch, add (1) 48" x 40' culvert.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.21957	-69.46170
Piscataquis	Brownville	2	Spencer Farm Road	$30,000	Medium Term	Spencer Farm Road: Ditch and riprap 1,500', upsize 24' x 18", 18' x 60' and 24" x 20' culverts.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.21957	-69.46170
Piscataquis	Brownville	3	Lake View Road	$500,000	Short Term	Lake View Road: Upsize (2) 48" x 60' culverts, (1) 48" x 80' culvert.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.28018	-69.43110
Piscataquis	Brownville	4	Upper Front Street	$15,000	Short Term	Upper Front Street: Install culvert 48" x 32".	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.18144	-69.02730
Piscataquis	Brownville	5	Ross Road	$10,000	Short Term	Ross Road: Upgrade culvert, 48" x 32'.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.09650	-69.64080
Piscataquis	Brownville	6	Davis Street Ballfield	$18,000	Short Term	Davis Street Ballfield: Prevent washout picnic area, riprap.	Recreation Department and Contractor	Deferred/Lack of Funding	45.12210	-69.31250
Piscataquis	Brownville	7	Davis Street Ballfield	$12,000	Short Term	Davis Street Ballfield: Prevent flooding, raise 3'.	Recreation Department and Contractor	Deferred/Lack of Funding	45.12210	-69.31250
Piscataquis	Brownville	9	Upper Van Horn Avenue	$20,000	Short Term	Upper Van Horn Avenue: Ditch and rip rap 800'.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.34853	-69.06590
Piscataquis	Brownville	10	Front Street	$50,000	Short Term	Front Street: Install (2) catch basins, 18" x 400', underground drainage.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.10138	-69.27920
Piscataquis	Brownville	11	Railroad Avenue	$100,000	Short Term	Railroad Avenue: Install (6) catch basins, 18" x 1,250', underground drainage.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.35024	-69.05640

Piscataquis	Brownville	12	North Street	$100,000	Short Term	North Street: Install (6) catch basins, 18” x 1,250’, underground drainage.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.35179	-69.05790
Piscataquis	Brownville	13	Center Street	$40,000	Short Term	Center Street: Install (2) catch basins, 18” x 400’, underground drainage.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.35241	-69.05690
Piscataquis	Brownville	14	Pine Street	$25,000	Short Term	Pine Street: Install (2) catch basins, 18” x 300’, underground drainage.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.35076	-69.05940
Piscataquis	Brownville	15	Front Street	$30,000	Short Term	Front Street: 300’ outfall.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.10138	-69.27920
Piscataquis	Dover-Foxcro	1	East Dover Road	$75,000	Medium Term	East Dover Road: 15,000' ditching, upsize (6) 18" x 38' culverts.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.31211	-68.96230
Piscataquis	Dover-Foxcro	2	Boat Marina	$25,000	Medium Term	Boat Marina: Upgrade bridge abutment, riprap brook bank 300' x 10'.	Contractor	Deferred/Lack of Funding	45.34384	-69.00380
Piscataquis	Dover-Foxcro	3	Marina	$170,000	Long Term	Dredge marina basin.	Contractor	Deferred/Lack of Funding	45.15783	-69.14510
Piscataquis	Dover-Foxcro	4	Cotton Brook Road	$97,500	Long Term	Cotton Brook Road: Ditch, raise 18” 4,000'.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.34439	-68.99990
Piscataquis	Dover-Foxcro	6	East Dover Road	$90,000	Medium Term	East Dover Road: Bridge upgrade abutments.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.31211	-68.96230
Piscataquis	Dover-Foxcro	7	Lincoln Street	$120,000	Long Term	Lincoln Street: Bridge upgrade sidewalls and overhead structure.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.37997	-69.05490
Piscataquis	Dover-Foxcro	8	Autumn Avenue Bridge	$50,000	Long Term	Autumn Avenue Bridge: Upgrade with 12’ x 4,800’ box culvert.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.19050	-69.23010
Piscataquis	Dover-Foxcroft		Fairview Avenue	$12,000	Completed	Fairview Avenue: Upsize culvert 24" x 40', dredge retention pond 6,000 cubic yards, install 12" x 1,000' underground drainage.	Contractor and/or Road Commissioner	Culvert Done/Drainage Done	45.33984	-69.00940
Piscataquis	Dover-Foxcroft		Hewett Road	$143,000	Long Term	Hewett Road: Ditch, raise 18” 5,500'.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.37997	-69.05490
Piscataquis	Greenville	1	Greenville	UNK	Long Term	Roads. Improve ditching, upsize culverts as needed.	Road Commissioner	Completed	45.24963	-69.23970
Piscataquis	Greenville	2	Fire Station	$6,500	Short Term	55K Generator. Acquire and install generator at fire station.	Selectmen	New	45.24979	-69.23960
Piscataquis	Guilford	1	Wharf Road	$639,000	Medium Term	Wharf Road: Upsize culverts and improve ditching.		Deferred/Lack of Funding	45.26412	-68.86250
Piscataquis	Guilford	2	Guilford	$10,000	Short Term	Floodproof playground equipment.	Town Manager	Deferred/Lack of Funding	45.19047	-69.23020
Piscataquis	Guilford	3	Glass Hill Road	$150,000	Long Term	Glass Hill Road: Total upgrade to include ditching, fabric, culverts and paving to address springs in the road.	Road Commissioner	Completed	45.18491	-69.23010
Piscataquis	Guilford	4	High Street	$175,000	Long Term	High Street: Total upgrade to include ditching, fabric, culverts, sidewalks and paving.	Road Commissioner	Deferred/Lack of Funding	45.19242	-69.31780
Piscataquis	Guilford	5	School Street	$400,000	Long Term	School Street: Total upgrade to include stump removal, ditching, fabric, culverts, sidewalks and paving.	Road Commissioner	Deferred/Lack of Funding	45.16962	-69.38620
Piscataquis	Guilford	6	Applebee Hill Road	$40,000	Medium Term	Applebee Hill Road: Culverts, riprap, fabric and paving.	Road Commissioner	Deferred/Lack of Funding	45.18581	-69.16740
Piscataquis	Kingsbury Pla	1	Wellington Road	$9,000	Long Term	Wellington Road: Ditch 4,000', upsize (1) 36' x 40' and (3) 24" x 40' culverts.	Contractor and/or Road Commissioner	Completed	45.14183	-69.48850
Piscataquis	Kingsbury Pla	2	Wellington Road	$160,000	Long Term	Wellington Road: Upgrade road with 6,000' of gravel and road matting.		Deferred/Lack of Funding	45.15286	-69.31860

Piscataquis	Kingsbury Pla	3	Campbell Road	$350,000	Long Term	Campbell Road: Upgrade road with 15,200' of gravel and road matting.		New	45.22277	-68.97880
Piscataquis	Kingsbury Pla	4	Cross Road	$80,000	Long Term	Cross Road: Upgrade road with 3,400' of gravel and road matting.		Completed	45.30966	-69.50950
Piscataquis	Kingsbury Pla	5	Kingsbury Pond Dam	$300,000	Long Term	Kingsbury Pond Dam: Upgrade dam.	Assessor	Completed	45.28662	-69.50980
Piscataquis	Medford	1	North Medford Road	$200,000	Long Term	North Medford Road: Elevate 1,700' x 24' x 3' and repave.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.23760	-69.13640
Piscataquis	Medford	2	North Road near Schoodic Stream	$60,000	Medium Term	North Road near Schoodic Stream: Upgrade from 18" culvert to 30" culvert, ditching, riprap and paving.	Contractor and/or Road Commissioner	Completed	45.25133	-69.08390
Piscataquis	Medford	3	North Road near Alder Brook	$240,000	Long Term	North Road near Alder Brook: Upgrade 8-15" and 118" culverts, ditching, riprap, 2,000 yards of gravel and paving.	Contractor and/or Road Commissioner	Completed	45.23485	-69.14330
Piscataquis	Medford	4	Community Building	$6,500	Short Term	20K Generator for Community Building: Building is used as an emergency shelter and town EOC.	Selectmen	Completed	45.20713	-69.11260
Piscataquis	Milo	1	Pleasant Street	UNK	Long Term	Pleasant Street: Correct flooding issues. (Note: Extremely complicated problem which will require extensive engineering.)	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.04395	-69.55950
Piscataquis	Milo	2	Desmond Road	$2,000	Short Term	Desmond Road: Riprap.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.26955	-69.13420
Piscataquis	Milo	3	Pleasant River Road	$20,000	Short Term	Pleasant River Road: Culvert 6' x 50', rip rap, channel clearing, 50' ditching.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.36141	-69.60810
Piscataquis	Monson	1	Pleasant Street	$2,500	Short Term	Pleasant Street: Ditching and fill with angular rock.	Contractor and/or Road Commissioner	Completed	45.30525	-69.38780
Piscataquis	Monson	2	Elliotsville Road	$4,500	Short Term	Elliotsville Road: Upsize culvert to 18" x 24', ditch.	Contractor and/or Road Commissioner	Completed	45.02916	-69.60490
Piscataquis	Parkman	1	Pease Bridge Road	$300,000	Long Term	Pease Bridge Road: Upgrade bridge, extend wingwalls, refasten.	Contractoy	Deferred/Lack of Funding	45.21206	-69.50130
Piscataquis	Sangerville		Flanders Road	$14,000	Short Term	Flanders Road: Elevate 100' x 12' x 4' add 18" x 30' culvert , repave.		Deferred/Lack of Funding	45.15278	-69.32012
Piscataquis	Sebec		Cove Road	$6,500	Short Term	Cove Road: Raise 400' 3'.		Deferred/Lack of Funding	45.34717	-69.05962
Piscataquis	Sebec		Downs Road	$1,800	Short Term	Downs Road: Upsize culvert 30" x 32".		Deferred/Lack of Funding	45.35357	-69.05472
Piscataquis	Sebec		North Road	$12,000	Short Term	North Road: Blast ditch line 900', repave.		Deferred/Lack of Funding	45.35031	-69.05580
Piscataquis	Sebec		North Road	$20,000	Short Term	North Road: Blast ditch line 900', repave.		Deferred/Lack of Funding	45.35179	-69.05794
Piscataquis	Sebec		North Road	$12,000	Short Term	North Road: Upsize to box culvert 8' x 5' x 32'.		Deferred/Lack of Funding	45.35031	-69.05580
Piscataquis	Sebec		North Road	$20,000	Short Term	North Road: Upsize to box culvert 8' x 5' x 32'.		Deferred/Lack of Funding	45.35179	-69.05794
Piscataquis	Sebec		Old Brownville Road	$9,000	Short Term	Old Brownville Road: Add 4' culvert, elevate 3'.		Deferred/Lack of Funding	45.35242	-69.05707
Piscataquis	Sebec		River Road	$54,000	Medium Term	River Road: Elevate 300' x 4' x 26', install 36" x 30' culvert and repave.		Deferred/Lack of Funding	45.35079	-69.05910
Piscataquis	Shirley	1	Upper Corner Road	$18,000	Short Term	Upper Corner Road: Upgrade culvert 12' x 40'.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.35940	-69.60280
Piscataquis	Unorganized	3	Blanchard Township - Bridge #941	$185,000	Short Term	Blanchard Township - Bridge #941: Upgrade culvert.		Completed 2007	45.17244	-69.39230
Piscataquis	Unorganized	3	Blanchard Township - Bridge #941	$185,000	Short Term	Blanchard Township - Bridge #941: Upgrade culvert.		Completed 2007	45.17244	-69.39230

Piscataquis	Unorganized	4	Williamsburg Township - Williamsburg Road	$300,000	Long Term	Willamsburg Township - Williamsburg Road: Rehabilitate Whetstone North and South Bridges.		Completed	45.10654	-69.64640
Piscataquis	Unorganized	4	Williamsburg Township - Williamsburg Road	$300,000	Long Term	Willamsburg Township - Williamsburg Road: Rehabilitate Whetstone North and South Bridges.		Completed	45.10654	-69.64640
Piscataquis	Unorganized	5	Blanchard Township, Gully Brook Bridge	$350,000	Medium Term	Blanchard Township - Gully Brook Bridge: Upgrade substructure and abutments.		Deferred/Lack of Funding	45.16946	-69.38760
Piscataquis	Unorganized	5	Blanchard Township, Gully Brook Bridge	$350,000	Medium Term	Blanchard Township - Gully Brook Bridge: Upgrade substructure and abutments.		Deferred/Lack of Funding	45.16946	-69.38760
Piscataquis	Unorganized	6	Elliotsville, Bodfish Valley Road	$50,000	Medium Term	Elliotsville - Bodfish Valley Road: Add safety infrastructure including guardrails.		Deferred/Lack of Funding	45.18417	-69.41050
Piscataquis	Unorganized	6	Elliotsville, Bodfish Valley Road	$50,000	Medium Term	Elliotsville - Bodfish Valley Road: Add safety infrastructure including guardrails.		Deferred/Lack of Funding	45.18417	-69.41050
Piscataquis	Wellington	1	Smith Hill Road	$15,000	Short Term	Smith Hill Road: Ditch 1,200', install (2) culverts 15" and 18" x 40'.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.08239	-69.59140
Piscataquis	Wellington	2	Cross Road	$15,000	Short Term	Cross Road: Ditch 3,000'; upsize (3) 18" x 28' culverts.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.11431	-69.59980
Piscataquis	Wellington	3	Huff Corner Road	$18,000	Short Term	Huff Corner Road: Blast ditch line 600'.	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.11060	-69.62300
Piscataquis	Wellington	5	Hutchinson Road	UNK	Short Term	Hutchinson Road: Ditch 1,000'.	Contractor and/or Road Commissioner	Deferred/Lack of Funding		
Piscataquis	Wellington		Zion Road	$20,000	Short Term	Zion Road: Ditch 1,000', add (2) culverts (15" x 40' and 24" x 40').		New	45.30527	-69.38790
Piscataquis	Willimantic	2	Wilson Stream Road	$15,000	Short Term	Wilson Stream Road: Ditch 1,000	Contractor and/or Road Commissioner	Deferred/Lack of Funding	45.26744	-69.58400
Piscataquis	Willimantic	3	Wilson Stream Road at Jackson Brook	$90,000	Medium Term	Wilson Stream Road at Jackson Brook: Upgrade bridge with new cement abutments, steel frame, wood deck.	Contractor and/or Road Commissioner	Completed	45.30527	-69.38780
Piscataquis	Willimantic	4	Elliotsville Road at Prescott Brook	$90,000	Medium Term	Elliotsville Road at Prescott Brook: Upgrade bridge to elevate road , 35' gravel, riprap.		Completed	45.30150	-69.41660
Piscataquis	Willimantic	5	Elliotsville Road at Monson Road	$35,000	Medium Term	Elliotsville Road at Monson Road: Upgrade 30" culvert.		Completed	45.30732	-69.40710
Piscataquis	Willimantic	6	Town Hall	$30,000	Short Term	14K Generator: Install generator for town hall.	Selectmen	Deferred/Lack of Funding	45.30608	-69.40790
Sagadahoc	Arrowsic		Bald Head Road	$250,000	52 weeks	Bald Head Road: Dig out and build up the under layer in five specific sections and then recover with dirt to help with draining.		Emergency repairs conducted. Repairs not sufficient to fully mitigate issue	44.03254	-69.84740
Sagadahoc	Bath	1	Rose and Hunt Pump Station	$40,000	24 Weeks	Rose and Hunt Pump Station: Upgrade, elevate electrical equipment, and flood proof building.	Public Works	New	44.10663	-69.81230
Sagadahoc	Bath	2	Willow Street	$2,000,000	4 years	Willow Street: Correct ongoing flooding, upgrade drainage structures.		New/Planning Stage	43.90304	-69.81700
Sagadahoc	Bath	3	Commercial Street	$35,000	within 5-year planning cycle	Commercial Street: Correct flooding problem, improve drainage.	Public Works	New/Planning Stage	44.01213	-69.95900
Sagadahoc	Bath		Lower Washington Street	$40,000	4 weeks	Lower Washington Street: Correct flooding problem, improve drainage.	Public Works	New	43.91690	-69.81590

Sagadahoc	Bath		North Bath Road	$15,000	6 weeks	North Bath Road: Culvert at the Mill Pond is undersized and creates flooding, upsize culvert.		New	44.12260	-69.79005
Sagadahoc	Bath		North Bath Road	$55,000	6 weeks	North Bath Road: Culvert at the Mill Pond is undersized and creates flooding, upsize culvert.		New	44.10987	-69.79929
Sagadahoc	Bowdoin		West Burrough Rd	$100,000	3 weeks	West Burrough: Culvert upgrades.	Road Commissioner	New/Planning Stage	43.93014	-69.81720
Sagadahoc	Bowdoinham		Fisher Road	$15,000	2 weeks	Fisher Road: Design and install debris catcher for 72" culvert at Shinglemen's Creek.		Deferred until funding is available.	43.83812	-69.85710
Sagadahoc	Bowdoinham		Bowdoinham	$152,700	26 weeks each	Twelve identified roads for new culvert upgrades and repaving. Backhill Street, Browns Point, Carding Machine, Cemetery Road, Dinsmore Crossing, Pork Point, Preble Ridge Road, School Street, South Pleasant, Spring Street, and Wilde Road.		Deferred until funding is available.	43.78876	-69.81750
Sagadahoc	Bowdoinham		Bowdoinham	$475,000	26 weeks each	Twelve identified roads for new culvert upgrades and repaving. Backhill Street, Browns Point, Carding Machine, Cemetery Road, Dinsmore Crossing, Pork Point, Preble Ridge Road, School Street, South Pleasant, Spring Street, and Wilde Road.		Deferred until funding is available.	43.78876	-69.81750
Sagadahoc	Phippsburg		Cranberry Point Road	$100,000	3 weeks	Cranberry Pont Road from ruth deck rd 300' section	Road Commissioner	Ongoing	43.82282	-69.81190
Sagadahoc	Phippsburg		Parker Head Road (Mill Brook ro Mill Pond)	$250,000	6 weeks	Parker Head Road (Mill Brook to Mill Pond): 6' culvert upgrade with twin 7' culverts at present location.	Road Commissioner	New	43.85678	-69.85540
Sagadahoc	Phippsburg		Parker House Road	$1,100,000	20 Weeks	Parker House Rd.: flooding & drainage problem near 1774 Inn. Separated into 2 Phases: A. Address flooding drainage B. Address and extend roadwork 800' to flood prone section due to anticipated sea level rise.		New	43.92135	-69.85600
Sagadahoc	Phippsburg		Sam Day Hill Road: Parker Head Swamp Brook to Bailey Brook	$100,000	12 weeks	Sam Day Hill Road: Parker Head Swamp Brook to Bailey Brook		Continue to be deferred; Sam Day Hill Road project revised and split into two parts. This is Part 2. Site visited; need additional traffic count and other information for competitive BCA.	43.93210	-69.77950
Sagadahoc	Phippsburg		Sam Day Hill Road: Bailey Brook to Mill Brook	$135,000	24 weeks	Sam Day Hill Road/Bailey Brook to Mill Brook		Continue to be deferred; Sam Day Hill Road project revised and split into two parts. This is Part 1. Site visited; need additional traffic count and other information for competitive BCA.	43.98683	-69.80790
Sagadahoc	Phippsburg		Stoney Brook Road	$225,000	6 weeks	Stoney Brook Rd.: road flooding across 1000' section, raise elevation	Road Commissioner	Completed in 2019	43.96865	-69.76710
Sagadahoc	Topsham	2	Pleasant Point Road	$750,000	8 weeks	Pleasant Point Road: A 400' section of the road is subject to flooding and needs to be raised.	Public Works	Ongoing, awaiting funds and planning to be completed	44.06991	-69.89710

Sagadahoc	Topsham		Bay Park Subdivision (Goldeneye Drive, Hunter Lane and Elder Lane)	$1,500,000	52 weeks	Bay Park Subdivision (Goldeneye Drive, Hunter Lane and Elder Lane): Storm drain replacement and upgrade. Upgrade existing 8” underdrain system including new pipe, basins and paving. Construction of a new outlet and or upgrade of existing outlet.	Public Works	Ongoing, will be broken into phases according to funds and availability	44.01786	-70.01790
Sagadahoc	Unorganized			$125,000	52 weeks	Upgrade drainage on county-owned roads. Upsize culverts, improve ditching.		Pending due to lack of funding.	44.15993	-69.83210
Sagadahoc	West Bath		Birch Point Road	$425,000	14 weeks	Birch Point Road: Ditch 10,000’, blast 3,000 cubic yards, install (12) 15’ x 40’ and (12) 18” x 40’ culverts and repave.	Road Commissioner	Ongoing, deffered until funding is available	44.11290	-69.84540
Sagadahoc	West Bath		Hill Road	$150,000	16 weeks	Hill Road: Rebuild and pave road surface to repair storm water damage.		Ongoing, deffered until funding is available	43.88694	-69.86340
Sagadahoc	West Bath		Mountain Road	$750,000	14 weeks	Mountain Road: Riprap 600’ x 10’ x 3’, ditching and culverts.		Ongoing, deffered until funding is available	43.77988	-69.76470
Sagadahoc	West Bath		Sabino Road	$350,000	8 weeks	Sabino Road: Dig up, geomesh installed to prevent any future sinking and then rebuild.		Ongoing, deffered until funding is available	43.78022	-69.74780
Sagadahoc	West Bath		Sanfords Crossing Road	$250,000	8 weeks	Sanfords Crossing Road: Ditch, culverts and overlay.		Ongoing, deffered until funding is available	44.11000	-69.79940
Sagadahoc	Woolwich	1	George Wright Road and US route 1 intersection	$500,000	6 months	George Wright Rd. and U.S. Route 1 Intersection: replace box culvert with adequately sized bridge.	Road Commissioner/DOT	Planned	43.92648	-69.95650
Sagadahoc	Woolwich		Old Stage Road (just north of Dana Mill Road intersection)	$45,000	2 weeks	Old State Road (just north of Dana Mill Road Intersection): Elevate 300’ x 20’ x 2’, replace existing 40’ x 5’ with (2) 50’ x 4’ poly smooth flow culvert pipes and repave.	Road Commissioner	Deferred until funding is available.	43.97030	-69.75110
Sagadahoc	Woolwich		River Road	$350,000	16 weeks	River Road: Elevate 100’ x 32’ x 2', upsize 8' x 50’ box culverts and repave (near Knight Drive (Knights Farm) on Route 128).	DOT	Completed	43.92845	-69.92380
Somerset	Anson		Anson	UNK	Long Term	Elevate roads subject to flooding including Hollin Waite Hill Road (Dane Corner), Madison Street on the end, Mayhew Road (also add culverts), Greenleaf Road.		New		
Somerset	Anson		Anson	UNK	Long Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Anson		Madison Street	$125,000	Long Term	Madison Street: Elevate 1,000’ x 21’ x 6’; repave.		Deferred/Lack of Funding	44.85798	-69.88400
Somerset	Athens		Floyd French Road	$12,000	Short Term	Floyd French Road: Upsize 15” x 32’ culvert.		Deferred/Lack of Funding	44.92187	-69.71128
Somerset	Bingham		Austin Stream	$35,000	Long Term	Geo engineer Austin Stream to return to original channel.		Deferred/Lack of Funding	45.05181	-69.87274
Somerset	Bingham		Bingham	UNK	Long Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Bingham		Kennebec River	$75,000	Long Term	Geo engineer Kennebec River to return to original channel.		Deferred/Lack of Funding	45.03124	-69.86456
Somerset	Cambridge		Burden Hill Circle	$3,500	Short Term	Burden Hill Road: Ditch 1,000’ and upsize 24” x 32’ culvert.		Deferred/Lack of Funding	45.02885	-69.47610
Somerset	Cambridge		Ham Hill Road	$5,000	Short Term	Ham Hill Road: Ditch 2,500’.		Deferred/Lack of Funding	45.03369	-69.48702
Somerset	Canaan		Canaan	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Canaan		Moores Mill Bridge	$250,000	Long Term	Moores Mill Bridge: Upgrade with replacement bridge.		New	44.75248	-69.58386
Somerset	Caratunk		Caratunk	UNK	Long Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Cornville		Cornville	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Dennistown		Dennistown	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		

Somerset	Detroit		Detroit	UNK	Long Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Detroit		Horseback Road	$17,000	Long Term	Horseback Road: Improve bridge abutments.		Deferred/Lack of Funding	44.75026	-69.34332
Somerset	Embden		Dunbar Hill Road	$100,000	Medium Term	Dunbar Hill Road: Upgrade road due to ledge coming out of the ground.		Deferred/Lack of Funding	44.94407	-69.92020
Somerset	Embden		Embden School	$20,000	Short Term	Take steps to make the Embden School an Emergency Shelter.		Deferred/Lack of Funding	44.90209	-69.93883
Somerset	Fairfield		Fairfield	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Harmony		Harmoiny	UNK	Short Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Hartland		Hartland	UNK	Short Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Highland Plantation		Highland Plantation	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Jackman		Jackman	UNK	Short Term	Install generators.		Deferred/Lack of Funding		
Somerset	Jackman		Jackman	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Madison		Lake Wesserunsett	$28,000	Long Term	Lake Wesserunsett: Upgrade sluiceway with mechanized system.		Deferred/Lack of Funding	44.84461	-69.77215
Somerset	Madison		Lower Mill Road Dam	UNK	Long Term	Lower Mill Road Dam: Remove dam.		New	44.85025	-69.75720
Somerset	Madison		Shusta Road	UNK	Medium Term	Shusta Road: Upgrade culvert.		New	44.78937	-69.84550
Somerset	Mercer		East Sandy River Road	UNK	Short Term	East Sandy River Road: Upgrade 8' x 40' culvert.		Deferred/Lack of Funding	44.75642	-69.89140
Somerset	Mercer		Mercer	UNK	Long Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Mercer		Rome Road	UNK	Medium Term	Rome Road: Upgrade box culvert to 8' x 50'.		Deferred/Lack of Funding	44.64498	-69.93218
Somerset	Moose River		Moose River	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Moscow		Moscow	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	New Portland		Gilman Pond Road	$16,000	Long Term	Gillman Pond Road: Elevate 1,500' x 1' and stabilize slope.		Deferred/Lack of Funding	44.94395	-70.05653
Somerset	New Portland		New Portland	UNK	Long Term	Improve ditching, upsize culverts as needed.		New		
Somerset	New Portland		Stafford Road	$3,500	Short Term	Stafford Road: Upsize 36" x 40' overflow culvert.		Deferred/Lack of Funding	44.90185	-70.03837
Somerset	Norridgewock		Norridgewock	UNK	Long Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Norridgewock		Public Library	$105,000	Short Term	Public Library: Stabilize river bank along Kennebec River 400' x 16' x 3'.		Deferred/Lack of Funding	44.71772	-69.79805
Somerset	Norridgewock		Sandy River Road	$25,000	Short Term	Sandy River Road: Elevate 400' x 4'; add 48" x 40' cross culvert.		Deferred/Lack of Funding	44.73366	-69.88446
Somerset	Palmyra		Libby Hill Road	$60,000	Long Term	Libby Hill Road: Upsize 40' of culvert with arched culvert 12' x 4' to better protect Newport water supply.		New	44.86142	-69.30344
Somerset	Palmyra		Palmyra	UNK	Short Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Palmyra		Smith Road	$40,000	Short Term	Smith Road: Clear 1,000' ditch on Route 100 end. Upgrade culvert to 24" x 40'. Elevate ½ mile of road about 1 1/5'.		New	44.82573	-69.30837
Somerset	Pittsfield		Pittsfield	UNK	Short Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Pleasant Ridge Plantati		Pleasant Ridge Plantation	UNK	Short Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Somerset	Ripley		Curtis Road	$7,000	Short Term	Curtis Road: Upsize 60" x 30' culvert and riprap.		Deferred/Lack of Funding	44.98588	-69.37153
Somerset	Ripley		North Road	$7,000	Short Term	North Road: Upsize 60" x 30' culvert and riprap.		Deferred/Lack of Funding	45.01586	-69.37523
Somerset	Ripley		Ripley	UNK	Short Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Skowhegan		Fire Station	$4,500,000	Long Term	Relocate fire station out of floodplain.		Deferred/Lack of Funding	44.76393	-69.71930
Somerset	Skowhegan		Recreation Center	$5,000	Short Term	Generator; purchase and install generator for the Recreation Center.		Deferred/Lack of Funding	44.75512	-69.72611
Somerset	Skowhegan		Red Bridge Road	$100,000	Short Term	Red Bridge Road: Upgrade with replacement bridge 24' x 70'.		Deferred/Lack of Funding	44.73826	-69.58224

Somerset	Skowhegan		Skowhegan	UNK	Long Term	Acquire and demolish, or relocate frequently flooded homes, depending on cost beneficial aspects of project and voluntary participation.		New		
Somerset	Skowhegan		Skowhegan	UNK	Short Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Skowhegan		Steward Hill Road	$40,000	Short Term	Steward Hill Road: Upsize 15" x 40' squash pipe and riprap intake and outflow.		Deferred/Lack of Funding	44.79810	-69.71373
Somerset	Smithfield		Miller Lane	$5,000	Medium Term	Miller Lane: Ditch 1,600', upsize 30" x 40' plastic culvert.		Deferred/Lack of Funding	44.66863	-69.79881
Somerset	Smithfield		Smithfield	UNK	Short Term	Improve ditching, upsize culverts as needed.		New		
Somerset	Solon		Solon	$50,000	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding	44.94803	-69.85260
Somerset	St. Albans		Denbow Road	$30,000	Short Term	Denbow Road: Upsize culvert.		Deferred/Lack of Funding	44.89771	-69.41989
Somerset	St. Albans		Devils Head Road	$34,000	Short Term	Devils Head Road: Ditch 15,000'; install check dams in ditch.		Deferred/Lack of Funding	44.95196	-69.44001
Somerset	St. Albans		Ripley Road	$10,000	Short Term	Ripley Road: Upsize to 72" x 40' squash pipe; riprap intake and outflow.		Deferred/Lack of Funding	44.95685	-69.36585
Somerset	St. Albans		Springer Road	$45,000	Short Term	Springer Road: Upsize to 15' x 50' box culvert with head walls to be engineered.		Deferred/Lack of Funding	44.93584	-69.40432
Somerset	Starks		Starks	$50,000	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding	44.73615	-69.94401
Somerset	The Forks Plantation		The Forks Plantation	$50,000	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding	45.26670	-69.91397
Somerset	Unorganized Territory		Lexington - Back Road (lower portion of road)	$36,000	Long Term	Lexington - Back Road (lower portion of road): 1,200' x 20' x 4'; add (2) 48" x 60' culverts and pave and toe in 400' low water crossing.		Deferred/Lack of Funding	45.00311	-70.04300
Somerset	Unorganized Territory		Lexington - Round Up Road	$15,000	Short Term	Lexington - Round Up Road: Add 25' x 10' each end to existing culvert and riprap intake and outflow.		Deferred/Lack of Funding	45.01838	-70.07251
Somerset	West Forks Plantation		West Forks Plantation	UNK	Long Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Waldo	Freedom		Freedom	UNK	Ongoing	Distribute the County Family Preparedness Guides.				
Waldo	Freedom		Main Street	$2,000	1 week	Main Street: Upgrade 100' of roadside drainage.			44.52930	-69.29612
Waldo	Freedom		Mill Street	$1,000	1 week	Mill Street: Upgrade 50' of roadside drainage.			44.52737	-69.29884
Waldo	Freedom		Mitchell Road	$130,000	12 weeks	Mitchell Road: Replace/improve existing bridge.			44.50985	-69.31815
Waldo	Freedom		Penny Hill	$15,000	4 weeks	Penny Hill: Upgrade 1,500' of drainage, replace culverts, add drain, and geotextile.			44.48784	-69.30420
Waldo	Freedom		Pleasant Road	$5,000	1 week	Pleasant Street: Upgrade 275' of roadside drainage.			44.52599	-69.29343
Waldo	Freedom		Waning Road	$6,000	4 weeks	Waning Road: Remove ledge and ditch 500'.			44.55722	-69.34459
Waldo	Knox		Knox	UNK	2 months	Distribute the County Family Preparedness Guides.				
Waldo	Liberty		Liberty	UNK	2 months	Distribute the County Family Preparedness Guides.				
Waldo	Lincolnville		Lincolnville	UNK	2 months	Distribute the County Family Preparedness Guides.				
Waldo	Montville		Halldale Road	$60,000	3 weeks	Halldale Road: Add 24" x 40' culverts and repave.			44.45241	-69.31271
Waldo	Montville		Haystack Mt. Road	$10,000	2 weeks	Haystack Mt. Road: Add 24" x 40' culverts and repave.			44.39892	-69.30027
Waldo	Montville		Hogback Mt. Road	$30,000	3 weeks	Hogback Mt. Road: Add 24" x 40' culverts and resurface.			44.45726	-69.27803
Waldo	Montville		Kingdom Road	$175,000	1 year	Kingdom Road: Replace/upgrade bridge.			44.40202	-69.28998
Waldo	Montville		Montville	UNK	Ongoing	Distribute the County Family Preparedness Guides.				
Waldo	Montville		Morrill Road	$60,000	3 weeks	Morrill Road: Upsize existing 18'' x 40' culvert with 24'' x 40' HDPE culvert and repave.			44.44884	-69.24321
Waldo	Montville		North Ridge Road	$30,000	3 weeks	North Ridge Road: Add 24'' x 40' culvert and repave.			44.42759	-69.25615

Waldo	Montville		Randlett Road	$25,000	3 weeks	Randlett Road: Add 24” x 40’ culverts and repave.			44.49993	-69.27854
Waldo	Northport		Northport	UNK	2 months	Distribute the County Family Preparedness Guides.				
Waldo	Palermo		Arnold Lane	$5,200	5 weeks	Arnold Lane: Place 40' of 24” dia culvert and riprap inlet and outlet.			44.45203	-69.40974
Waldo	Palermo		Belden Woods Road	$16,500	5 weeks	Belden Woods Road: Place 50' of 48” dia culvert; riprap inlet/outlet; add 95' x 22' of 36" depth gravel.			44.41555	-69.41215
Waldo	Palermo		Chisholm Pond Road	$62,000	5 weeks	Chisholm Pond Road: Ditch 2,500' and place 2,500' x 22' of geotextile fabic and add 12'' base and surface gravel.			44.43216	-69.36392
Waldo	Palermo		Jones Road	$10,500	5 weeks	Jones Road: Place 50' of 24” dia culvert; add 400' x 22' wide 12'' surface gravel.			44.36914	-69.46830
Waldo	Palermo		Parmenter Road	$28,500	5 weeks	Parmenter Road: Ditch 1,200' and place 1,200' x 22' of geotextile fabic and add 12'' base and surface gravel.			44.39869	-69.44096
Waldo	Prospect		Dickey Hill Bridge on George Road	$100,000	6 months	Replace/upgrade the Dickey Hill Bridge on George Road with more resilient structure.			44.52387	-68.92204
Waldo	Prospect		Hawes Stream Road at Lane Brook	$50,000	2 months	Upgrade culvert on Hawes Stream Road at Lane Brook.			44.54760	-68.88903
Waldo	Searsmont		Searsmont	UNK	2 months	Distribute the County Family Preparedness Guides.				
Waldo	Searsport		Cottage Road	$20,000	2 weeks	Cottage Road: Upsize existing culvert and riprap.			44.40804	-69.18459
Waldo	Unity		Berry Road	$26,000	4 weeks	Berry Road: Upgrade Western Bridge abutments and wingwall.			44.58703	-69.29893
Waldo	Unity		Crowell Road/Hunter Road	$38,000	6 weeks	Crowell Road/Hunter Road: Upsize 36'' x 60' culvert with 48'' x 60' culvert, elevate 250' x 24' x 24'' and stabilize shoulders, add 24'' x 50' relief culvert and build berm.			44.55470	-69.33131
Waldo	Unity		East Mussey Road	$32,000	5 weeks	East Mussey Road: Elevate 150' x 21' x 2', upsize existing 48'' x 30' culvert with 5' x 5' x 50' box culvert.			44.59284	-69.31542
Waldo	Unity		Kanokolus Road	$50,000	6 weeks	Kanokolus Road: Elevate 2,000' x 21' x 2' and repave.			44.62108	-69.34142
Waldo	Unity		Stage Coach Road	$48,000	4 weeks	Stage Coach Road: Ditch 15,000, and upsize (1) 15'' x 50' to 18'' x 50' culvert and (1) 18'' x 50' to 24'' x 50' culvert.			44.63500	-69.29173
Waldo	Unity		Unity	UNK	Ongoing	Distribute the County Family Preparedness Guides.				
Waldo	Unity		Waning Road (Site 1)	$76,000	4 weeks	Waning Road (Site 1): Elevate 1,500' x 2' x 18', stabilize shoulders and repave, upsize (2) 24'' x 50' to 36'' x 50' culverts and upsize (1) 36'' x 50' culvert with 4' x 50' box culvert.			44.57847	-69.33145
Waldo	Unity		Waning Road (Site 2)	$17,000	4 weeks	Waning Road (Site 2): Elevate 150' x 21' x 2' and upsize 36'' x 60' to 48'' x 60' culvert.			44.54914	-69.38645
Waldo	Waldo County		Waldo County	UNK	Ongoing	Distribute the County Family Preparedness Guides.				
Waldo	Winterport		Rancourt Road	$20,000	2 months	Rancourt Road: Upgrade old 48” culvert with new 40' long 72” culvert.			44.66833	-68.91156
Waldo	Winterport		Winterport	UNK	2 weeks	Stabilize 5,000' of shoulders at various locations.				
Waldo	Winterport		Winterport	UNK	Ongoing	Distribute the County Family Preparedness Guides.				
Washington	Addison		Addison	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Alexander		Arm Road	$18,000	Medium Term	Arm Road: Ditch 3,000’, upsize (2) 36” x 40’ culverts, (2) 24” x 50’ culverts, (2) 24” x 40’ culverts.		Deferred/Lack of Funding	45.07272	-67.48702
Washington	Alexander		C.E. Davis Road	$42,000	Medium Term	C.E. Davis Road: Elevate 500’ x 3’ average; upsize (1) 48” x 50’ culvert; patch pavement.		Deferred/Lack of Funding	45.06962	-67.49509

Washington	Alexander		Flat Road	$34,000	Short Term	Flat Road: Upsize culvert at Elwin Daley.		Deferred/Lack of Funding	45.08547	-67.43856
Washington	Alexander		Flat Road	$20,000	Short Term	Flat Road: Upsize culvert at Elwin Daley.		Deferred/Lack of Funding	45.10073	-67.44733
Washington	Alexander		Pokey Road	$40,000	Medium Term	Pokey Road: Ditch 4,000', upsize (2) 30" x 50' culverts, (1) 24" x 40' culvert.		Deferred/Lack of Funding	45.11315	-67.51838
Washington	Alexander		Spearin Road	$16,500	Short Term	Spearin Road: Ditch 6,800', upsize (1) 36" x 40' culvert, (2) 24" x 40' culverts, patch paving.		Deferred/Lack of Funding	45.08955	-67.46388
Washington	Alexander		Tommy Long Road	$40,000	Medium Term	Tommy Long Road: Ditch 2,000', upsize (1) 36" x 40' culvert, upsize (1) 24" x 40' culvert.		Deferred/Lack of Funding	45.08158	-67.46754
Washington	Baileyville		Baileyville	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Baring Plantation		Charlotte Road	$31,000	Medium Term	Charlotte Road: Ditch 10,000', upsize (12) 18' x 24 culverts.		Deferred/Lack of Funding	45.03691	-67.26168
Washington	Beals		Alley's Bay Road	$100,000	Long Term	Alley's Bay Road: Riprap 1,000' of roadway, install stone barrier.		Deferred/Lack of Funding	44.51276	-67.59301
Washington	Beals		Back Field Park	$50,000	Long Term	Back Field Park: Riprap 500' shoreline to protect turnaround.		Deferred/Lack of Funding	44.51153	-67.59038
Washington	Beals		Hard Head Road	$10,000	Short Term	Hard Head Road: Riprap shoreline less than 500'.		Deferred/Lack of Funding	44.48699	-67.59773
Washington	Beals		Shore Road	$15,000	Short Term	Shore Road: Riprap shoreline, install stone barrier.		Deferred/Lack of Funding	44.52015	-67.61065
Washington	Beddington		Dam Road	$14,000	Short Term	Dam Road: Ditch 5,000', add (3) 18" x 22' culverts.		Deferred/Lack of Funding	44.80436	-68.03497
Washington	Calais		Beaver Lake Road	$30,000	Short Term	Beaver Lake Road: Stabilize road for fire control, 150'.		Deferred/Lack of Funding	45.13300	-67.21324
Washington	Calais		Calais Avenue	$100,000	Long Term	Calais Avenue: Upsize culvert 36" x 120'.		Deferred/Lack of Funding	45.18421	-67.27859
Washington	Calais		Calais High School	$326,000	Long Term	Calais High School: Catch basin, ledge removal and drain pipe for access road 500'.		Deferred/Lack of Funding	45.17974	-67.28226
Washington	Calais		Milltown Pumping Station	$100,000	Long Term	Milltown Pumping Station: Retrofit historic pump station in floodplain currently used as garage and workshop into picnic shell.		Sold by City of Calais	45.17949	-67.28624
Washington	Calais		Public Safety Building	$100,000	Long Term	Public Safety Building: Install culvert.		Deferred/Lack of Funding	45.18854	-67.27611
Washington	Charlotte		Damon Ridge Road	$20,000	Medium Term	Damon Ridge Road: Raise roadbed 1,500' x 1' average.		Deleted/No longer a town priority	45.00464	-67.30813
Washington	Charlotte		Fisher Brook	$40,000	Medium Term	Upgrade culverts on Fisher Brook.		Deferred/Lack of Funding	45.00650	-67.29736
Washington	Charlotte		Oscar Brown Lane	$40,000	Medium Term	Oscar Brown Lane: Upgrade road to better withstand hazards.		New	45.02764	-67.26865
Washington	Charlotte		School	$30,000	Medium Term	Purchase and install generator at school.		Deferred/Lack of Funding	44.99797	-67.26181
Washington	Charlotte		Smith Ridge Road and Rich Hill Road	$50,000	Medium Term	Smith Ridge Road and Rich Hill Road: Ditch 3,000' of road and rebuild hill, culverts and ditching.		Deleted/No longer a town priority	44.97438	-67.28475
Washington	Charlotte		Station Road	$10,000	Short Term	Station Road: Rebuild intersection.		Deleted/No longer a town priority	45.02210	-67.24394
Washington	Cherryfield		Marsh Stream Bridge	$30,000	Medium Term	Marsh Stream Bridge: Upsize old stone culvert to 10' x 5' x 30'		Deferred/Lack of Funding	44.64237	-67.93073
Washington	Cherryfield		Park Street	$25,000	Medium Term	Park Street: Upsize old stone culvert to 10' x 4' x 30' oval culvert.		Deferred/Lack of Funding	44.59417	-67.92020
Washington	Cherryfield		River Road	$20,000	Medium Term	River Road: Upsize culvert intersection of Elm Street; 8' x 4' x 30'.		Deferred/Lack of Funding	44.60417	-67.92680
Washington	Cherryfield		School Street	$25,000	Medium Term	School Street: Upsize stone culvert to 10' x 4' x 30' oval culvert.		Deferred/Lack of Funding	44.60121	-67.92801
Washington	Cherryfield		Willey District	$25,000	Medium Term	Willey District: Upsize old stone culvert to 10' x 4' x 30' oval culvert.		Deferred/Lack of Funding	44.61412	-67.88731
Washington	Cherryfield		Willey District	$20,000	Medium Term	Willey District: Upsize old stone culvert to 10' x 4' x 30' oval culvert.		Deferred/Lack of Funding	44.61392	-67.88859
Washington	Cherryfield		Willey District	$25,000	Medium Term	Willey District: Upsize culvert to 8' x 4' x 30'.		Deferred/Lack of Funding	44.61412	-67.88731

Washington	Cherryfield		Willey District	$20,000	Medium Term	Willey District: Upsize culvert to 8' x 4' x 30'.		Deferred/Lack of Funding	44.61392	-67.88859
Washington	Cherryfield		Willey Hill Road	$15,000	Short Term	Willey Hill Road: Clean and riprap ditch line 500'.		Deferred/Lack of Funding	44.61420	-67.88653
Washington	Cherryfield		Wilson Hill Road	$20,000	Medium Term	Wilson Hill Road: Upsize old stone culvert to 8' x 4' x 30'.		Deferred/Lack of Funding	44.59544	-67.92579
Washington	Codyville Plantation		Codyville Plantation	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Columbia		Columbia	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Columbia Falls		Columbia Falls	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Columbia Falls		Crow Road at East Ridge Road	$2,500	Short Term	Crow Road at East Ridge Road: Upsize 15" CMP to 24' x 30', build up and shape 40' road. Riprap.		Deferred/Lack of Funding	44.65756	-67.72058
Washington	Crawford		Crawford Arm Road	$8,500	Short Term	Crawford Arm Road: Ditch 3,000', add (1) 24' x 18" culvert.		Deferred/Lack of Funding	45.05004	-67.53310
Washington	Crawford		Crawford Lake Road	$5,500	Short Term	Crawford Lake Road: Ditch and rip rap 300' road.		Deferred/Lack of Funding	45.03992	-67.56274
Washington	Cutler		Cutler	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Danforth		Danforth	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Dennysville		Milwaukee Road	$450,000	Long Term	Milwaukee Road: On the side adjacent to Dennysville River, opposite 83 Milwaukee, install riprap and add 2' gravel for about 800' of this dead-end road to reduce flooding.		New	44.90239	-67.24911
Washington	Dennysville		Phe Lane	$66,000	Long Term	Phe Lane: Elevate 1,000' x 1', ditch 2,000', add (3) 18" x 20' culverts and repave.		Deferred/Lack of Funding	44.90136	-67.23393
Washington	East Machias		Factory Road	$105,000	Long Term	Factory Road: Move 1,000' of road, excavate hillside and repave.		Deferred/Lack of Funding	44.74043	-67.38753
Washington	Eastport		Battery Street to Middle Street	$45,000	Medium Term	Battery Street to Middle Street: Upgrade 400' of 36" clay pipe.		New	44.90043	-66.98682
Washington	Eastport		High Street	$500,000	Long Term	High Street: Elevate two sections of road 6', add culverts and underground drainage, repave.		Deferred/Lack of Funding	44.90117	-66.99015
Washington	Eastport		Toll Bridge Road	$250,000	Long Term	Toll Bridge Road: Upgrade culvert, elevate 500' and repave.		New	44.92895	-67.03890
Washington	Grand Lake Stream		Grand Lake Stream	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Harrington		Marshville Road	$76,000	Long Term	Marshville Road: Ditch 30,000', add (10) 18' x 40' culverts and patch pavement.		Deferred/Lack of Funding	44.58862	-67.78269
Washington	Indian Township		Chain Link Road	$750,000	Long Term	Chain Link Road: Rebuild 8.8 miles of road, ditch and add culverts.		Deferred/Lack of Funding	45.22835	-67.57706
Washington	Jonesboro		Jonesboro	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Jonesport		Cross Road	$25,000	Medium Term	Cross Road: Grade and shape 5,220' of road, add 24" x 30' culvert, raise road to prevent erosion.		Deferred/Lack of Funding	44.61557	-67.61168
Washington	Lubec		Crow's Neck Road	$50,000	Medium Term	Crow's Neck Road: Install drainage improvements.		Deferred/Lack of Funding	44.83484	-67.10512
Washington	Lubec		Lubec	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Town acquired excavator/Some ditching has been done.		
Washington	Machias		Machias	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Machiasport		Corn Hill Road	$35,000	Medium Term	Corn Hill Road: Ditch 15,000', upsize (1) 42" x 30' culvert.		Deferred/Lack of Funding	44.69703	-67.39723
Washington	Machiasport		Small Point Road	$44,000	Medium Term	Small Point Road: Ditch 20,000', add (4) 24" x 30' culverts.		Deferred/Lack of Funding	43.73992	-69.84153
Washington	Marshfield		Ingalls Road	$5,000	Short Term	Ingalls Road: Riprap bank on both sides of bridge over Middle River.		Deferred/Lack of Funding	44.73924	-67.50300
Washington	Meddybemps		Behind Town Hall	$6,000	Short Term	Lake bank stabilization behind town hall 12' x 10'.		Deferred/Lack of Funding	45.03155	-67.34398
Washington	Milbridge		Milbridge	UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		

Washington	Northfield		Eastern Ridge Road	$38,000	Medium Term	Eastern Ridge Road: Blast ditch line 50', grub and ditch 15,000'.		Deferred/Lack of Funding	44.83807	-67.54993
Washington	Northfield		Smith Landing Road	$32,000	Medium Term	Smith Landing Road: Grub and ditch 15,000'.		Deferred/Lack of Funding	44.81114	-67.58219
Washington	Pembroke		Oxcove Road	$13,500	Short Term	Oxcove Road: Blast ditch line 75', add (2) 18" x 40' culverts.		Deferred/Lack of Funding	44.91842	-67.19517
Washington	Perry		Cannon Road	$158,000	Long Term	Cannon Road: Blast ditch line 400 cubic yards, add surface gravel 10,800 cubic yards.		Deferred/Lack of Funding	44.93930	-67.07026
Washington	Perry		Golding Road at Boyden Stream Extension	$3,600	Short Term	Golding Road: Upgrade three culverts at Boyden Stream extension.		Deferred/Lack of Funding	44.99257	-67.10258
Washington	Perry		Golding Road near J. Trott	$2,400	Short Term	Golding Road: Upgrade culverts near J. Trott.		Deferred/Lack of Funding	44.99886	-67.10832
Washington	Perry		Old Eastport Road at Meadow	$1,200	Short Term	Old Eastport Road: Upgrade culvert at Meadow.		Deferred/Lack of Funding	44.96065	-67.07368
Washington	Perry		Old Eastport Road at Stream to Half Moon Cove	$1,200	Short Term	Old Eastport Road: Upgrade culvert at stream to Half Moon Cove.		Deferred/Lack of Funding	44.95279	-67.06344
Washington	Perry		Shore Road/Gin Cove Road	$1,200	Short Term	Shore Road/Gin Cove Road: Upgrade culvert at intersection.		Deferred/Lack of Funding	45.01500	-67.08603
Washington	Perry		South Meadow Road near Boyden Stream	$1,200	Short Term	South Meadow Road: Upgrade culvert at Boyden Stream.		Deferred/Lack of Funding	44.97359	-67.09212
Washington	Perry		South Meadow Road near Cook Road	$1,200	Short Term	South Meadow Road: Upgrade culvert near Cook Road.		Deferred/Lack of Funding	44.97359	-67.09212
Washington	Perry		South Meadow Road near Four Corners	$1,200	Short Term	South Meadow Road: Upgrade culvert near Four Corners.		Deferred/Lack of Funding	44.97359	-67.09212
Washington	Pleasant Point		Passamaquoddy Road	$16,000	Short Term	Passamaquoddy Road: Install perimeter ditching around five houses to prevent basement flooding; install catch basin and ditch road 100'.		Deferred/Lack of Funding	44.95443	-67.04707
Washington	Pleasant Point		Waste Treatment Plant	$25,000	Short Term	Waste Treatment Plant: Design and install erosion control measures between plant and the river.		New	44.95603	-67.04296
Washington	Princeton		Edgley Road	$4,500	Short Term	Edgley Road: Upsize twin 18" CMP's to one 36" x 40' culvert, riprap.		Deferred/Lack of Funding	45.18813	-67.54217
Washington	Princeton		School	UNK	Short Term	School: Install generator at school so school can serve as community shelter.		In Process of Completion	45.21305	-67.63190
Washington	Princeton		South Princeton Road	$4,000	Short Term	South Princeton Road: Upsize CMP to 36" x 40', riprap.		Deferred/Lack of Funding	45.17988	-67.51636
Washington	Robbinston		Brewer Road - Eastern Stream Crossing	$15,000	Short Term	Brewer Road: Upgrade (3) 24" culverts – Eastern Stream crossing.		Deferred/Lack of Funding	45.08179	-67.12316
Washington	Robbinston		Brewer Road along Eastern Stream	$12,000	Short Term	Brewer Road: Ditch 3,000' along Eastern Stream.		Deferred/Lack of Funding	45.07351	-67.14128
Washington	Robbinston		Brewer Road on Picnic Hill	$16,000	Short Term	Brewer Road: Upgrade (4) 24' culverts on Picnic Hill.		Deferred/Lack of Funding	45.07107	-67.14691
Washington	Robbinston		Lake Road	$15,000	Short Term	Lake Road: Upgrade 6' culvert at Mill Stream.		Deferred/Lack of Funding	45.02383	-67.15305
Washington	Robbinston		Ridge Road	$12,000	Medium Term	Ridge Road: Raise road surface 24," install (2) 24" culverts 600'.		Deferred/Lack of Funding	45.02769	-67.17637
Washington	Robbinston		Ridge Road	$35,000	Medium Term	Ridge Road: Raise road surface 24," install (2) 24" culverts 600'.		Deferred/Lack of Funding	45.03761	-67.16413
Washington	Robbinston		Ridge Road - Johnson's Tree Farm	$10,000	Short Term	Ridge Road: Ditch 1200' (Johnson's Tree Farm).		Deferred/Lack of Funding	45.04181	-67.14770

Washington	Robbinston		Ridge Road - Mill Stream Crossing	$10,000	Short Term	Ridge Road: Upgrade 48” culvert (Mill Stream crossing).		Deferred/Lack of Funding	45.04025	-67.15863
Washington	Rocque Bluffs		Rocque Bluffs	$50,000	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding	44.62911	-67.47372
Washington	Rocque Bluffs		Schoppee Point Road	$100,000	Long Term	Schoppee Point Road: Install erosion control measures past Watts Beach on the left.		New	44.61111	-67.48534
Washington	Steuben		Unionville Road - Stanley Point Road	$31,000	Medium Term	Unionville Road - Stanley Point Road: Ditch 15,000’, upsize (1) 24” x 40’ culvert.		Deferred/Lack of Funding	44.58019	-67.98972
Washington	Talmadge		Old Mill Road	$15,000	Short Term	Old Mill Road: Ditch 7,000’, upsize 18” to 36” x 40’ culvert.		Deferred/Lack of Funding	45.32160	-67.70793
Washington	Talmadge		Talmadge Road	$29,000	Medium Term	Talmadge Road: Ditch 12,500’, upsize (5) 12” to 18” x 30’ culverts.		Deferred/Lack of Funding	45.33700	-67.71063
Washington	Topsfield		Topsfield	$50,000	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding	45.43989	-67.78311
Washington	Unorganized Territory		Road 19	UNK	Medium Term	Road 19: Install drainage improvements.		Deferred/Lack of Funding		
Washington	Unorganized Territory			UNK	Medium Term	Improve ditching, upsize culverts as needed.		Deferred/Lack of Funding		
Washington	Vanceboro		Salmon Brook Road	$40,000	Medium Term	Salmon Brook Road: Ditch 15,000’, install (3) 24” x 40’ and (1) 48” x 40’ culvert.		Deferred/Lack of Funding	45.52142	-67.44147
Washington	Waite		Old Mill Road	$12,000	Short Term	Old Mill Road: Ditch 5,000’, upsize 18” to 36” x 40’ culvert.		Deferred/Lack of Funding	44.95984	-67.43880
Washington	Wesley		Guptaill Road	$11,000	Short Term	Guptaill Road: Ditch 800’, add 80’ x 24” culvert, add 2,600’ finish gravel.		Deferred/Lack of Funding	44.88129	-67.69290
Washington	Whiting		Gardners Lake Road	$2,500	Short Term	Gardners Lake Road: Install (2) beaver guards on culverts.		Deferred/Lack of Funding	44.78794	-67.33075
Washington	Whitneyvillw		Back Street Road	$1,500	Short Term	Back Street Road: Upsize 12’ culvert with 18” x 30’ culvert.		Deferred/Lack of Funding	44.69119	-67.53553
Washington	Whitneyvillw		Canal Road	$6,500	Short Term	Canal Road: Upsize (3) 15” culverts with 18” x 30’ culverts, add 18” x 30’ culvert.		Deferred/Lack of Funding	44.73390	-67.53720
York	Acton		Acton	$150,000	8 months	All roads in general: Survey all culverts. Upgrade and resize where necessary including ditching.		New Project	43.38511	-70.54239
York	Alfred		Brackett Hill Road	$400,000	4 months	Brackett Hill Road: Rebuild road base 10,000' x 18' and ditch.		Still Deferred/Lack of Funding	43.51905	-70.73505
York	Alfred		Federal Street	$10,000	2 weeks	Federal Street: Ditching and upgrade culverts.		Planning Phase	43.63402	-70.63635
York	Alfred		Federal Street - Corner of Gile Road	$35,000	1 week	Federal Street - Corner of Gile Road: Upgrade 4' culvert.		New Project	43.61360	-70.61244
York	Alfred		Gore Road	$10,000	2 weeks	Gore Road: Ditching and upgrade culverts.		Planning Phase	43.40178	-70.42262
York	Alfred		Mountain Road	$200,000	3 weeks	Mountain Road: Rebuild road base 3,000'.		New Project	43.39857	-70.41489
York	Alfred		Mouse Lane	$100,000	2 weeks	Mouse Lane: Upgrade 1,000' of underdrain, ditch and rebuild road base with fabric.		New Project	43.36971	-70.43332
York	Alfred		Witchers Mills Road	$10,000	2 weeks	Witchers Mills Road: Ditching and upgrade culverts.		Planning Phase	43.08761	-70.74966
York	Arundel		Downing Road at Duck Brook	$55,000	4 weeks	Downing Road at Duck Brook: Slip line existing 12' 8" x 8' x 55' arch pipe to increase flow capacity.		Still in Planning Phase/Seeking Funding	43.78011	-70.71593
York	Berwick		Adeline Road	$6,000	2 weeks	Adeline Road: Add 36" x 40' overflow pipe at brook crossing tying into natural swale.		Deferred/Still Lack Funding	43.70757	-70.71131
York	Berwick		Berwick	UNK	TBD	Elevate or acquire flood damaged homes.		Ongoing/No Eligible Applicants	43.78442	-70.67928
York	Berwick		Little River Road	$12,000	2 weeks	Little River Road: Upsize existing twin 24" x 30' culverts with 60" x 40' elliptical pipe.		Deferred/Still Lack Funding	43.37806	-70.77763
York	Berwick		Wilson Street	$100,000	4 months	Wilson Street: Upsize existing underground drainage system between Wilson Street and Salmon Falls River.		Deferred/Still Lack Funding	43.30348	-70.72991
York	Biddeford		Fortunes Rock Road	$1,000,000	2 years	Fortunes Rock Road: Elevate road, raise retaining wall and upgrade culverts.		Planning Phase	43.31903	-70.86450

York	Biddeford		Granite Point Road	$500,000	2 years	Granite Point Road: Elevate road way for 500', expand retaining wall to protect from overflow.		Planning Phase	43.39280	-70.77787
York	Biddeford		Route 111 at Maine Turnpike	$150,000	2 years	Route 111 at Maine Turnpike: H&H study to address storm water flooding events, mitigate as needed.		MTA doing study/Seeking Funding	43.35018	-70.80171
York	Buxton		Back Nippen Road	$14,000	4 weeks	Back Nippen Road: Upsize 48" culvert with 60" culvert, elevate roadway 2', geotextile on slopes and riprap.		Planning Phase	43.54154	-70.37412
York	Buxton		Elden Road	$35,000	2 months	Elden Road: Ditching, regrade 1525' x 18' roadway and pave. Remove 8 trees, upgrade culverts in roadway and driveways, riprap pipes.		Planning Phase	43.52306	-70.37382
York	Buxton		Patten Farm Road	$62,000	6 weeks	Patten Farm Road: Upsize existing 6' x 7' x 24' bridge with 10' x 6' x 24' box culvert with headwall.		Still in Planning Phase/Seeking Funding	43.50719	-70.38187
York	Buxton		Town Farm Road	$56,000	2 months	Town Farm Road: Repave roadway and upgrade culverts.		Planning Phase	43.50468	-70.38226
York	Cornish		Maple Street	$10,000	3 months	Maple Street: Town Hall erosion.		New Project	43.50409	-70.38340
York	Cornish		Roland Day Road	$45,000	4 weeks	Roland Day Road: Elevate 1000' x 3' x 19' and add (3) 24" x 40' culverts.		Deferred/Seeking Funds	43.50372	-70.38361
York	Dayton		Buzzel Road	$162,000	8 weeks	Buzzel Road: 6 to 8' culvert arch, riprap.		New Project	43.52544	-70.36554
York	Dayton		Dennet Road	$50,000	5 weeks	Dennet Road: Upsize 18" culvert to 24", install riprap.		Planning Phase	43.41152	-70.77818
York	Dayton		Hight Road	$50,000	5 weeks	Hight Road: Upsize 18' culvert to 24", install riprap, regrade road.		Planning Phase	43.47135	-70.82381
York	Dayton		Hollis Road	$80,000	8 weeks	Hollis Road: Upgrade/increase number of culverts, riprap, repave.		Planning Phase	43.37400	-70.70419
York	Dayton		Murch Road	$80,000	8 weeks	Murch Road: Upsize culvert, install riprap, upgrade road surface.		Planning Phase	43.64647	-70.70596
York	Eliot		Pleasant Street	$5,000	2 weeks	Pleasant Street: Stabilize river bank. Riprap 30' x 100' x 5' of river bank.		Repaired but needs additional work	43.09734	-70.77005
York	Hollis		Clark Mills Road/Glaude Avenue	$7,000	2 weeks	Clark Mills Road/Glaude Avenue: Ditch 700' , reshape and line ditch.		Still Deferred	43.65420	-70.88638
York	Hollis		Hailey Road	$45,000	4 weeks	Hailey Road: Elevate 300' x 3' x 19', upsize 24" culvert to 36" x 30', riprap intake and outflow and repave.		Still deferred for lack of funds.	43.15677	-70.80148
York	Hollis		Saco Road	$88,000	2 months	Saco Road: Elevate roadway 2'-3'.		Planning Phase	43.17319	-70.77129
York	Hollis		Salmon Falls Road	$30,000	2 weeks	Salmon Falls Road: Upgrade (5) existing culverts.		New Project	43.15816	-70.75241
York	Hollis		Sand Pond Road	$25,000	6 weeks	Sand Pond Road: Elevate 500' x 32" x 22', ditch and line 1200', add (3) 24" x 30' culverts and repave.		Planning Phase/Seeking Funding	43.52822	-70.79710
York	Kennebunk		Alfred Road	$400,000	6 weeks	Alfred Road: Culvert and drainage.		Deferred until funding is available.	43.52148	-70.80246
York	Kennebunk		Bayberry Avenue	$720,000	6 weeks	Bayberry Avenue: 6,000' underground drainage and catch basins.		Still deferred until funding is available.	43.12651	-70.80395
York	Kennebunk		Cole Road	$350,000	4 weeks	Cole Road: Drainage.		New Project/Seeking Funds	43.65767	-70.78452
York	Kennebunk		Emmons Road	$1,000,000	8 weeks	Emmons Road: Bridge reconstruction and elevation.		New Project/Seeking Funds	43.23313	-70.72110
York	Kennebunk		Woodhaven	$480,000	6 weeks	Woodhaven: 4,000' underground drainage.		Still deferred until funding is available.	43.41233	-70.59072
York	Kennebunkport		Arundel Road	$30,000	4 weeks	Arundel Road: Elevate road 300' x 3' x 22', repave and add 8' x 50' culvert.		Planning Phase/Seeking Funding	43.77415	-70.83342
York	Kennebunkport		Goose Rocks Road	$24,000	2 weeks	Goose Rocks Road: Upsize existing 48" x 40' culvert to 72" x 60' elliptical pipe.		Planning Phase/Seeking Funding	43.34532	-70.84556

York	Kennebunkport		Ocean Avenue	$100,000	4 weeks	Ocean Avenue: Elevate two sections of road 500' X 3'.		Planning Phase	43.37690	-70.81437
York	Kennebunkport		Pier Road Causeway	$18,000	4 weeks	Pier Road Causeway: Elevate 25' x 3' x 24' and repave.		Still Planning until funding is available.	43.51904	-70.37300
York	Kittery		Payne Road	$100,000	4 weeks	Payne Road: Elevate 700' section of road.		Planning Phase/Seeking Funding	43.11657	-70.67455
York	Lebanon		Dickson Road	$73,000	6 weeks	Dickson Road: Ditch 30,000' and line 2,000' of ditch; upsize (2) 24" x 40' culverts.		Still in Planning Phase/Seeking Funding	43.51427	-70.73174
York	Lebanon		Lebanon	$15,000	3 weeks	Upsize culverts - various locations.		Planning Phase	43.43868	-70.69508
York	Lebanon		Orrills Hill Road	$30,000	2 weeks	Orrills Hill Road: Upsize culvert.		Planning Phase	43.47366	-70.75778
York	Lebanon		Poplar Hill Road	$85,000	6 weeks	Poplar Hill Road: Ditch 30,000' and line 2,000' of ditch; upsize (2) 24" x 40' culverts.		Still in Planning Phase/Seeking Funding	43.80300	-70.82579
York	Lebanon		Shapleigh Road	$33,000	4 weeks	Shapleigh Road: Ditch 15,000', upsize 24" x 40' culvert.		Still in Planning Phase/Seeking Funding	43.51996	-70.55748
York	Lebanon		Union School Road/Lower Guinea Road	$20,000	2 weeks	Union School Road/Lower Guinea Road: Upsize culvert.		Planning Phase	43.59986	-70.55635
York	Limerick		Limerick	$2,000	2 weeks	Identify all culverts in town with GPS and identify status.		Planning Phase/Seeking Funding	43.71077	-70.68466
York	Limington		Allen Hill Road - from Route 11 to Moody Road	$18,000	2 weeks	Allen Hill Road - from Route 11 to Moody Road: Ditch, riprap, fabric and upgrade (4) 15' x 30' culverts.		New Project	43.73504	-70.68820
York	Limington		Boothby Road - from Axelsen Road to Beaver Berry Road	$15,000	2 weeks	Boothby Road - from Axelsen Road to Beaver Berry Road: Ditch, fabric, riprap and clear culverts.		New Project	43.77318	-70.76327
York	Limington		Boothby Road and Axelsen Road Intersection	$175,000	2 weeks	Boothby Road and Axelsen Road Intersection: Upgrade large culvert, fabric, riprap.		New Project	43.70446	-70.73818
York	Limington		Doles Ridge Road - from Route 117 in 1,800'	$8,000	3-4 days	Doles Ridge Road - from Route 117 in 1,800': Ditch, remove berms, fabric, riprap, check dams and clear all culverts.		Planning Phase	43.70508	-70.73164
York	Limington		Douglas Road to Merrifield Farm Road	$13,000	3 weeks	Douglas Road to Merrifield Farm Road: Remove berms, ditch, fabric, riprap, check dams where needed and upgrade culverts.		New Project	43.72312	-70.70162
York	Limington		Hanscomb School Road	$15,000	8 days	Hanscomb School Road: Remove berms, ditch where needed, riprap, check dams and fabric as needed. Upgrade one cross culvert.		New Project	43.68920	-70.73328
York	Limington		Hanscomb School Road	$15,000	8 days	Hanscomb School Road: Remove berms, ditch where needed, riprap, check dams and fabric as needed. Upgrade one cross culvert.		New Project	43.68920	-70.73328
York	Limington		Mill Turn Road	$23,000	2 weeks	Mill Turn Road: Ditch 1,900' with fabric, riprap including check dams.		Planning Phase	43.68116	-70.68230
York	Limington		Moody Road - from Route 117 to Route 11	$15,000	2 weeks	Moody Road - from Route 117 to Route 11: Ditch, fabric, riprap, check dams and clear all culverts		New Project	43.50214	-70.43848
York	Limington		Richardson Road	$11,000	2 weeks	Richardson Road: Ditch, riprap fabric and upgrade (4) 15' x 30' culverts.		New Project	43.72299	-70.70167
York	Limington		River Road	$26,000	2 weeks	River Road: Ditch 2,000', mitigate with fabric, riprap including check dams.		Planning Phase	43.73976	-70.64807
York	Limington		Sedgley Road - from Jo Joy Road to Limerick line	$20,000	2 weeks	Sedgley Road - from Jo Joy Road to Limerick line: Ditch, remove berms, riprap, check dams and fabric.		New Project	43.46563	-70.79965

York	Limington		Tucker Road - from Sage Road	$10,000	1 week	Tucker Road - from Sage Road: 1,800' - ditch, rip rap and upgrade culverts.		New Project	43.79241	-70.72605
York	Limington		Tucker Road - Route 25 to Lipaline Drive	$11,000	1 week	Tucker Road - Route 25 to Lipaline Drive: Ditch, mitigate with fabric, riprap and upgrade culverts.		New Project	43.78122	-70.74454
York	Lyman		Clarks Wood Road	$15,000	3 weeks	Clarks Wood Road: Ditching.		Planning Phase	43.41760	-70.54271
York	Lyman		Old North Berwick Road	$200,000	6 weeks	Old North Berwick Road: Elevate road, upgrade culverts and ditch.		Planning Phase	43.26645	-70.60288
York	Newfield		Lewis Road	$10,000	2 weeks	Lewis Road: Ditch 600' to include blasting of ledge.		Still in Planning Phase/Seeking Funding	43.65885	-70.93270
York	North Berwick		Estes Hill Road	$25,000	4 weeks	Estes Hill Road: Ditch and line 2,500' and add/check dams.		Discontinued Road - work not needed.	43.53040	-70.76987
York	North Berwick		North Berwick	$200,000	10 months	Complete all road surveys. Upgrade and upsize culverts including ditching		New Project	43.60699	-70.50831
York	Ogunquit		Captain Thomas Road	$100,000	2 months	Captain Thomas Road: Upsize 36" x 40' to 60" x 40' and 24" x 40' to 36" x 40' culverts, raise roadway 2-3', repave.		Planning Phase/Still Seeking Funding	43.59448	-70.54627
York	Ogunquit		Kings Highway	$12,000	4 weeks	Kings Highway: Upgrade foot bridge with 6' x 40' span.		Ongoing Project	43.56132	-70.56556
York	Old Orchard Beach		First Street	$83,800	12 weeks	12 First Street: Drainage system.		Starting in July 2016.	43.56245	-70.58156
York	Old Orchard Beach		Milliken Street area	$24,000	16 weeks	Milliken Street area: Conduct hydrologic and hydraulic analysis to assess means to mitigate stormwater related to flooding.		In Process	43.52675	-70.54194
York	Old Orchard Beach		Old Orchard Beach	$50,000	12 weeks	Drainage Structure (French drain) at (11) different locations. Cost is the same for each site.		Ongoing Project	43.64563	-70.62655
York	Parsonsfield		Arthur Morrill Road	$5,000	1 week	Arthur Morrill Road: Ditch and line 500'.		Still in Planning Phase/Seeking Funding	43.52525	-70.63672
York	Parsonsfield		Benson Road	$4,000	2 weeks	Benson Road: Add (3) 18" x 32' culverts.		Still in Planning Phase/Seeking Funding	43.45139	-70.76733
York	Parsonsfield		Bob Day Road	$10,000	2 weeks	Bob Day Road: Ditch and line 1,000'.		Still in Planning Phase/Seeking Funding	43.45409	-70.78079
York	Parsonsfield		Chase Road	$11,000	2 weeks	Chase Road: Ditch and line 1,000' and add 18" x 36' culvert.		Still in Planning Phase/Seeking Funding	43.30035	-70.72492
York	Parsonsfield		Chick Road	$15,000	2 weeks	Chick Road: Ditch and line 1,500'.		Still in Planning Phase/Seeking Funding	43.32810	-70.67034
York	Parsonsfield		Cross Road	$23,000	3 weeks	Cross Road: Ditch and line 2,000' and upsize (3) culverts to 18" x 36'.		Still in Planning Phase/Seeking Funding	43.28271	-70.58638
York	Parsonsfield		Dearborn Road	$6,000	1 week	Dearborn Road: Ditch and line 500' and add 18" x 36' culvert.		Still in Planning Phase/Seeking Funding	43.69754	-70.64369
York	Parsonsfield		Devereux Road	$22,000	3 weeks	Devereux Road: Ditch and line 2,000' and upsize culvert to 18' x 36'.		Still in Planning Phase/Seeking Funding	43.40972	-70.45792
York	Parsonsfield		Dutch Road	$10,000	2 weeks	Dutch Road: Ditch and line 1,000'.		Still in Planning Phase/Seeking Funding	43.38699	-70.47261
York	Parsonsfield		Hasty Road	$20,000	3 weeks	Hasty Road: Ditch and line 2,000'.		Still in Planning Phase/Seeking Funding	43.11635	-70.67450
York	Parsonsfield		Hobbs Swamp Road	$5,000	1 week	Hobbs Swamp Road: Ditch and line 500'.		Still in Planning Phase/Seeking Funding	43.76826	-70.96477
York	Parsonsfield		Joe Berry Road	$35,000	4 weeks	Joe Berry Road: Regravel, reshape and ditch 1,800' of roadway.		Still in Planning Phase/Seeking Funding	43.26433	-70.61176
York	Parsonsfield		Kezar Mountain Road	$35,000	4 weeks	Kezar Mountain Road: Regravel road, ditch and line 5,000' rt and lt and upsize (3) culverts to 18" x 36'.		Still in Planning Phase/Seeking Funding	43.34365	-70.56206

York	Parsonsfield		Lombard Hill Road	$20,000	3 weeks	Lombard Hill Road: Ditch and line 2,000'.		Still in Planning Phase/Seeking Funding	43.69792	-70.95434
York	Parsonsfield		Long Pond Road	$55,000	8 weeks	Long Pond Road: Removal of roughly 200 lf of ledge, widen road, reshape ditches, pave widened portion.		Still in Planning Phase/Seeking Funding	43.09735	-70.77001
York	Parsonsfield		Lost Mile Road	$5,000	1 week	Lost Mile Road: Ditch and line 500'.		Still in Planning Phase/Seeking Funding	43.51209	-70.37810
York	Parsonsfield		Maplecrest Road	$13,000	2 weeks	Maplecrest Road: Ditch and line 1,000' and upsize (3) culverts to 18" x 36'.		Still in Planning Phase/Seeking Funding	43.51779	-70.42803
York	Parsonsfield		Middle Road	$45,000	3 weeks	Middle Road: Add gravel, regrade, ditch and line 3,000'.		Still in Planning Phase/Seeking Funding	43.57229	-70.61462
York	Parsonsfield		Milliken Road	$14,000	2 weeks	Milliken Road: Ditch and line 1,000' and upsize culvert to 42" x 36'.		Still in Planning Phase/Seeking Funding	43.63348	-70.62202
York	Parsonsfield		Mountain Road	$13,000	2 weeks	Mountain Road: Ditch and line 1,000' and upsize (3) culverts to 18" x 36'.		Still in Planning Phase/Seeking Funding	43.68381	-70.94475
York	Parsonsfield		Mudget Meadow Road	$5,000	2 weeks	Mudget Meadow Road: Upsize (4) culverts to 18" x 36'.		Still in Planning Phase/Seeking Funding	43.34824	-70.48515
York	Parsonsfield		New County Road	$13,000	2 weeks	New County Road: Ditch and line 1,000' and upsize culvert to 42" x 36' and add (4) 18" x 36'.		Still in Planning Phase/Seeking Funding	43.48841	-70.73754
York	Parsonsfield		Pendexter Road	$25,000	4 weeks	Pendexter Road: Upsize culvert to 42" x 36'; raise road elevation 10", add cross culverts as needed, ditch.		Still in Planning Phase/Seeking Funding	43.27667	-70.72661
York	Parsonsfield		Pratt Road	$10,000	2 weeks	Pratt Road: Ditch and line 1,000'.		Still in Planning Phase/Seeking Funding	43.24361	-70.77214
York	Parsonsfield		Road Between the Ponds	UNK	6 weeks	Road Between the Ponds: Remove pavement, widen road width, upgrade culverts, ditch and repave. Removal of trees and resetting of telephone poles required.		New Project		
York	Parsonsfield		Smith Road	$10,000	2 weeks	Smith Road: Ditch and line 1,000'.		Still in Planning Phase/Seeking Funding	43.44316	-70.78539
York	Parsonsfield		Stacey Lane	$5,000	1 week	Stacey Lane: Ditch and line 500'.		Still in Planning Phase/Seeking Funding	43.43195	-70.55349
York	Parsonsfield		Stagecoach Road	$5,000	1 week	Stagecoach Road: Ditch and line 500'.		Still in Planning Phase/Seeking Funding	43.64421	-70.46655
York	Parsonsfield		West Road	$1,500	1 week	West Road: Add 18" x 36' culvert.		Still in Planning Phase/Seeking Funding	43.40992	-70.96730
York	Parsonsfield		Woodward Road	$5,000	1 week	Woodward Road: Ditch and line 500'.		Still in Planning Phase/Seeking Funding	43.40705	-70.95103
York	Saco		Cleveland Street and Summer Street	$100,000	4 weeks	Cleveland Street and Summer Street: Mitigate current surface flooding by upsizing pipe system/improve channel flow.		New Project	43.40121	-70.94332
York	Saco		Heath Road	$15,000	4 weeks	Heath Road: Install underground drainage 18" x 500', rip rap.		Still in Planning Phase/Seeking Funding	43.65938	-70.93276
York	Saco		Ocean Park Road	$250,000	8 weeks	Ocean Park Road: Upgrade aging undersized drainage system to remove barrier to natural flow volumes.		New Project	43.69795	-70.95430
York	Saco		Route 1	$3,000	1 week	Route 1: Clean and improve 1,000' ditch line South of Route 1.		State Road – need to work with DOT – Ongoing work	43.72743	-70.93476
York	Saco		York County Emergency Shelter	$18,000	3 weeks	York County Emergency Shelter: Iinstall French drain 500' and install redundant sump pump in basement.		Still in Planning Phase/Seeking Funding	43.72592	-70.96920
York	Sanford		Bernier Road	$250,000	8 weeks	Bernier Road: Bridge upgradement.		New Project	43.79294	-70.87434

York	Sanford		Bradeen Street	$225,000	4 weeks	Bradeen Street Drainage: Upgrade storm drains and increase culvert from 8" to 12" minimum.		New Project	43.78000	-70.86356
York	Sanford		Cottage Street (North Avenue to Island Avenue)	$25,000	4 weeks	Cottage Street (North Avenue to Island Avenue): Upgrade culverts.		Planning Phase	43.68394	-70.89404
York	Sanford		Gowan Park Drive	$32,000	4 weeks	Gowan Park Drive: Upsize (2) 24" x 40' CMP's to 36" x 40' CMP's, elevate 500' x 3' x 24' and repave.		Still in Planning Phase/Seeking Funding	43.75550	-70.95807
York	Sanford		Horace Mills Road/Sam Allen Road	$4,800	2 weeks	Horace Mills Road/Sam Allen Road: Install (2) 18" x 40' culverts, ditch 800'.		Still in Planning Phase/Seeking Funding	43.71672	-70.89238
York	Sanford		Mousam Way Trail	$35,000	4 weeks	Mousam Way Trail: Upgrade granite culvert to either box culvert or metal arch.		Planning Phase	43.71185	-70.89060
York	Sanford		North Street	$127,000	8 weeks	North Street: Install (10) catch basins andupsize 12" x 600' to 18" x 600' underground drainage.		Still Deferred/Seeking Funding	43.71515	-70.90482
York	Sanford		Pioneer Avenue	$250,000	4 weeks	Pioneer Avenue Drainage: Upgrade existing spiral PVC culvert with HDPE.		New Project	43.68388	-70.94473
York	Sanford		Rosenfield Development	$205,000	8 weeks	Rosenfield Development: Install (10) catch basins and 2,000' x 24", 48' x 1,200' underground drainage.		Removed from list – deemed impractical	43.72887	-70.86775
York	Sanford		Sacopee Road	$4,000	2 weeks	Sacopee Road: Upsize existing 18" x 40' CMP with 24" x 40' culvert and add additional 18" x 40" culvert approximately 500' from existing pipe.		Still in Planning Phase/Seeking Funding	43.73656	-70.87139
York	Sanford		Sacopee Road (Site 1)	$30,000	4 weeks	Sacopee Road (Site 1): Upsize existing 48" x 40' culvert with 6' x 4' x 40' box culvert.		Still in Planning Phase/Seeking Funding	43.79633	-70.87304
York	Sanford		Stiles Avenue/Howard Street	$29,000	3 weeks	Stiles Avenue/Howard Street: Upsize twin 36" x 150' RCP with 50" x 150' RCP.		Still in Planning Phase/Seeking Funding	43.70257	-70.94882
York	Sanford		Whiches Mills Road	$14,000	2 weeks	Whiches Mills Road: Upsize and realign existing 50" x 40' culvert with 60" x 60' culvert.		Still in Planning Phase/Seeking Funding	43.79629	-70.87894
York	Shapleigh		Shapleigh	$120,000	11 months	Culvert program - upsize and resize culverts, add lead-in ditching and stonework where necessary.		New Project	43.70229	-70.97325
York	South Berwick		Belle Marsh Road	$2,500	1 week	Belle Marsh Road: Ditch 1,000'.		Still in Planning Phase/Seeking Funding	43.78644	-70.97557
York	South Berwick		Clarks Lane (Quamphagan Brook Watershed)	$30,000	3 weeks	Clarks Lane (Quamphagan Brook Watershed): Perform H&H study to correct runoff flooding to driveways near Marshwood High School.		Still in Planning Phase/Seeking Funding	43.69988	-70.92199
York	South Berwick		Emery's Bridge Road at White Marsh	$600,000		Emery's Bridge Road at White Marsh: Upsize culvert and raise road bed.		Still Deferred/Lack of Funds	43.76936	-70.97193
York	South Berwick		Hopper Sands Road along Great Works River	$150,000	5 months	Hopper Sands Road along Great Works River: Buy out house and restore site.		Still Deferred/Lack of Funds	43.70581	-70.96637
York	South Berwick		Lower Main Street	$100,000		Lower Main Street: Upgrade drainage system.		Planning Phase	43.78608	-70.91490
York	South Berwick		Thrurrell Road	$100,000	8 weeks	Thrurrell Road: Elevate 800' x 22' x 8', stabilize banks and add relief culverts as needed, repave.		Still Deferred/Lack of Funds	43.74440	-70.84108
York	Waterboro		Waterboro	$254,000	1 year	Survey culverts and improve ditching and stonework; upsize and upgrade old culverts.		New Project	43.44711	-70.78429
York	Wells		Bragdon Road at Merriland River	$35,000	4 weeks	Bragdon Road at Merriland River: Upsize culvert and elevate roadway.		Planning Phase	43.41028	-70.66840
York	Wells		Furbish Road	$125,000	4 months	Furbish Road: Elevate roadway.		Planning Phase	43.28273	-70.58626

York	Wells		Post Road at Cozy Corner at Merriland River	$1,200,000	1 year	Post Road at Cozy Corner at Merriland River: Upgrade existing concrete structure with a wider taller structure. Raise Route 1 and Route 9 travel way.		Planning Phase; seeking funds	43.34868	-70.70960
York	Wells		Coles Hill Road	$6,000	1 week	Coles Hill Road: Install 48" x 40' smoothbore overflow culvert, or as determined by H&H study.		Still in Planning Phase/Seeking Funding	43.16440	-70.74033
York	Wells		Wire Road	$20,000	4 weeks	Wire Road: Improve drainage.		Planning Phase	43.37664	-70.65160
York	York		Broadway Avenue	$900,000	6 months	Broadway Avenue: Drainage System Improvements. Outflow G2 in Town Plan.		Town Funded - Still in PE Stage	43.16184	-70.62781
York	York		Long Beach Avenue/Anchorage Motel	$350,000	6 months	Long Beach Avenue/Anchorage Motel: Drainage Improvement - Outflow L.		Ongoing; started Fall of 2015	43.16325	-70.62015
York	York		Long Beach Avenue/Sea Rose Lane	$500,000	6 months	Long Beach Avenue/Sea Rose Lane: Outfall culvert upgradement - Outflow J.		Town/Grant Funded - PE Stage	43.24863	-70.62503
York	York		Main Street/Bayhaven	$750,000	3 months	Main Street/Bayhaven: Drainage improvement.		Town Funded and Permitted for 2015/2016	43.21621	-70.61738
York	York		Payne Road	$100,000	2 months	Payne Road: Upsize culverts on Kittery/York line.		New Project	43.21229	-70.64257
York	York		Pine Hill Road at Teeny Brook	$25,000	2 weeks	Pine Hill Road at Teeny Brook: Upsize culvert.		Still in Planning Phase	43.14357	-70.65059
York	York		Seabury Road	$20,000	2 weeks	Seabury Road: Culvert enlargement and improve drainage near Carwin Lane.		Town Funded	43.21330	-70.58660
York	York		Sentury Hill/York Street	$100,000	3 months	Sentury Hill/York Street: Drainage improvement.		Still in Planning Phase	43.14771	-70.66509
York	York		Shore Road (Keyes Pond to Ogunquit)	$75,000	2 weeks	Shore Road (Keyes Pond to Ogunquit): Line drainage system, upgrade and upsize capacity.		Still in Planning Phase	43.35458	-70.58664
York	York		Winterbrook Drive Development	$225,000	3 months	Winterbrook Drive Development: Drainage improvements, upsize system and crossings.		Still in Planning Phase/Partially Funded	43.13385	-70.63785
York	York		York Street	$450,000	6 months	York Street (cont. Long Beach Avenue): Drainage system upgrade. Outflow P in town plan.		Town Funded - 2015 Construction	43.17204	-70.60614
York	York		York Village Square	UNK	1 month	York Village Square: Drainage improvements, upsize system and crossings.		Ongoing/grant funded		