MAINE STATE HAZARD MITIGATION PLAN
2013 UPDATE

Maine Partners in Preparedness Conference – Augusta Civic Center – April 2010

MAINE STATE HAZARD MITIGATION PLAN – 2013 Update
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SECTION 1 – PREREQUISITES AND INTRODUCTION

PREREQUISITES

Adoption and Assurances	
Requirement *§201.4(c)(6): The plan **must** be formally adopted by the State prior to submittal to [FEMA] for final review and approval*	
Requirement *§201.4(c)(7): The plan **must** include assurances that the State [of Maine] will comply with all applicable Federal statues and regulation in effect with respect to the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c). The State will amend its plan whenever necessary to reflect changes in State of Federal laws and statutes as required in 44 CFR 13.11(d).*	
Element	A. Has the State formally adopted the new or updated plan?
	B. Does the plan provide assurances that the State will continue to comply with all applicable Federal statutes and regulations during the periods for which it receives grant funding, in compliance with 44 CFR 13.11(c), and will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d)

As noted in the FEMA guidelines, "formal adoption of the state plan will vary according to state protocols. Generally, states should obtain the signature of the state emergency management director as approval of the plan." The Maine **State** Hazard Mitigation Plan **2013 Update** has been adopted accordingly, as signified by the signature of the Director of Maine Emergency Management Agency (MEMA).

Robert McAleer,
Director, Maine Emergency Management Agency

10/25/13
Date

This plan meets requirements for a Standard State Plan under Interim Final rule 44 CFR 201.4, published by the Federal Emergency Management Agency on February 26, 2002. Meeting the requirements of the regulations noted above keeps the State of Maine qualified to obtain all disaster assistance including hazard mitigation grants available through the Robert T. Stafford Disaster Relief and Emergency Assistance Act, P. L. 93-288 as amended.

The State of Maine will comply with all applicable Federal statutes and regulations in effect with respect to the period for which it receives grant funding, in compliance with 44 CFR 13.11(c). The State will amend its plan whenever necessary to reflect changes in State or Federal laws and statutes as required in 44 CFR 13.11(d).

INTRODUCTION

Background

Maine's geography and climate exert great influence on the occurrence and severity of the State's natural hazards. Although the State is usually able to handle these hazards, overwhelming events, such as the April 1987 Flood and the 1998 Ice Storm, have required federal assistance. *The Maine State Hazard Mitigation Plan* was originally prepared to refine mitigation efforts and eligibility for federal disaster relief in 1987. The plan has subsequently been updated in 1989, 1991, 1993, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2004, 2007 and 2010. In accordance with new Federal Emergency Management (FEMA) guidelines, this 2013 version reflects the most recent research, analysis and mitigation planning.

Authority

The *Maine State Hazard Mitigation Plan - 2013 Update* (the Plan) has been adopted to satisfy the requirements outlined in Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (P.L. 93-288, as amended) for federal disaster assistance and enacted under the Disaster Mitigation Act of 2000 (DMA 2000) (P.L. 106-390.)

Purpose

The purpose of the Plan is to provide guidance for a hazard resistant state that vigilantly assesses, plans for and mitigates any natural disaster.

Scope

At this time, the Plan only addresses the State's *natural* hazards. Events that tend to be seasonal, such as thunderstorms, lightning and tornados will all be found under "Summer Storms" though it is possible for them to occur at other times of year. Accordingly, blizzards, ice storms, nor'easters and snow storms are grouped under "Winter Storms" even though nor'easters can occur in other seasons. A notable exception to this convention is the hurricane hazard. Based on its potential for catastrophic damages, it is covered separately in the "Hurricane" section. Hazards that occur rarely and/or have had fairly small economic impacts are covered under broader headings.

Hazards such as erosion, landslides, drought, fire and earthquakes are generally mitigated by other State agencies. To coordinate with their efforts, material for these sections of the Plan was drawn largely from meetings, notes and records of the Department of Agriculture Conservation and Forestry, the Maine Geological Survey, and the Maine Department of Transportation as well as the National Weather Service and the United States Geological Survey.

Number One Hazard

The primary mitigation efforts of this Plan, however, concentrate on flooding, the State's number one hazard. A brief climate description at the beginning of the Risk Assessment section gives an overview of why flooding is a possibility during any season of any year. The causes are many and varied: spring runoff, ice jams, hurricanes, heavy rains, a dam breach, the rise in sea level, or some combination of factors. As profiled in the "Flood of '87," the results will be expensive, usually in terms of damaged roads, bridges and buildings, and could have far reaching consequences for businesses, municipalities and individuals.

Demographic and Resource Profiles

According to 2010 Census information, Maine has the third largest population of the six New England states (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.) However, its average population density of only 43.1 people per square mile is *half* that of the national average. While two thirds of the population is clustered in the southern-most counties of the State, the other third is scattered throughout the northern and western counties. Maine's population is also older than the national average, a trend that is likely to continue as young Mainers continue to leave the state in search of higher incomes.

Summary of Population
Maine and USA

Measure:	2000 Maine	2010 Maine	2010 USA
Population			
Total Population	1,274,923	1,328,361	308,745,538
% White	96.9	95.4	63.4
% Black	0.5	1.3	13.1
% American Indian	0.6	0.7	1.2
% Asia	0.7	1.1	5.0
% Hispanic Origin	0.7	1.4	16.7
Households			
Total Households	518,200	557,219	131,704,730
Household Units	651,901	721,830	116,716,292
Average Household Size	2.39	2.43	2.58
Income			
Median Household Income ($)	**37,240**	**46,933**	**51,914**
Persons below poverty, %1997	10.9	12.9	15.3
Children below poverty, %1997	13.0	17.8	21.6
Sex and Age			
Median Age, Total Population	38.6	42.7	37.2
% Female	51.3	51.1	50.8
% Male	48.7	48.9	49.2
% Under 5 Years	5.5	5.2	6.5
% 18 Years and over	76.4	79.3	76.0
% 65 Years and over	14.4	15.9	13.0
Population Density (sq. mi.)	**41.3**	**43.1**	**87.4**

Source: **2010** Census

Of the six New England states, Maine has the largest land area, covering 35,387 square miles, almost the combined area (36,022 square miles) of the other five states. Divided into 16 counties, this area has a multitude of natural resources: mountains and state parks, 5,779 lakes and ponds, five major rivers and 17 million areas of forest. The Atlantic Ocean forms the State's eastern boundary which includes 3,478 miles of coastline under tidal influence. All these natural resources provide a unique quality of life for its residents, many outdoor sports, and scenic opportunities for tourists.

However, Maine's location in the northeastern most corner of the United States also means that connecting Maine's population (or tourists) to goods and services requires an extensive network

of highways and bridges. This infrastructure must withstand the movement of heavy equipment, such as lumber trucks, and the wide extremes of a variable climate. Unlike the highways in the south and southwestern states, Maine highways must be sanded, salted and plowed during the winter months, an additional expense in equipment and staffing. Not surprisingly, the operating costs of maintaining the State's highway infrastructure are a very significant budget item.

While Maine has the largest land area to manage in the New England region, it also has the lowest median household income. The comparison table below shows that Maine incomes lag seriously behind the more affluent states of Connecticut and Massachusetts. Since those states are so close geographically, it is small wonder that younger Mainers leave the state, often after graduation, to seek higher paying careers in neighboring states. Like the rest of the country, Maine is hardly immune to the effects of outsourcing and the loss of manufacturing businesses, and is also in a painful transition to a new economy, still being defined.

These factors of income and population density, combined with geographic distances, are major challenges to the State's planning processes for its resources. A very small (and aging) population, with a low national average income, must pay for miles of infrastructure, a major budgetary consideration both at the local and state level. Because it is occurring as incomes are further squeezed by rising taxes, energy and health care costs, there is a critical need for strategic planning and the development of creative solutions.

Population Ranking
New England States

State	Population (ranking in region)	Land Area (ranking in region)	Median Household Income (ranking)
Maine	**1,328,361 (3)**	**30,841 (1)**	**$46,933 (6)**
Connecticut	3,574,097 (2)	4,840 (5)	$67,740 (1)
Massachusetts	6,547,629 (1)	7,801 (4)	$64,509 (2)
New Hampshire	1,316,470 (4)	8,952 (3)	$63,277 (3)
Rhode Island	1,052,567 (5)	1,034 (6)	$54,902 (4)
Vermont	625,741 (6)	9,217 (2)	$51,841 (5)

Source: 2010 Census

Sub-State Units of Government

Maine has a variety of sub-state units of government. The following summary is based in part on the Maine Municipal Association's report "Local Government in Maine."

Counties. County government in America was adapted from the British system of "shires." It was adapted in Maine from the county system in Massachusetts. County government in many states, particularly those of the South and West, has extensive legislative and executive powers, operating schools, public safety agencies and other services that in Maine are seen as municipal responsibilities. In New England, town government developed earlier than county government, and county governments were granted authority only for specific tasks by the Legislature. There are no home rule provisions in the state Constitution for counties similar to those provided for municipalities.

By the mid-19th century, the 16 counties we know today were established: Androscoggin, Aroostook, Cumberland, Franklin, Hancock, Kennebec, Knox, Lincoln, Oxford, Penobscot, Piscataquis, Sagadahoc, Somerset, Waldo, Washington and York. The state also designated

a community to serve as the county seat or "shire town." Each Maine county has a courthouse, and all but one has a jail in the county seat. Sometimes, the county seat is also the largest municipality, as with Portland in Cumberland County. In other cases, it is simply near the geographic center, as with Alfred in York County.

The citizens in each county typically elect three commissioners (in York County five are elected) to administer the county government. In addition, counties have a treasurer, sheriff, judge of probate, register of probate and a register of deeds, all of them elected. The communities within each county finance their county government through a county tax in proportion to taxable property valuation.

Cities. All cities in Maine have local charters granted by the Maine Legislature that provide for a representative form of government - meaning they have a city council that serves as the legislative body. The city council is elected by and answerable to the citizens. The office of mayor varies considerably from city to city, with only a few acting as chief executive officer. Some mayors are elected by the vote of the people, while others are elected by a vote of their fellow councilors.

Towns. Towns remain the cornerstone of local government. A Maine community becomes a town when it is incorporated by a special act of the legislature. At that time, it is given certain privileges and responsibilities. Under Home Rule, towns may take any action or change their form of government in any way not denied or precluded by state or federal law. The voters of the town constitute its legislative body. In increasing numbers of towns, the day-to-day governance has expanded from the original board of selectmen to include town managers, town councils, budget committees, municipal departments and various professional managers. In a small number of mostly larger towns, the council exerts legislative control without a town meeting. In others, a ballot vote is used to approve the budget rather than the open town meeting.

Townships/Unorganized Territory. Maine is unique among eastern states in having half its land mass, or more than 10 million acres, in a single, Unorganized Territory (UT). Twelve of the sixteen counties have some portion of the UT within their boundaries, but most of the UT is located in the western, northern and easternmost counties. There is no local, incorporated municipal government. Collectively, the UT has a population of 9,000 residents, which is 0.68 percent of the State's population.

Provision of services and property tax administration for the UT is shared among various State, County and local agencies. Law enforcement and public road maintenance is the County's responsibility. Taxes are paid to the State Property Tax division. The State's Land Use Planning Commission (LUPC) establishes basic rules and manages the UT as one entity participating in the National Flood Insurance Program.

SECTION 2 – THE PLANNING PROCESS

Due to the highly variable weather and geographic conditions, Maine has for centuries been vulnerable to many natural hazards. Usually able to resolve the problems caused by weather events, the April 1987 Flood proved overwhelming, and the State requested assistance. *The Maine Hazard Mitigation Plan* was prepared to refine mitigation techniques and to make the state eligible for federal disaster relief in 1987. The Plan has been updated in 1989, 1991, 1993, 1995, 1996, 1997, 1998, 2000, 2004, 2007, and 2010.

The "Great Ice Storm of 1998" had brought representatives together from most State agencies to share the Emergency Operation Center (EOC) at Maine Emergency Management Agency (MEMA) for some twenty-eight days and nights. They were members of the Emergency Response Team (ERT) and much of their experience, along with reports from the towns and counties, informed the "collective knowledge" that is still used as a "worst case scenario" for planning purposes

Documentation of the Planning Process	
Requirement §201.4(c)(1). [The State must include a] description of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how other agencies participated.	
Element	*A. Does the plan provide a narrative description of how the new or updated plan was prepared?*
	B. Does the new or updated plan indicate who was involved in the current planning process?
	C. Does the new or updated plan indicate how other agencies participated in the current planning process?
	D. Does the updated plan document how the planning team reviewed and analyzed each section of the plan?
	E. Does the updated plan indicate for each section whether or not it was revised as part of the update process?

A. How the Plan was Prepared

The 2013 State Hazard Mitigation Plan revision was developed utilizing input from:

- The use of a planning consultant for portions of the research and drafting effort;
- Review of the 2010 Plan;
- Review of New England and other state plans, especially coastal states;
- Review of FEMA and MEMA records and website related to Federal Disaster Declarations and Emergency Declarations;
- Review of MEMA records on dams;
- Review of materials, reports and data provided by other agencies;
- Review of information on agency and other external websites;
- One-on-one meetings with Federal and State officials (see "Meetings with Federal, State and County Officials, below);
- A Hazard Mitigation Team that met on a periodic basis; and
- Information obtained during preparation of the 2011-2013 county plan updates. It should be noted that the Maine Emergency Management agency was heavily involved in the preparation of the County (Multi-jurisdictional) Mitigation Plans, as well as ~~six~~ one covering the University of Maine System, all of which were re-approved by FEMA between 2011 and 2013.

In 2009, MEMA prepared a guide to expedite preparation of the multi-jurisdictional (county) plans so that all plans would have a standardized format. It was anticipated that this would make it easier to review and extract information for inclusion in the state plan. Since all of the multi-jurisdiction plans, as well as the University of Maine System plan, utilized the suggested format contained in the guide, this greatly expedited the preparation of the updated 2013 State Hazard Mitigation plan. All of the plans are now organized by: Section 1 – Introduction/overview; Section 2 – Adoption; Section 3 Planning; Section 4 – Risk; Section 5 – Strategies; and Section 6 – Plan Maintenance. All of the plans used tables for such information as history of hazard occurrences and most used the Consumer Price Index to capture costs.

Meetings with Federal, State and County Officials

The following are key points from meetings that were held with federal, state and county officials during the preparation of the Maine State Hazard Mitigation Plan – 2013 Update. The meetings included a review of pertinent sections of the plan, so most of the discussions were aimed at supplementing, correcting, and/or updating what was in the 2010 plan. The meetings also included a review of the goals, objectives and actions to determine the results, status and relevance of the goals, objectives and actions related to the programs of each respective agency interviewed.

FEMA (30 August, 2012)

The State Hazard Mitigation Officer, the Vendor, and Dwane Hubert met with FEMA Senior Planner Marilyn Hilliard and Community Planner Brigitte Ndikum-Nyada at MEMA's office to discuss plan preparation and review issues. Highlights included:

- The Maine State Hazard Mitigation Plan will be updated using fact-based Maine data.
- Maine's State Hazard Mitigation Plan is current until October 22, 2013.
- The draft update will be submitted as soon as possible to ensure that it's reviewed, and re-approved by October 22.
- The strategies will be tied to the risk assessment.
- Stakeholder participation is important, especially where new scientific information can verify changes in Maine's vulnerability.

Maine Geological Survey (28 June, 2012)

The State Hazard Mitigation Officer and the Vendor met with officials from MGS (Stephen Dickson, Marine Geologist, and Bob Marvinney, Director, Maine Geological Survey) to review the agency's work as it relates to several of the hazards profiled in this plan. Highlights included:

Earthquakes

- Because the Virginia earthquake (magnitude 5.7) was a reminder that earthquakes can happen in the east, we need to be aware of the potential for damage in Maine.
- The energy from earthquakes travels farther in the east.
- As part of the NSF Earthscope Project, the number of seismic monitoring stations will increase over the next two years from five stations to 24 stations.
- Active seismic stations in Maine include one at Colby College in Waterville, one at the University of Maine at Presque Isle, one at the University of Maine at Machias, and one at Peaks-Kenny State Park in Dover Foxcroft.
- It's important to emphasize the long-term need for more monitoring stations.

- USGS is no longer providing funds to Weston Observatory of Boston College to manage the New England network of monitors; USGS is now managing it.
- Maine's contact is now the National Earthquake Center in Colorado. USGS monitors earthquakes above magnitude 2.5 so it is difficult to get reliable information on smaller ones.

Sea Level Rise

- The Portland tide gauge has been in operation for over 100 years and is one of the State's best tools for monitoring sea level rise. Analysis of the data from the gauge is on the MGS website.
- The most significant information from the gauge is the last 10 years of data. Eight out of 10 of the highest tide floods in Portland have occurred in the last 10 years. A 12-foot tide will back up water into low lying parts of the City.
- The storms of today will be the tides of tomorrow.
- Sea levels are higher in the summer because of onshore winds and thermal expansion, but in 2009 and 2010, sea levels didn't go down later in the year.
- Sea level is influenced by the salinity of the Gulf Stream and atmospheric conditions.
- The trend line since 1993 has been accelerating, but 2009 was an anomaly.
- Sea level rise has been about 2 mm/year, but now it is 3 mm/year (some stations show 3-4 mm/year because of the 2009 anomaly).
- 2.2 trillion tons of ice have melted from Greenland in the past 10 years.
- The Gulf Stream conveyor belt (of warmer water) has slowed 20%.
- The Sargasso Sea is a large mound of water that will spread out as the Gulf Stream slows.
- While the St. Lawrence basin is still crustal rebounding from the last ice age, there is virtually no rebounding in Maine.

LiDAR

- This is a revolutionary tool for determining the elevation of land and its susceptibility to flooding.
- LiDAR data has been gathered for the first few hundred feet of the entire coast and portions of Androscoggin, Oxford and Kennebec Counties.
- LiDAR can be used to document the fact that beaches are eroding.
- As funds have become available, more LiDAR data has been gathered to keep building a statewide data base.
- LiDAR is beginning to be used for modeling at the local level, but the generation of LiDAR-based maps is very expensive.

National Weather Service, Gray, Maine (19 July, 2012)

The State Hazard Mitigation Officer and the Vendor met with officials from the National Weather Service (John Jensenius, Meteorologist, Hendrichs Lulofs, Meteorologist, and Thomas Hawley, Service Hydrologist) to discuss updating the weather data contained in this plan. Highlights included:

- The weather portion of the plan is fact-based and does not include a debate about climate change or what is causing it.
- There is considerable variation in the weather from one year to the next.
- To keep the plan fact-based, data from the weather stations in Portland, Bangor and Caribou was used.

- Dr. Sam Merrill at the Muskie School (USM) has undertaken a great deal of research on changes in sea levels and has developed a model that communities can use, for free, to determine damages to the built environment, and to determine the cost-effectiveness of adaptation strategies.

United State Geological Survey (25 July, 2012)

The State Hazard Mitigation Officer, Lynette Miller and Dwane Hubert of MEMA, and the Vendor met with officials from USGS (Greg Stewart and Robert Lent) to review the agency's work as it relates to several of the hazards profiled in this plan. Highlights included:

Ground water

- Ground water levels are up in Maine from what they were 50 years ago. There is more precipitation in winter which results in more ground water later in the year.
- There is less runoff than in previous years.

Flooding

- The 2006 flood in York County was the result of 6-16 inches of rain (stream flow was low and the snowpack was gone). The flood of 2007 was similar, but the conditions were different (above normal stream flow, saturated ground water, 5-9 inches of rain).
- The system of stream gauges is vulnerable to budget cuts. There are about 70 gauges (not all are USGS gauges) and 38 or 39 could be shut down with federal budget cuts.
- The flood of 2008 in Northern Maine (the St. John at Ft Kent) was the result of rain on top of 40-70 inches of snow on the ground (10-15 inches of water equivalent)
- A very small percentage of floods in New England are caused by tropical storms.
- Ice jam floods are more common. The 2010 ice jam flood in Augusta included a 3.5 foot rise in water during a 30-minute period as water backed up behind the ice.
- Low temperatures cause more ice; a deeper snow pack results in less ice.

River Flows

- River flows have been increasing during the past 10-15 years.
- Spring run-off is occurring 10 to 15 days sooner.
- Flood flows are getting larger, particularly in the coastal basins.

Climate Variation

- A warmer climate will result in less snowmelt, but there will be a longer period of vulnerability to flooding.
- NOAA is revising the climate variation assessment.
- It appears there will be long term changes in temperature, precipitation, and peak flows.
- Peak flows have been higher over the past 100 years.
- LiDAR and stream gauges are cost effective monitoring tools.
- Overall, variations in climate have had very little impact on larger basins.

Maine Floodplain Management Program (Dept. of Agriculture, Conservation, Forestry) (20 August, 2012)

The State Hazard Mitigation Officer and the Vendor met with officials from the Maine Floodplain Management Program (Sue Baker, NFIP Coordinator, and Joe Young, Mapping Coordinator) to review the agency's floodplain management work. Highlights included:

Misc. Plan-related Items

- There will be a datum change from NGVD (old maps) to NAVD (as counties are updated)
- Floodplain management staff is notified through Emergency Action Plans for dams.
- Maine has relatively few repetitive loss properties. In addition to owner-funded removal of the flood risk, it is possible to use grant funds to address the risk but only if the project is cost beneficial and only if the property owner voluntarily chooses to participate.
- Ortho-imaging mapping: Would like to continue to work with other agencies to get updated aerial photography for counties which can then be digitally overlaid with topography. This year, partnerships are being built. Towns cans purchase higher resolution mapping. Towns from Wells to Falmouth have purchased higher resolution maps as they have become more aware of flooding risk and the value of better maps to help identify the most cost effective adaptation strategies. Better maps can be used to show floodplain boundaries and to better document flood damages.
- New coastal floodplain maps have been prepared.

LiDAR

- LiDAR data is now available for portions of Oxford, Kennebec and Androscoggin Counties.
- Accurate data is essential when working with towns to address sea level rise.
- Roads and bridges have not been looked at systematically for flooding vulnerability.
- There are regulatory obstacles for upgrades as well as higher costs. Any evaluation would have to be watershed based, and would be very expensive.

Sea Level Rise

- MGS and Maine's NFIP program are encouraging a 3-foot freeboard requirement in local ordinances. Saco is the first community in Maine to require it.
- Public education will be a major component of adapting to sea level rise.

Flood Insurance

- Congress just passed a law requiring a phased-in actuarial approach to flood insurance. Costs will rise on many policies over the next four years.

Land Use Planning Commission (LUPC) (27 September, 2012)

The State Hazard Mitigation Officer and the Vendor met with an official from LUPC (Sue Burns) to review floodplain management in the unorganized territory. Highlights included:

- There are 459 "townships" and "plantations" in the unorganized territory. Only 35 of these areas have floodplain maps.
- Floodplains are included in LUPC's Protection Subdistrict which includes the P-FP (Flood Prone Area Protection District).
- The P-FP District includes mapped floodplains as well as floodplain soils where these are depicted on soils maps.

- Regulations are based on the Maine floodplain management model.
- All of FEMA's floodplain maps in the unorganized territory are adopted by reference.
- FEMA reviewed PUPC's floodplain management program in 2003-04 and again in 2008-09

University of Southern Maine - Dr. Sam Merrill (12 December, 2012)

The State Hazard Mitigation Officer and the Vendor spoke with USM's Dr. Sam Merrill by conference call to discuss the modeling work he has undertaken. Highlights included:

- Dr. Merrill was instrumental in developing COAST, a software tool that can be used free of charge to help develop cost-effective options for dealing with sea level rise.
- It uses Google Maps to develop 3-D visualization of different flooding scenarios as they relate to valuable community assets.
- The tool helps determine cost/benefit ratios over multi-decades for different adaptation strategies (for example, benefit/cost ratio of barriers).
- Can help towns deal with complex factors to modify risk.
- The model takes into account the increasing frequency of coastal storms.

Maine County EMA Directors' Meeting (19 December, 2012)

The State Hazard Mitigation Officer and the Vendor attended the monthly Maine County Emergency Management Directors' meeting at which Pete Slovinsky, from MGS, gave a presentation about sea level rise. Highlights of the presentation included:

- The sea is rising at a rate of 1.9 mm per year, but this varies from place to place. Worldwide, the rise is 1.8 mm/year. In Portland, it's 3 to 4 mm.
- A 2-foot sea level rise is assumed in many regulations; this doesn't take into account the melting of glaciers.
- We are now approaching the upper end of projections of sea level rise.
- Worldwide, there has been about a foot of ice sheet melt.
- There are different projections of sea level rise over the remainder of the century. The highest scenario assumes 6 feet; the intermediate assumes 3.9 feet; the lowest assumes 0.7 feet due only to thermal expansion (it assumes minimal ice sheet melt).
- Sea level is higher in Portland in summer when the wind is blowing toward the coast; it is lower during the winter because of offshore winds.
- Statistically, every year, there is a chance of a 1-foot tidal surge along the coast. Every 10 years, there is a chance of a 2.5 foot surge, and every 100 years, there is a chance of a 4-foot tidal surge.
- It is likely there will be a 1-foot sea level rise by 2050, and 2-3 feet by 2100. The storm surges of today will be the high tides of tomorrow.
- A 2-foot sea level rise means that the level of the 2007 Patriot's Day storm will occur every high tide.
- He (Pete Slovinsky) has been working with towns to show impacts of sea level scenarios on the ground and build sea level into local ordinances (for example, 3 feet of freeboard).
- In Portland, the municipal storm sewers back-up and flood at high tide.
- The 2005 Army Corps of Engineers SLOSH maps compare well with LiDAR data.
- The COAST computer model will be released in April, 2013.Blue Marble worked with Sam Merrill on this.

Note: While the County EMA Directors meet monthly at MEMA, they are in much more frequent contact with their towns, often through their own monthly meetings. This approach

keeps information flowing back and forth on a timely basis. Combined with trainings and exercises (see Appendix) on a multi-jurisdictional level, the state, counties and towns are constantly interacting with one another throughout the year.

Emergency Response Team (18 March, 2013)

The State Hazard Mitigation Officer and the Vendor met with three MaineDOT officials (Don Hutchins, Jeff Naum, P.E., and Brian Burne, P.E.) who are members of the State ERT (emergency response team) and who worked with Vermont and New York to help officials in those states deal with Hurricane Irene and Sandy, respectively. Highlights included:

- Vermont and New York were opposites. In Vermont, people sheltered in place, but in New York, people went to shelters. In Maine, people shelter in place.
- MaineDOT has sufficient fuel on hand to power their equipment even if fuel shipments into Maine were interrupted. MaineDOT also has contractors on board who can help undertake road and bridge repairs.
- Because Maine is a small state and officials tend to know one another, they have a better sense of who is in charge during an emergency.
- Maine has an extensive road network, so equipment is well positioned around the state in MaineDOT's regions. This reduces the possibility of all equipment being compromised in one event and allows the unaffected regions to quickly deploy resources to another region.
- Maine is a member of EMAC (Emergency Management Action Compact).

Maine Partners in Preparedness (25-26 April, 2013)

The fifth annual ME Partners in Preparedness was attended by 650 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 the H1N1 virus to the tsunami in Japan. The keynotes in 2013 were the Police Officers from the Sandy Hook School shooting and Maine state officials who went to New York or New Jersey to provide assistance to Hurricane Sandy survivors. Both keynotes held "lessons learned" sessions applicable to Maine planning efforts for future events. Breakout sessions ranged widely from preparedness to mitigation. Examples of topics included: School Safety, Floodplain Management and Mapping, Pet Sheltering, and Community Resilience Efforts in Coastal Maine.

Workshops/Training Sessions

A number of exercises/training sessions were held around the state since the completion of the 2010 State Hazard Mitigation Plan. These sessions focused on both natural hazards and technological situations and are part of the overall planning and management responsibilities of state, county and local units of government. A summary of these sessions includes the following:

05/07/2011 - **Bangor International Airport Full Scale*****Large **airplane explosion** on the runway with several people and pets needing treatment/care. Utilized several mutual aid resources to triage, treat, and transport both the pets and the people.

05/09/2011 and 05/10/2011 - **Harbor Wave 2011*****These were two separate, but similar, **Tsunami** Tabletop exercises that occurred in the Mid-Coast Region and the Southern Maine Region in order to get responders/Emergency Managers from both parts of the state. It was a coordinated effort between Maine Geological Survey and the National Weather Service to inform the attendees on the risk for a potential Tsunami as well as play out a scenario of such.

6/8/2011, 6/22/2011, and 7/27/2011***__Cross Border Communications__ Tabletop Exercises which were all similar in nature however conducted in different regions of the state. This exercise broke through some of the communications issues between the United States and Canadian responders. Some discussion points were tower location, frequency problems, and equipment shortages.

8/6/2011 - 8/8/2011 **Statewide Incident Management Assistance Team Functional Exercise******This exercise brought in members from all of the county IMAT's from across the state. A scenario of a plane crash was used and the incident required all sorts of support from resources to personnel, all of which IMATs help to fulfill.

3/10/2012 - **Oxford County Full Scale Sheltering Exercise*****Responders from Oxford County established operated a shelter for both people and for pets at the Telstar High School in Bethel. After establishing it, volunteers circulated through as if it was a real shelter. Pets came too.

5/17/2012 - Maine/**FEMA R1 Recovery Seminar*****Maine hosted a seminar discussing recovery efforts after a significant **tornado** hitting Lewiston/Auburn area. This was used to test our new Maine Disaster Recovery Framework.

6/5/12 - **National Level Exercise 12*****MEMA, Office of Information Technology, several Maine Water/Wastewater companies, and county directors participated in a **Cyber Exercise** as part of the National Level Exercise. FEMA Region 1 was the targeted region and although not every state in Region 1 participated, Maine participated and worked with New Hampshire and Massachusetts.

10/12/12 - **Penobscot Bay Responder Full Scale Exercise******Simulated plane crash in the Penobscot Bay. This exercise required searching for the plane, searching for the victims in water and on land, treating the victims, transporting them, and running a proper incident command/unified command.

12/6/12 - **Feeding Task Force TTX*****Discussed the Feeding Task Force Plan as it relates to feeding mass quantities of people in the event of a disaster. This was also used to test the newly published plan.

Technical Assistance to Jurisdictions (2010 - 2013)

Funded by a PDM grant, all sixteen of the county (multi-jurisdictional) hazard mitigation plans and the University of Maine System plan were updated between 2010-2013. During that time, the state provided technical assistance by holding workshops, individual meetings with the planners, attending as many kick off and other meetings as possible and through multiple reviews of draft sections. To save on time and travel, plan update information was frequently on the monthly EMA Director agenda so common topics such as rep loss properties and status of mitigation activities – could be mutually addressed.

After initial meetings with planners, most of the draft section reviews were conducted through email and phone calls. The following table shows that effective February 2013, all the plans have been approved by FEMA. They cover 99% of the state's population.

Maine Hazard Mitigation Plans: as of June, 2013						
	Approval Month	Approval Year	**# of Total Communities**	**Status**	**Re-Approval Due**	**Comments**
State Hazard Mitigation Plan	27 Oct	2010	461 of 492 Statewide	**FEMA APPROVED**	Oct 2013	Submitted July 24
County (Multi-jurisdictional Hazard Mitigation Plans						
Androscoggin	May 29	2012	14 of 14	**FEMA APPROVED**	2017	
Aroostook	Jul 7	2011	48 of 67 plus UT portion	**FEMA APPROVED**	2016	
Cumberland	June 4	2012	28 of 28	**FEMA APPROVED**	2017	
Franklin	Sept 21	2011	20 of 21 plus UT portion	**FEMA APPROVED**	2016	
Hancock	Mar 13	2013	37 of 37 plus UT portion	**FEMA APPROVED**	2018	
Kennebec	May 21	2012	29 of 29 plus UT portion	**FEMA APPROVED**	2017	
Knox	Feb 5	2013	18 of 18 plus UT portion	**FEMA APPROVED**	2018	
Lincoln	Jan 3	2012	19 of 19 plus UT portion	**FEMA APPROVED**	2017	
Oxford	Aug 27	2012	36 of 36 plus UT portion	**FEMA APPROVED**	2017	
Penobscot	Feb 16	2012	59* of 60 plus UT portion	**FEMA APPROVED**	2017	
Piscataquis	Sept 27	2012	16 of 19 plus UT portion	**FEMA APPROVED**	2017	
Sagadahoc	Jan 24	2012	10 of 10 plus UT portion	**FEMA APPROVED**	2017	
Somerset	Dec 10	2012	33 of 33 plus UT portion	**FEMA APPROVED**	2017	
Waldo	Sept 22	2011	26 of 26	**FEMA APPROVED**	2016	
Washington	Feb 20	2013	39**of 46 plus UT portion	**FEMA APPROVED**	2018	
York	July 8	2011	29 of 29	**FEMA APPROVED**	2016	
			Total: 461 of 492			
University Plans						
UMaine System Plan	Mar 11	2013	7 of 7 campuses	**FEMA APPROVED**	2018	

Note: Non-participating communities include a total of 7,007 residents, or 0.5% of the State's total population of 1,328,361
*Includes the Penobscot Indian Nation
**Includes the Passamaquoddy Tribe

See Appendix B for the jurisdictions that are participating in each of the FEMA approved multi-jurisdiction plans listed above as well as the campuses of the University of Maine System. Current non-participants will be invited to join the next updates.

B., C. Who was Involved in the Current Planning Process and How Other Agencies Participated

In addition to the individual meetings with county, state and federal agencies, the MEMA website continued to be a useful planning and communications tool for the public. Tracking a year's worth of "hits" demonstrated that the website is well known and used. It features planning, training and exercise efforts throughout the year, grant opportunities and links to county, state and federal partners. However, by tracking "engagements" (length of stay) rather than "hits" it was obvious weather is still the most important feature for the public. Furthermore, though engagements spiked significantly compared to daily traffic at the time of Hurricane Sandy (2012), they increased far less for the "Blizzard of 2013". This would seem to indicate that rare weather events in Maine (such as hurricanes) cause the public to seek more information than for a typical weather event, like a blizzard, which they are familiar with and feel they are ready for.

Most of the inquiries by email and phone had focused on local projects until new evacuation route signs were installed in 2010, when several callers wanted more information about potential storm surge. The citizens who are most concerned about lessening the impacts of hazards tend to be on the town or county planning committees. Their names, titles and communities are found on the sign-up sheets in the individual county plan appendices.

D. How the Planning Team Reviewed Each Section of the Plan

In 2007, 2010 and 2013, most members of the Team expressed concern that, given their workloads and other commitments, as well as understaffing, the continued State hiring freeze and requested cuts, they would not have time to meet on a regular basis. They agreed that MEMA would re-draft Sections 1, 2, 5, and 6 of the Plan and provide Team members with an electronic copy. They also agreed that MEMA should work individually with Team members and appropriate State and county officials to re-draft sections of the risk assessment (Section 3) and mitigation strategies (Section 4) related to their areas of expertise and in what had been accomplished in the last three years. Team members would then be given a copy of the final drafts of Sections 3 and 4 for their review and comment.

Accordingly, this is the approach that was taken in the preparation of the 2013 revision. MEMA was assisted in its efforts to meet with agencies and draft sections of the plan by a planning consultant who also helped prepare the 2007 and 2010 revised plans.

E. How Changes in the Plan are Shown

In the draft phase, as posted on the MEMA website and in the meetings, additions were shown in red font; deletions were shown by cross-outs.

Coordination among Agencies	
Requirement §201.4(b): The [State] mitigation planning process should include coordination with other State agencies, appropriate Federal agencies and interested groups.	
Element	*A. Does the new or updated plan describe how Federal and State agencies were involved in the current planning process?*
	B. Does the new or updated plan describe how interested groups (e.g., businesses, non-profit organizations, and other interested parties) were involved in the current planning process?
	C. Does the updated plan discuss how coordination among Federal and State agencies changed since approval of the previous plan?

A. How Federal, State and County Agencies Were Involved

As indicated in the previous discussion under Documentation of the Planning Process, information flows back and forth on a frequent basis between towns, their respective counties and the State. Concurrently, agencies were involved through their participation on the Planning Team and through individual meetings and contacts with MEMA and its consultant. 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 operation of FEMA's Joint Field Offices (JFOs) provides excellent venues for this cooperation. The results of this coordination work include:

- **Awareness of issues**: A greater awareness of some of the issues facing Maine, 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 the need to use the 406 program for mitigation purposes has continued since 2007;
- **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.

B. How Interested Groups Were Involved

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 should continue to save tax dollars after hazard effects have been reduced.

C. How Coordination Has Changed Since Approval of Last Plan

Since approval of the 2010 State Hazard Mitigation Plan, coordination between State and Federal agencies has taken place at various workshops, through Federal, State and local participation in the plan review process, and through close working relationships established as a result of the State's recent disaster declarations.

In addition to the current updates of the 16 county plans and the University of Maine System Plan, MEMA has placed a major emphasis on outreach to the general public as well as State and Federal agencies through continuous expansion of workshops, training and exercises that bring public participants together.

As detailed in Section 3, the Maine Legislature passed a law in 2009 requiring the Maine Department of Environmental Protection to prepare a climate change report that builds on the 2009 climate impact assessment prepared by the University of Maine. The Department developed a report in 2010 entitled "People and Nature, Adapting to a Changing Climate." The report contains 60 recommendations that were developed with the assistance of a stakeholders groups consisting of 57 organizations and 19 state and federal agencies.

Program Integration	
Requirement §201.4(b) (The State mitigation planning process should) be integrated to the extent possible with other ongoing State planning efforts as well as other FEMA mitigation programs and initiatives.	
Element	*A. Does the new or updated plan describe how the State mitigation planning process is integrated with other ongoing State planning efforts?*
	B. Does the new or updated plan describe how the State mitigation planning process is integrated with FEMA mitigation programs and initiatives?

A. Integration with Other State Planning Efforts

Since flooding is the State's primary hazard, most mitigation planning efforts have been integrated with those of State's NFIP program, which, as a result of government reorganization, is now located in the Department of Agriculture, Conservation and Forestry. The State Planning Office was abolished by an act of the Legislature in 2012.

MEMA has also worked closely with and supported the mapping efforts of the Maine Geological Survey (MGS). MEMA initially provided funds to MGS to map landslide hazards in four inland communities. Through the Joint Field Office, FEMA also funded an expansion of the demonstration program to fund inland mapping of all communities in York and Cumberland Counties that are seaward of the ancient marine limit.

B. Integration with FEMA Mitigation 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: pre-disaster mitigation competitive (PDM-C) grant program; the hazard mitigation grant program (HMGP); and the Flood Mitigation Assistance (FMA) grant program. Going forward, the projects identified in the local plans will continue to be linked to the overarching goals of the State Plan, especially with regard to flooding, which is the State's number one hazard. MEMA will also continue to explore greater use of the 406 program to implement more mitigation projects, and continue to target mitigation assistance to the areas of greatest need. 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.

ISSUES AND CHALLENGES

The following is a partial list of some of the planning issues and challenges facing Maine. These issues have arisen from MEMA's experience managing FEMA programs (PDM-C, HMGP, and FMA), working with Joint Field Offices when available, and assisting counties and municipalities with the preparation of hazard mitigation plans.

1. **Mitigation versus resources/capabilities.** The 16 approved county mitigation plans include 2,058 potential mitigation projects. Assuming an average of about $100,000 per project (some are much more) the total need is over $205,800,000. 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.

2. **Smaller towns lack planning expertise.** Approximately 56% of Maine's 490 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 PDM-C 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.

3. **Lack of local match.** With economic conditions little better than they were three years ago, and the existence of a State-imposed spending cap (LD 1), towns are severely limited in how much they can raise.

4. **County plans have raised local expectations.** When the county multi-jurisdictional plans were prepared, local officials were informed that in order to be eligible for HMGP and PDM-C funds, their participation in the planning process was required. As a result, many town officials drove many miles during evening hours to participate in the development of their county plan. They anticipated that their involvement in the development of the plan would someday help their community address its most pressing mitigation issues. Few realized the extent to which mitigation needs statewide exceed available funds (and therefore, how slim their community's opportunities for FEMA funding would be – see item #1 above).

5. **Mapping.** There is a need to prepare detailed GIS storm inundation maps, particularly along the coast. Completion of LIDAR-based flood hazard maps are essential to providing the tools to local officials for better managing flood hazard areas, but there currently is very little money available for such work.

SECTION 3 – RISK ASSESSMENT

Risk Assessment

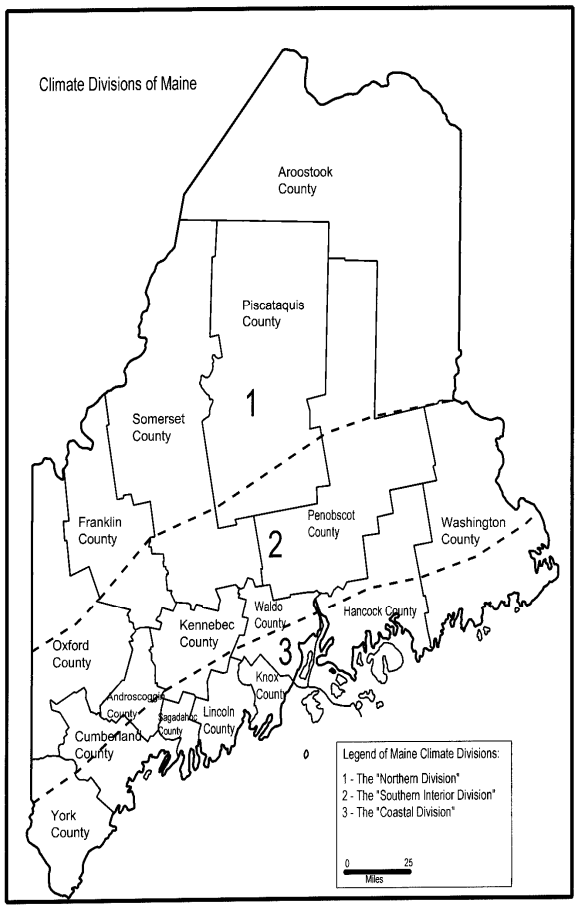
Requirement: §201.4(c)(2): (The State plan must include a risk assessment) that provides the factual basis for activities proposed in the strategy portion of the mitigation plan. Statewide risk assessments must characterize and analyze natural hazards and risks to provide a statewide overview. This overview will allow the State to compare potential losses throughout the State and to determine their priorities for implementing mitigation measures under the strategy, and to prioritize jurisdictions for receiving technical and financial support in developing more detailed local risk and vulnerability assessments.

INTRODUCTION

In compliance with *Requirement §201.4(c)(2)* the following section identifies, profiles and assesses the vulnerability of the State to natural hazards. No risk assessment of Maine's natural hazards can be done, however, without first considering its climate and geography. Factors such as variable seasonal temperatures, annual precipitation, prevailing wind directions, rising sea levels, and topographic features can all profoundly affect both the occurrence and severity of hazards as diverse as floods and drought.

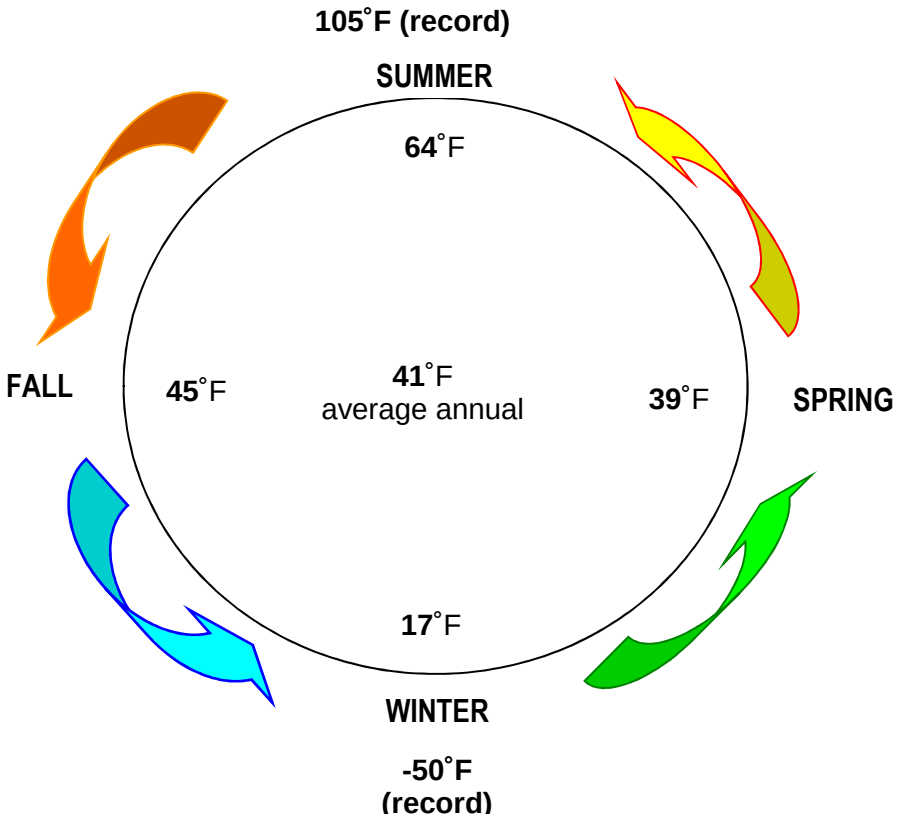
Climate and Geography. As shown in the figure to the right, Maine has three distinct climatic divisions whose boundaries run parallel to the coastline:

- *The Northern Division* (#1) encompasses the northernmost 17,916 square miles (54%) of the State. This division is least affected by marine influences and it contains most of the central and western mountainous regions.
- *The Southern Interior Division* (#2) contains the 10,307 square miles adjacent to the Northern Division and represents 31% of the State's area.
- *The Coastal Division* (#3) occupies the smallest area, a 20-30 mile band along the coast or 4,992 square miles (15% of the State's area). This division is most affected by the ocean but has minimal elevation change and thus, minimal climatic impact from any topographic controls.



Source: National Weather Service

Temperature. To date, the highest temperature ever recorded in the State was 105˚F, and the lowest was –50˚F. This range demonstrates the broad "variability" that can occur during the seasons and from year to year, though on average, Maine is a cool weather state.



Maine's average annual temperatures by season

Precipitation. Maine's average amount of precipitation based on the long-term record since 1895 is 42.6 inches. This includes the conversion of all snowfall to a water-equivalent. Distribution of this precipitation throughout the year is fairly uniform from month to month in the Southern Interior and the Coastal Divisions with a slight seasonality to precipitation in the Northern Division.

From a statewide perspective, average monthly precipitation is between 3 and 4 inches, with November being the wettest month and February being the driest month. Average precipitation in the Southern Interior is 44 inches with only a 1.2-inch difference between the wettest month (4.2 inches on average in November) and the driest month (3.1 inches on average in February). Coastal sites show a similar month-to-month distribution and difference between maximum and minimum monthly precipitation, although the proximity to the ocean produces an overall average value of 46 inches per year.

The fairly equal distribution of precipitation during the year is driven, in part, by winter precipitation amounts that are greater than summer precipitation amounts. Down East Maine is the only place east of the Rocky Mountains, except for the lee side of the Great Lakes, that receives more precipitation during the winter than the summer. Coastal storms provide the abundant winter precipitation, whereas the cool ocean water and sea breeze help to limit convective activity during the summer, thus inhibiting abundant thunderstorm activity that is

responsible for so much of the summer precipitation in the rest of the central and eastern parts of the country.

Prevailing Winds. Prevailing wind direction varies across the State with both season and location. Local influences such as orientation of a valley also may play a key role in dictating prevalent wind direction at any one location. Most of the State is under northwest to west-northwest winds throughout much of the year and particularly during the winter. During the summer, southwest to southerly winds may become quite frequent across the State. In fact, southerly winds prevail along the Mid-Coast and Down East portions of the State during the summer. Part of the reason for the prevalence of winds from these directions during the summer is the frequent formation of a sea breeze. A sea breeze can kick-in anywhere along the coast during the spring as well. The formation of a sea breeze especially occurs when regional winds are weak during the summer months. The sea breeze produces the cool, refreshing temperatures during the summer along the coast.

Topographic Features. Maine occupies 35,387 square miles, almost one-half of New England's total area. Its southern boundary lies near the 43rd parallel, while its northern boundary lies at a latitude of 47.5˚N, or about 300 miles for its total north-south distance. The State extends about 200 miles in an east-west direction at its widest part or about 6˚ of longitude starting from its eastern edge at 67˚W.

Overall, the terrain across much of the State is hilly. Elevations range from sea level at the coast of the Gulf of Maine to over 5000 feet in the central mountains. Mt. Katahdin, located within Baxter State Park, is the highest point in Maine. Its peak is at an elevation of 5,268 feet, or about 4,500 feet above its base. Elevations in the southeastern part of the State are generally below 500 feet. The terrain rises northward from this coastal plain to heights of 1,000 feet in northernmost Maine (Aroostook County) and northwestward to the peaks within the central to western part of the State that top out in the 3,000 to 5,000 foot range. Most of these peaks are in the Longfellow Mountains, the northern part of the Appalachian chain within the United States. Highest elevations in the northwestern-most part of the State are in the 1,000 to 1,500 foot range.

The present-day landscape is a direct result of glacial erosion and deposition from the large ice sheets that completely covered Maine as recently as about 14,000 years ago. A variety of glacial deposits cover the State, providing a rich variety in the overall landscape as well as abundant sand and gravel for construction material. Many of these deposits also are excellent sources of ground water (that is, aquifers) for household and industrial water supplies. In addition, glacial deposits and erosion are directly responsible for the more than 1,600 lakes found in the State that cover over 2,200 square miles. Moosehead Lake is the largest.

Extensive wetland areas that provide habitat for many ecosystems are also a result of past glaciation in combination with existing climatic conditions. Flatland is found along the southeastern coastal plain, along many of the larger river systems, such as near the mouths of the Androscoggin and Kennebec Rivers, and particularly, within Aroostook County in the north and northeastern part of the State. The topography in that part of the State helps contribute to the agricultural development in that region including potato farming. Overall, about 2,000 square miles of the State is in farmland.

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

The Maine coast is famous for its ruggedness and scenic views resulting from the many inlets, bays, harbors, promontories and rocky islands found along almost its entire length. Sandy beaches are prevalent along the southwestern coast, but the mid-coast region is dominated by lengthy peninsulas and hills including Mount Cadillac (elevation of 1,530 feet) on Mount Desert Island. Mount Cadillac is the highest point on the eastern coast of the United States. Many harbors and inlets characterize the Down East part of the coast. The irregularity of the coastline produces a total length of 3,478 miles under tidal influence or approximately 1/3 of the eastern seaboard from Canada to the tip of Florida.

Sources for above paragraphs: University of Maine Climate Change Institute, Department of Conservation, Maine Geological Survey, and State Planning Office.

CLIMATE VARIATION

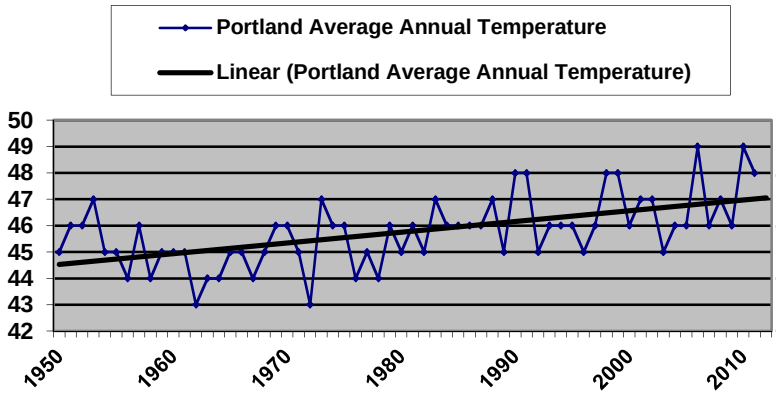
NOTE: The purpose of this part of the plan is not to debate climate change or its causes, but to provide an overview of how climate changes over time, as documented in various scientific studies, and may be impacting the occurrence and severity of natural hazards in Maine.

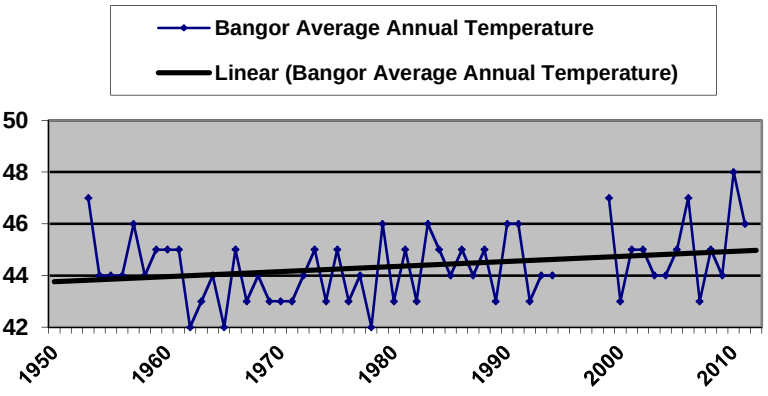
Temperature and Precipitation. A number of recent studies have documented that average temperature and precipitation have been increasing across the New England region and Maine over a long period of time.

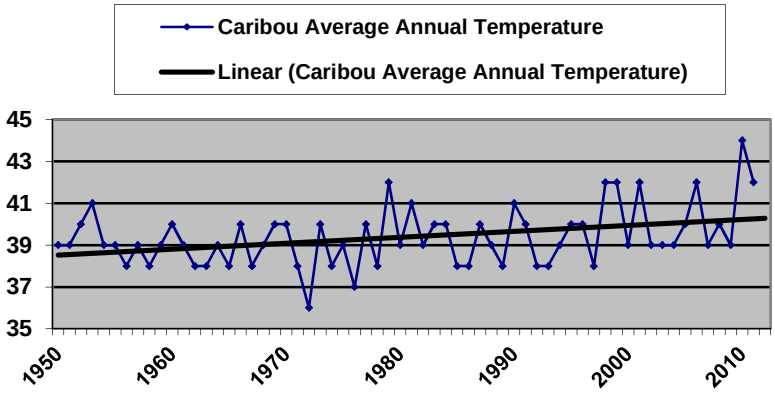
Excerpts from Maine's Climate Future, February 2009 (revised April 2009) prepared by the University of Maine and its Climate Change Institute.

> "Weather is the state of the atmosphere in terms of hot or cold, wet or dry, windy or calm, cloudy or clear. Instantaneous, or synoptic, measurements of meteorological variables – namely temperature, precipitation, humidity, pressure, winds, and cloudiness – are used to quantify the weather. …climate is the statistical collection of average weather conditions at a given place, typically defined over a 30-year time interval…Maine's instrumental record of meteorological variables has been systematically kept for about 130 years"… (page 10).
>
> "Today, all three of Maine's climate divisions are warmer than they were 30 years ago…all three climate divisions have trended toward wetter conditions over the time span from 1950-2007" (page 11).
>
> "Overall, the models show a strong trend in Maine toward warmer and generally wetter conditions in all … seasons over the 21st century with the exception of summer precipitation …Projected increases in both temperature and precipitation tend to be greatest in the north, and least along the coast. These warming trends imply a significant shift in the regional hydrology, from a snowmelt-dominated regime (in Northern and Southern Interior climate divisions) to one that shows significant runoff during winter" (page 15).

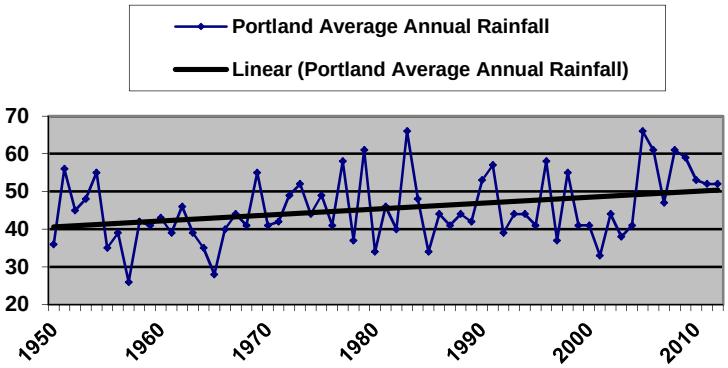
The National Weather Service in Gray, Maine, has compiled monthly average and annual average temperatures for a long period of time at three locations in Maine: The Portland International Jetport (1940-present); The Bangor International Airport (1953-1994, and 1999-present), and the Caribou Municipal Airport. The data from all three measuring stations show that annual average temperatures have gradually increased at all three locations, as shown in the charts below, although the increase has been greatest at the Portland Jetport station.

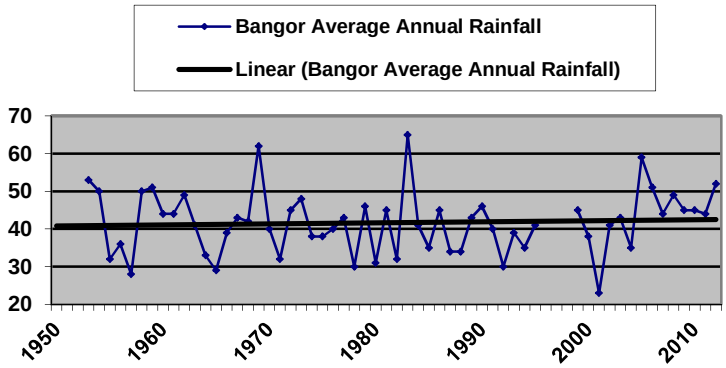


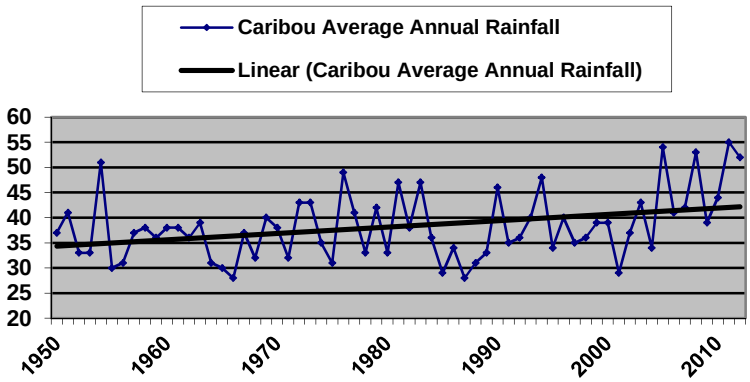




The National Weather Service has also compiled monthly average and annual average precipitation at the Portland Jetport, the Bangor International Airport and the Caribou Municipal Airport. The data from all three measuring stations show that annual average precipitation has have gradually increased at all three locations, as shown in the charts below. The increase has been greatest at the Portland Jetport and the Caribou Municipal Airport.

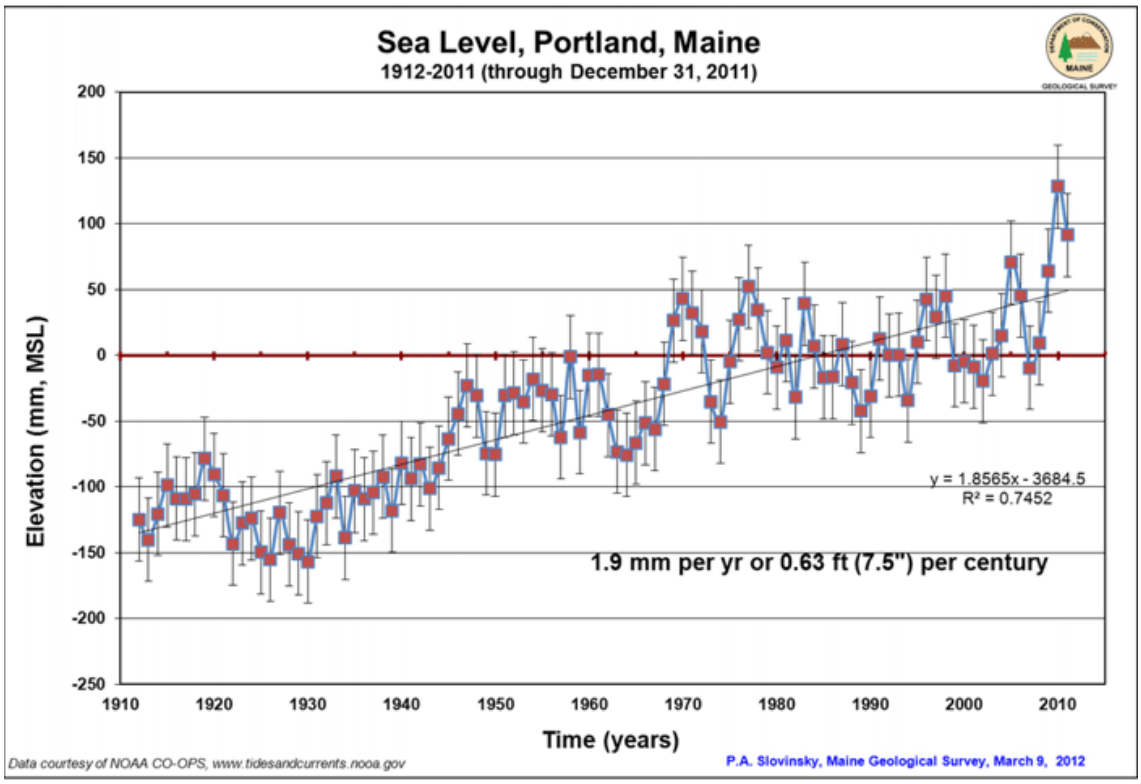




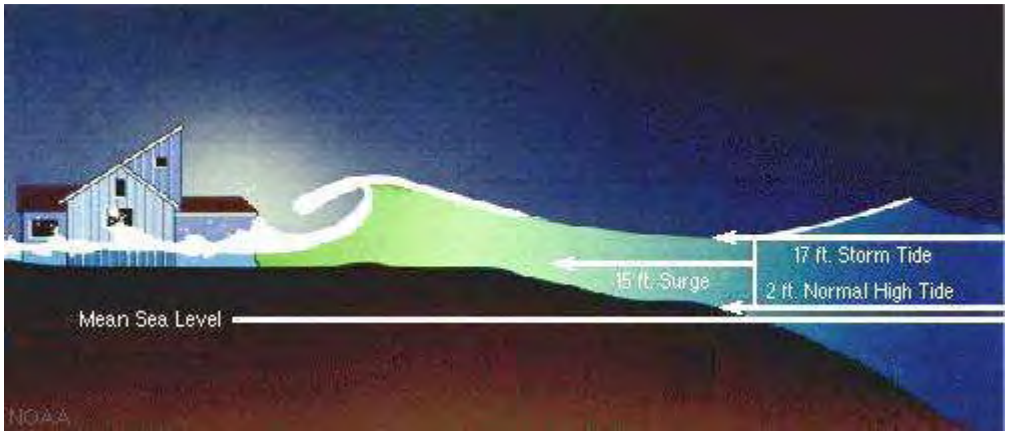


Sea Level Rise. Maine's coast has been and will continue to be profoundly affected by an increase in sea level. Based on information from the Maine Geological Survey's website, the Portland, Maine, tidal station measures water levels in real-time, six-minute intervals, 24 hours a day. The Portland tidal station is one of the longest continuously operating tidal stations in the United States. For annualized data from 1912 through the end of 2011, the Portland gauge has shown an increase in mean sea level of approximately 1.9 mm per year, or about 7.5 inches over the past 100 years, as shown in the chart on the next page.

The result of the gradual increase in sea level has been increased flooding, erosion of coastal bluffs and landslides. The consensus of the scientific community, reflected in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) is that sea level will continue to rise at an accelerating rate through the year 2100.



One of the consequences of sea level rise is the damage that can occur from storm surges. Storm surge is simply water that is pushed toward the shore by the force of the winds swirling around the storm as well as low barometric pressure. This advancing surge combines with the normal tides to create the storm tide. In addition, wind driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides. The following illustration shows how storm surge can increase flooding risk.



No one knows for sure how high the sea will rise or how quickly it will occur, but the IPCC has prepared a range of scenarios based on a scientific analysis of a number of variables including glacial ice melt, thermal expansion of water due to global warming, slowing of the Gulf Stream (there has been a 25% reduction during the past decade), and the melting of ice caps in Greenland and Antarctica. Based on the IPCC's projections, the Maine Geological Survey (MGS) is using for its studies a conservative, mid-range estimate of two (2) additional feet of sea level rise by the year 2100.

Along the Maine Coast, a sea level rise of one (1) foot means more homes, businesses, public infrastructure such as roads, and entire communities could be subject to more devastating coastal floods on a more frequent basis.

The following is an excerpt from the Maine Geological Survey's website:

> "In Portland Harbor, it is locally known that "flood stage" occurs when water levels meet or exceed 12 feet Mean Lower Low Water (MLLW), as described by Cannon and others (2009). This means that coastal flooding is expected once water levels reach this elevation. Using this elevation as a baseline, a tool developed by the NOAA CO-OPS called the Inundation Analysis Tool (IAT) can be used to look at the frequency of past flooding events, and how potential sea level rise may impact the frequency of those events. This tool can output the number of events that met or exceeded a given elevation, in addition to the duration (in hours) that the given elevation was met or exceeded..."
>
> "Data indicates that in 2011, flood stage was exceeded 11 times, for a duration of about only 8 hours. This represented about 1.6% of all high tides that occurred in 2011, meaning only about 2% of the tides that occurred in 2011 exceeded the flood stage. However, if sea level rose 1 foot (0.3m), the frequency of flooding would increase to 98 times, for a duration of 141 hours total, and account for roughly 14% of all high tides. In a 2 foot sea level rise scenario, these numbers increased to 281 times flooding would occur, for a duration of 570 hours, and almost 40% of all tides. It is important to note that these estimates are based simply on a repeat of the 2011 tide and storm surge history."

Based on MGS' inventory of coastal bluffs between York and Machias, about half the Maine Coast consists of unstable coastal bluffs less than 20 feet in height. Bluffs of the soft Presumpscot Formation mud erode at 1.6 to 3.3 feet/year, while bluffs of till, a stiff, stoney sediment, erode at about half that rate. Without expensive remediation, rising sea levels will likely increase the rate of erosion and threaten additional bluffs that are currently stable. Unstable coastal bluffs in excess of 20 feet in height will likely be subject to landslides on a more frequent basis. As a result, more homes, businesses and public infrastructure will be threatened with catastrophic loss.

Climate change report

In 2009, the Maine Legislature passed a law requiring the Maine Department of Environmental Protection to prepare a climate change report that builds on the 2009 climate impact assessment prepared by the University of Maine. The Department developed a report in 2010 entitled "People and Nature, Adapting to a Changing Climate." The report contains 60 recommendations that were developed with the assistance of a stakeholders groups consisting of 57 organizations and 19 state and federal agencies. The report did not include cost estimates for implementation, nor did it attempt to prioritize the various recommendations, and in most cases it did not identify a party responsible for implementation. According to the authors of the report, the next step is creating a climate change adaptation strategy based on the 2010 report. As previously discussed, these recommendations are available to all communities to review and take action.

A number of the recommendations contained in the 2010 report relate directly to the hazards developed in this Maine State Hazard Mitigation Plan update. These are shown below along with comments in italics by the authors of this Plan (the letters and numbers are included as they appear in the 2010 report):

A.2.1.3 Re-establish and expand the river stream gauging network to monitor long and short term trends in flow.

Comment: Stream gauges are relatively inexpensive, but annual maintenance is costly and time-consuming. Additional gauges would help monitor stream flow conditions and provide useful information during flood events.

A.2.2.1 Improve mapping and characterization of sea level rise vulnerability for all Maine coastal areas. Specifically, obtain and process high resolution LiDAR topographic mapping data for the entire coast, and use these to create digital elevation models to update current shoreland HAT (Highest Annual Tide) maps and 100 year floodplain maps based on updated storm frequency data. Develop projected inundation models for likely expected sea level rise and alternative SLR scenarios.

Comment: LiDAR data has been gathered for the entire coast. Topographic mapping with 2 foot contours would be very useful, but also very costly. A number of models have been or are being developed, and the Maine Geological Survey and others have used LiDAR data to help several Maine communities visualize storm impacts and develop adaptation strategies. Providing a similar, intensive level of such assistance to all coastal communities would be very expensive.

A.2.2.2 Encourage use of these data by multiple towns that share a common river or beach or bay system to develop regionally consistent zoning and coordinated emergency response plans.

Comment: The report does not explain what "regionally consistent zoning" means or how it would be helpful. State officials have encouraged municipalities to build a higher freeboard requirement into local flood hazard management ordinances. As of this writing, the City of Saco requires an elevation of three (3) feet above flood elevation. There currently is a great deal of emergency response coordination that takes place through the county EMAs.

A.2.3.1 Improve mapping and characterization of likely storm and precipitation impacts to Maine's watersheds and riverine flood zones.

Comment: The report doesn't explain what is meant by an improvement in mapping, nor does it recommend that funds for such improvements be prioritized. More accurate mapping would require LiDAR data for the entire state and the use of that data to create maps – a very costly endeavor.

Comment from Charles Hebson, P.E., MaineDOT: Many models on the large watersheds use regression equations for peak flows and do not even use rainfall data. This would have to be fleshed out.

A.4.1 Develop and disseminate tools that will allow local and regional planning authorities to initiate and implement their own adaptation processes.

Comment: As previously mentioned, a number of models have been or are being developed. The report does not indicate who should be responsible for implementation.

B.2.1 Develop a method to inventory roadways, culverts, struts, and related infrastructure at all jurisdiction levels, and overlay this information onto NOAA and FEMA maps of floodways, coastal inundation zones, etc.

Comment from Peter Coughlin, P.E., Director, Maine Local Roads Center, MaineDOT: (the) Local Roads Center already has a road management software system for towns and we are working now to develop another module on culvert/strut inventories. I have no idea if this can be overlaid onto NOAA data.

The Maine Local Roads Center provides training, technical assistance, and information to municipal/county officials who are responsible for constructing, maintaining and managing local roads and bridges in Maine's 502 municipalities, counties and Indian reservations. Administered by the Maine Department of Transportation, the Maine Local Roads Center is one of over 50 Technology Transfer Centers established by the Federal Local Technical Assistance Program (LTAP) as administered through the Federal Highway Administration. Established in 1986, the Center is widely recognized as an excellent resource for local officials who are looking for answers, advice and other types of technical assistance on local transportation issues.

B.2.1.1 MaineDOT should initiate development and distribution of inventory/ assessment tools; provide information to local jurisdictions on potential climate change impacts related to routine maintenance and repair, and capital improvement planning; and provide technical assistance to local entities for modifying existing road structures to mitigate current effects.

Comment: Depending on what is meant by "inventory roadways, culverts, struts and related infrastructure," this could be prohibitively expensive, requiring many hours of data gathering and modeling for every piece of transportation infrastructure in the state.

Comment from Charles Hebson, P.E., Environmental Office, MaineDOT: MaineDOT is currently sponsoring several demonstration studies on assessment of criticality/vulnerability of various transportation assets under standard climate scenarios, as well as benefit/cost analysis of various adaptation and investment strategies.

Comment from John Buxton, P.E, Bridge Maintenance Engineer, MaineDOT: All of MaineDOT's bridges that are susceptible to flood waters have scour plans of action (POA). The POAs recommend certain action during a given flow or event. The regions have developed detour plans for such events.

All local bridges and minor spans are inspected every 24 months. Scour POAs have been developed for critical bridges. The towns will be instructed on how to implement and use the POAs. The Bridge and Structures Maintenance Division provides a high level of technical assistance to municipalities on a regular basis.

Comment from Judy Gates, Director, Environmental Office, MaineDOT: My understanding is that our inventory process is still in progress. B.2.1.1. is a huge task that requires modeling specific to location and asset type; MaineDOT is in the baby stages of figuring out how to do this for its own

infrastructure and doesn't have the resources to do this for towns at the moment.

Comment from Peter Coughlin, P.E., Director, Maine Local Roads Center, MaineDOT: Local roads Center can do that but would need help from appropriate agencies who are the pros in this field.

B.5.1.1 The Maine Emergency Management Agency (MEMA) should develop assessment guidelines for local use to evaluate community all-hazards vulnerability and emergency preparedness, both current and future, in light of climate change. MEMA and County Emergency Management Agencies should continue to provide technical assistance to rural communities in emergency preparedness, and build on existing social networks and relationships to optimize resilience.

Comment: Clarification is needed on what is meant by "assessment guidelines" and "resilience." Currently, natural hazards are assessed in the Risk Section of the county hazard mitigation plans, but none of the plans have identified a need for more detailed assessment guidelines.

B.8.1 Assist all levels of government (with tools that can be used) to build resilience into emergency management and response systems.

B.8.1.1 Continue to monitor and influence changes to national policies and programs that have the potential to provide funding for hazard mitigation in Maine. Such programs include FEMA's pre-disaster mitigation funds. In some cases, application procedures need to be changed to make them more user-friendly.

Comment: MEMA is already doing this for HMPG. MEMA has taken steps to make its grant application process more user-friendly, but it is a federal requirement that projects have a benefit cost ratio greater than one in order to be eligible for funding.

B.8.1.2. Develop and distribute tools to local jurisdictions and services that will allow them to evaluate the potential effects of climate change-related impacts on their emergency response capacity and critical infrastructure. Examples include:

- Hospitals and other health-care delivery facilities
- Assessment of local road systems that may be at risk of impending emergency or disaster response due to weather and
- Assessment of municipal response providers' communication and delivery capacity under extreme conditions

Comment: the report is not clear about what is meant by "tools," the data needed to be compiled, the associated cost, or who would implement them.

B.8.2 Continue to improve cooperative efforts among agencies at all levels to assure needed redundancy in disaster/severe weather situations

B.8.2.1 Continue to improve interactions among federal, state and local emergency services planners and providers to promote regional and statewide response and recovery capacity. Specific ongoing initiatives to support this recommendation include:

- Adoption of a statewide mutual aid agreement
- Standardized response training to support mutual aid
- Enhancement of interoperable communications systems
- Development of regional emergency shelter system (including the ability to serve those with disabilities, and to protect domestic pets)
- Development of mutual aid systems with other states and eastern Canadian provinces
- Development in cooperation with FEMA of debris management, resource allocation and deployment plans
- Supporting FEMA initiatives to build comprehensive catastrophic disaster plans in partnership with the state

Comment: Emergency response officials at all levels have been working together for the last 10 years during planning, training and exercises. A number of items mentioned above have been completed or are being implemented. For example, see the discussion in Section 2 under workshops and training sessions.

Identifying Hazards	
Requirement §201.4(c)(2)(i) [The State risk assessment shall include an] overview of the type … of all natural hazards that can affect the State …	
Element	*A. Does the new or updated plan provide a description of the type of all natural hazards that can affect the State? If the hazard identification omits (without explanation) any hazards commonly recognized as threats to the State, this part of the plan cannot received a satisfactory score).*

A. Description of all Natural Hazards

After reviewing the FEMA list of all natural hazards, a summary table was prepared to use as an overview of all the hazards that could potentially impact Maine. Because so many of the State's natural hazards tend to occur in seasonal groups, events such as thunderstorms, lightning and tornados will all be found under "Summer Storms" though it is possible for them to occur separately and at other times of year. By the same token, blizzards, ice storms, nor'easters and snow storms are grouped under "Winter Storms" even though nor'easters can occur in other seasons.

In considering the effect of each hazard, it became apparent that the end result was usually flooding. For that reason, "Dam Failure/Breach," though listed separately on the table for identification purposes, will appear in the flood hazard sections throughout the rest of the plan as will tsunamis. On the other hand, avalanches for which there are no records of occurrences will not be profiled or further assessed.

Major profiling changes since 2010 are:

- Additional information has been included on climate variation and sea level rise.

Thus the identification process narrowed the scope of hazards to nine: flood, winter storms, hurricane, erosion, landslides, wildfire, summer storms, drought and earthquake. (See next page for Maine Natural Hazard ID – Summary Table.) Hazards not profiled because of little or no hazardous impact on Maine include avalanche, subsidence, and blight/infestation. Some potential hazards (extreme heat/temperatures and wind) are included in other hazards (winter storms, summer storms, hurricanes).

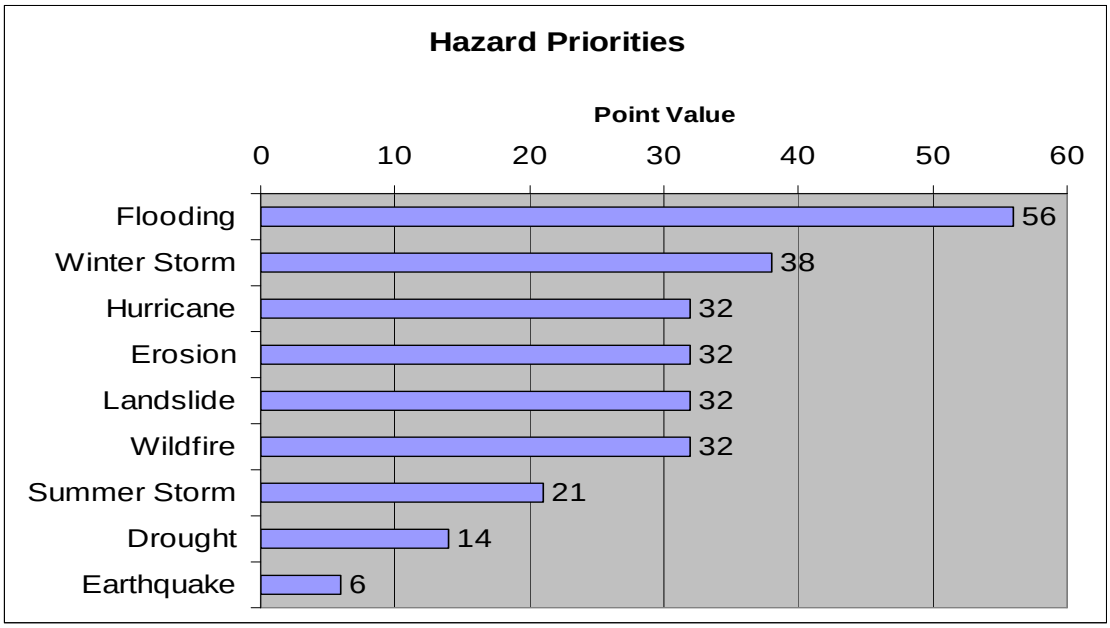
Maine Natural Hazard ID – Summary		
Hazard Type	**Sources of Information** (in addition to general Internet research)	**Location in Plan: Section 3 – Risk Assessment**
Dam Failure	MEMA, Dam Safety Program FEMA Disaster Reports Association of Dam Safety Officials News articles	Flood
Drought	Department of Agriculture, Conservation and Forestry Drought Advisory Committee	Drought
Earthquake (5.0 magnitude)	Maine Geological Survey Historical records	Earthquake
Erosion (a) beach erosion (b) bluff erosion	Department of Agriculture, Conservation and Forestry State Marine Geologist, ME Geological Survey FEMA Disaster Reports Newspaper articles	Erosion
Landslides	Department of Agriculture, Conservation and Forestry Flood Plain Management State Marine Geologist, ME Geological Survey FEMA Disaster Reports Newspaper articles	Landslides
Fire: • Urban • Wildfire	Forestry, Fire Protection Division State Fire Marshall's Office Wildfire Loose: The Year Maine Burned	Wildfire
Flooding (includes coastal, riverine, spring and stormwater runoff, ice jams, heavy rains, tsunami)	MEMA records Flood Plain Management programs FEMA Disaster Reports County EMA Directors Newspaper articles	Flood Hurricane
Hurricanes	MEMA records FEMA Disaster Reports National Weather Service NOAA website	Hurricane
Summer Storms • Lightning • Thunderstorms • Tornado	National Weather Service NOAA website	Summer Storms
Winter Storms: • Blizzard • Ice Storm • Nor'easters • Sleet Storm • Snow Storm	MEMA records FEMA Disaster Reports National Weather Service NOAA website Newspaper articles	Winter Storms
Other: Avalanche Subsidence Blight/infestation	FEMA hazards MEMA and FEMA reports MEMA records	Not included Not included Not included

Prepared by Maine Emergency Management Agency 2013

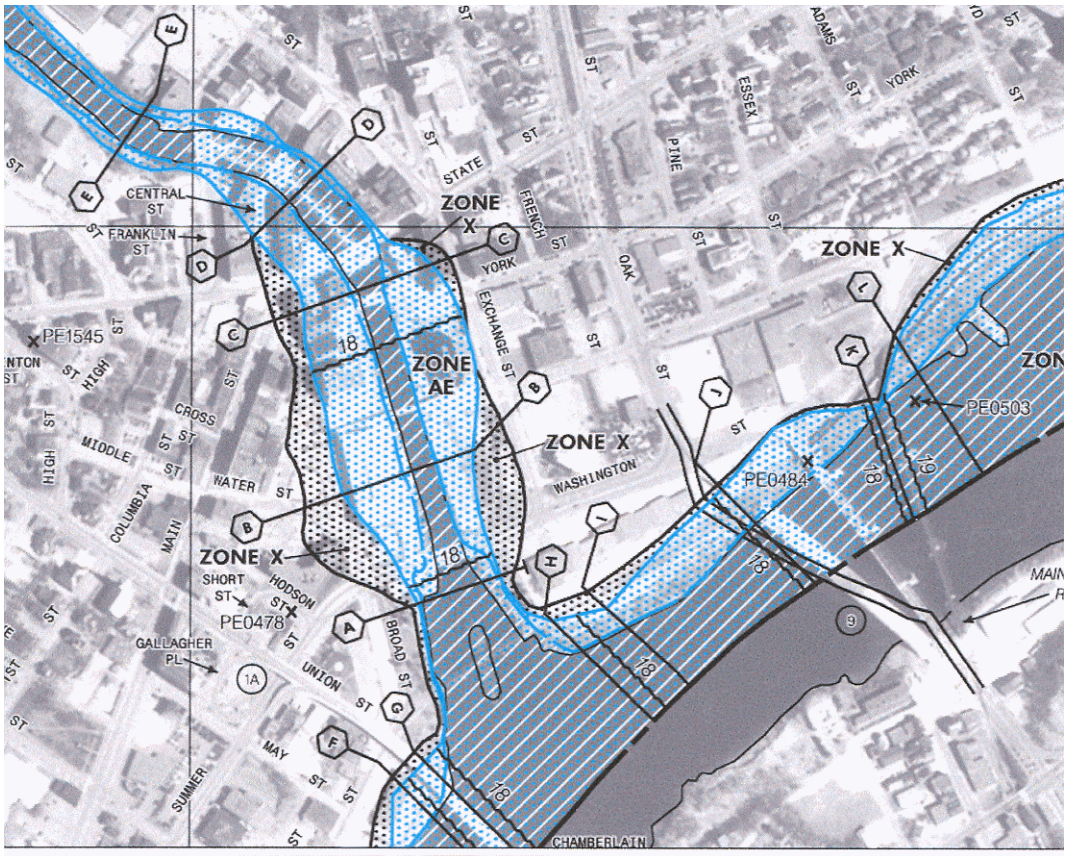
Profiling Hazards	
Requirement §201.4(c)(2)(i) [The State risk assessment shall include an overview of the] location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events using maps where appropriate …	
Elements	*A. Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the new or updated plan?*
	B. Does the new or updated plan provide information on previous occurrences of each hazard addressed in the plan?
	C. Does the new or updated plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the plan?

The nine natural hazards that can affect the State and which were summarized in the previous table are defined and detailed in this section. Most of them will have tables documenting their occurrence by date, affected county (jurisdiction) and the overall damage caused. In order to provide a "worst case scenario" for each hazard, storms of record were used.

For the rest of the Plan, the hazards will be addressed in order of priority as summarized in the following chart.



FLOODING



A portion of FEMA's new Flood Insurance Rate Map (FIRM) for Bangor, based on orthophoto quad maps. Areas in blue are within the 100-year floodplain. The heavy lines bounded by lettered hexagons are cross-sections tied to data in the detailed flood study of the community. The cross-hatched area of the floodplain is the high hazard floodway where greater velocities may be expected.

General Definition

A temporary inundation of normally dry land as a result of: 1) the overflow of inland or tidal waters, 2) the unusual and rapid accumulation or runoff of surface waters from any source. Note: the nature of Maine's geography, geology and hydrology is such that flooding is usually fast rising but of short duration.

Flood Types in Maine

Coastal Flooding. The temporary inundation of beaches and other land areas by the sea, either as a result of coastal storms, hurricanes (see profile of hurricanes contained in this Assessment), or erosion or landslides (see separate profiles of erosion and landslides contained in this Assessment). Coastal flooding comes with two significant components: still water and storm surge. The typical high winds associated with coastal flooding exacerbate the flooding by "pushing" more water toward land. A nor'easter can cause a storm surge along the coast of Maine. Fetch, or the distance the wind can blow toward the shore from out at sea is a significant factor in coastal flooding depths. The shape of the ocean floor just offshore is another variable.

Dam Failure/Breach. The sudden release of water resulting from structural collapse or improper operation of the impounding structure. Dam breach can cause rapid downstream flooding, loss of life, damage to property, and the forced evacuation of people. A dam breach has a low probability of occurring, but a potentially high impact. It's different than the other types of flooding because it's due to man-made causes, but it is included under flooding because the results and impacts are the same as flooding.

Flash Flood. A flood event occurring with little or no warning where water levels rise rapidly due to heavy rains, ice jam release, or rapid snow melt.

Ice Jam. An accumulation of floating ice fragments that blocks the normal flow of a river. During a thaw or rainstorm, the rapid increase in discharge from snow melt and/or rainfall can rapidly lift and break up a thick ice cover and carry it downstream as an ice run. Ice runs can jam in river bends, shallows, bridges or against the sheet ice covering flatter reaches. The resulting ice jams can block flow so thoroughly that serious flooding may result within an hour of their formation.

Failure of an ice jam suddenly releases water downstream. Damages from ice jam flooding usually exceed those of clear water flooding because of higher than predicted flood elevations, rapid increase in water levels upstream and downstream, and physical damage caused by ice chunks. Moving ice masses can shear off trees and destroy buildings and bridges above the level of the flood waters.

Lacustrine. (Lake Flooding) occurs when the outlet for the lake cannot discharge the flood waters fast enough to maintain the normal pool elevation of the lake. During a base flood event, normal increases in water surface elevations on most Maine lakes and ponds range from 1 to 5 feet. However, in Maine there are some examples where the base flood event will reverse the flow of the outlet stream. In such instances, river and base flood elevations can rise more than 15 feet above normal pool. Maine's mandatory shoreland zoning and floodplain management elevation requirements do much to mitigate for lake and pond development by imposing significant setbacks from the water's edge. While this type of flooding can impact older individual camps built near the water's edge, there are no records of major damages so this type of flood will not be further addressed in the Plan.

Riverine/Riparian. Periodic overbank flow of rivers and streams, usually the result of spring runoff, but can also be caused by major rain storms.

Tsunami. A wave produced by a disturbance that displaces a large mass of water – usually a result of geologic activities such as earthquakes, volcanic eruptions, underwater landslides, or in rare geologic cases, meteor strikes. After such a disturbance, displaced water travels outward from its site of origin as a series of unusually large waves at great speeds (Komar, 1996). All areas with an elevation less than 100 feet and within a mile of the coast could be impacted by a tsunami. Based on information obtained from the Maine Geological Survey, the chances of a catastrophic event are minimal. Moreover, with the presence of the relatively shallow Georges Bank offshore, Maine remains protected from the full force of an Atlantic Ocean tsunami.

Urban. Overflow of storm sewer systems, usually due to poor drainage, following heavy rain or rapid snow melt. The combined sanitary and storm water systems that some urban areas installed years ago cause flooding of sanitary sewerage when riparian or coastal floods occur. Runoff is increased due to a large amount of impervious surfaces such as roof tops, sidewalks and paved streets.

Nature of Hazard

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. Ironically, firefighting efforts can be compromised if fire fighters and equipment are responding to a flood emergency.

Because 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 the beds and the 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.

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.

Flood damages to roads, bridges and ditches continue to be a common occurrence throughout the State. 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. In order 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.

Nature of the Hazard from Coastal Flooding. As previously noted in the introduction to this section (page 3-4), the gradual rise in the level of the sea is having a profound effect on the nature of coastal flooding. The sea has risen about six inches since 1900, and is conservatively projected by the Maine Geological Survey to rise by roughly two additional feet by 2100. Along the Maine Coast, if the 10-year and 100-year storm elevations are only one foot apart, a sea level rise of one (1) foot means that a storm that had a 1% chance of occurring in any one year (the 100-year storm) at the original elevation will have a 10% chance of occurring in any one year (the 10-year storm) at the new elevation. 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. There is also concern in the scientific community that global warming may be increasing the intensity of coastal storms.

Wave action generated by winter storms, particularly northeasters, is the most threatening cause of coastal flooding. The Patriot's Day storm that occurred on April 16, 2007, was a northeaster.

Hurricanes occur far less frequently than winter storms, but can be just as, if not more devastating than, a winter storm (see separate profile on hurricanes contained in this Assessment).

Coastal erosion and landslides can be triggered by a storm event, although a slow, steady rise in sea level is the underlying reason for erosion along the coast (see separate profiles on landslides and erosion contained in this Assessment).

A lack of detailed, accurate mapping of flood hazards along the coast has been an issue for many years. However, there have been several major mapping initiatives dating from the mid-2000s:

- **Hurricane Surge Inundation Maps.** Hurricane Surge Inundation Maps have been prepared for the coast by the US Army Corps of Engineers (see Hurricane section).

- **FEMA Risk MAP Program** (see discussion under Location of Hazard, below)

- **LiDAR.** LiDAR is a remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light. The term LiDAR comes from combining the words "light" and "radar." LiDAR can precisely measure elevation at intervals of 3 feet, with a vertical accuracy of just 6 inches. According to information contained on the Maine Office of GIS website:

  "These laser pulses are shot out of a machine in the bottom of an airplane at a rate of almost 200,000 pulses per second. The pulses bounce off the ground, or trees, or buildings, and scatter back up to the plane. A sensor in the plane records the time it takes for the pulse to return. That measurement is then converted to a distance measurement. Using very precise measurement tools such as global positioning systems (GPS), the sensor can take into account the position, speed and movement of the plane to calibrate the distance measurement precisely, turning that into a measurement of the elevation where the pulse hit….The resulting data create a very precise model of the elevation and topography of an area. These data can then be used…to model flooding, sea level rise, and storm surges."

  As of this writing, LiDAR data has been gathered for the first few hundred feet of the entire Maine coast, and for portions of Androscoggin, Oxford and Kennebec Counties.

Nature of the Hazard from Dam Failure/breach. 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 (or unmonitored) sites have been built upon by beavers, impounding enough water to cause road washouts when they breach after heavy rains.

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

Location of Hazard

Flood Insurance Rate Maps. Readers with Internet access can go to the FEMA website to purchase or view Flood Insurance Rate Maps (FIRMs). However, for most Maine residents, it will be easier to go to the town office or city hall where the maps will be specific to their community.

Q3 Data. A number of years ago, half the 16 counties in Maine were mapped with Q3 data. The Q3 mapping that was done was primarily for the southern part of the State. Q3 mapping was essentially the process of scanning into a digital overlay the current floodplain boundaries. Q3 mapping, which has been discontinued, is not the same as a digital FIRM that is the end product associated with FEMA's Risk Map program which is ongoing.

FEMA RiskMAP Program. 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 ~~is~~ was to upgrade flood hazard data and mapping to create a more accurate digital product that will improve floodplain management across the country. This was undertaken with priority given to areas of greater population, need and ability to leverage resources. The former State Planning Office took the responsibility for Map Modernization in the State was designated by FEMA to coordinate mapping for Maine. Since that time, Maine's Floodplain Management Program has been relocated to the Maine Department of Agriculture, Conservation and Forestry.

Under the Risk Map Program, FEMA has been converting floodplain maps to a digital format. 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. The first counties to be remapped into a completely digital format are Oxford, Kennebec, Androscoggin, Cumberland and York Counties.

Location of flooding along major river basins. Flooding occurs along the State's major river basins:

The most vulnerable of Maine's rivers are the Kennebec and Androscoggin. The ***Kennebec River*** rises from the headwaters of Moosehead Lake in Piscataquis County and courses through five counties before joining the Androscoggin River in Merrymeeting Bay and emptying into the Atlantic Ocean. Historical figures have traced the path of the Kennebec. It was part of the route that Benedict Arnold followed. It was a path of commerce as well. When blocks of ice provided refrigeration, "Kennebec Ice" was a brand name of quality that was sold up and down the eastern seaboard as well as around the world. Great logging runs brought timber down river from lumber camps and agile lumberjacks kept them moving. Today, the logs move by trucks since log runs contaminated the river and were prohibited by legislation. Storage dams such as Wyman Dam in Somerset County control the upper part of the *Kennebec River* Basin, which drains about one-fifth of the State. The dams have also spawned a river rafting industry that depends on the timed releases of water. The basin below the dams is largely uncontrolled, however, and this affects communities such as Augusta, Hallowell and Gardiner, which had built extensively in the floodplains.

The ***Androscoggin River Basin*** drains from the western boundaries of the State, including neighboring New Hampshire. While it drains less area than the Kennebec, it has a more rapid fall (1,245 feet from its source), an average slope of almost eight feet per

mile. Its sharp drops attracted mill-based industries and many of the towns along its course, including Livermore Falls, Lewiston, Auburn, Lisbon Falls and Topsham. Before offshore outsourcing, the mills manufactured products as diverse as paper, textiles and shoes. Floods have been severe in some of these downtown locations where development was extensive. As noted in Figure 2, Oxford County has been the most vulnerable to its floods in the last 36 years. After major ice jam flooding in December 2003, one of its towns, Canton, applied for and won a $3 million FEMA Pre-Disaster Mitigation acquisition/demolition project. Because Oxford and York Counties abut the New Hampshire border and their rivers straddle the two state boundaries, emergency plans require cooperation through mutual aid agreements.

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 has in the past prevented massive floods. The Piscataquis River in the upper part of the basin passes through a series of small communities with many downtowns vulnerable to spring flooding. The Kenduskeag River flows through Bangor and joins the Penobscot in the downtown. It has occasionally caused considerable flooding damage to Bangor's downtown.

The ***St. John River Basin*** drains a vast area in Canada and northern Maine and has a considerable drop in elevation in the upper section. The State's only National Scenic Waterway, the Allagash is world renowned for its wilderness canoeing and forms the headwaters of the St. John basin. 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 very little development at risk in the St. John Basin. Maine's two most significant levees are in this basin. The older one was built in the late 1980s in Fort Kent and the newest was built in 2001 in Fort Fairfield. 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.

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. 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. Maine's largest city, Portland, lies at the mouth of the Presumpscot River. Many of these smaller rivers such as the Mousam have experienced significant flooding is recent years.

The ***St. Croix*** **River Basin** has as much drainage area but 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 includes the area known as Downeast. Most of this "basin" is subject to tidal influence but it is also comprised of many smaller rivers like the Dennys, Pleasant, Machias, Narraguagus and Union Rivers. This area has historically been sparsely populated but has experienced increasing pressures for development. Much of Hancock and Washington Counties are covered with blueberry barrens. Most flood damages in this basin are to infrastructure rather than residential and commercial structures.

Some of Maine's rivers have overflowed many times, but recent flooding has caused much more 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. 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. As seen in the Figure 1 graph, the most flood prone months are April, January and March respectively. The graph is based on a more detailed "Historical Record" at the end of this section. Compiled from MEMA records, the historical record captures information about the affected counties and, where known, the damages. Floods can also be caused by hurricanes. (See "Hurricane" section of the Plan.)

Location of Dams. The map on the next page shows the plots of all dams contained in Table 1 below. The latitude and longitude of those dams was verified by MEMA during 2012. The "hazard potential" of these dams was color coded in red, orange and blue as described below.

The terms "high", "significant" and "low" refer to the "hazard potential" of the dams as follows:

- High = dams that have the potential to cause the loss of life should they fail are indicated with red dots on map
- Significant = dams that have the potential to cause property damage, should they fail are indicated with orange dots,
- Low = dams which are unlikely to cause the loss of life or property damage, should they fail, are indicated with blue dots

While the Maine Dam Safety Program records 1,079 dams, only the 606 dams, as shown in Table 1, are regulated by MEMA Dam Safety Program. 164 Dams are regulated by FERC, giving a total of 770 dams that are overseen.

TABLE 1: State and FERC Regulated Dams in the State of Maine (June 31, 2013)

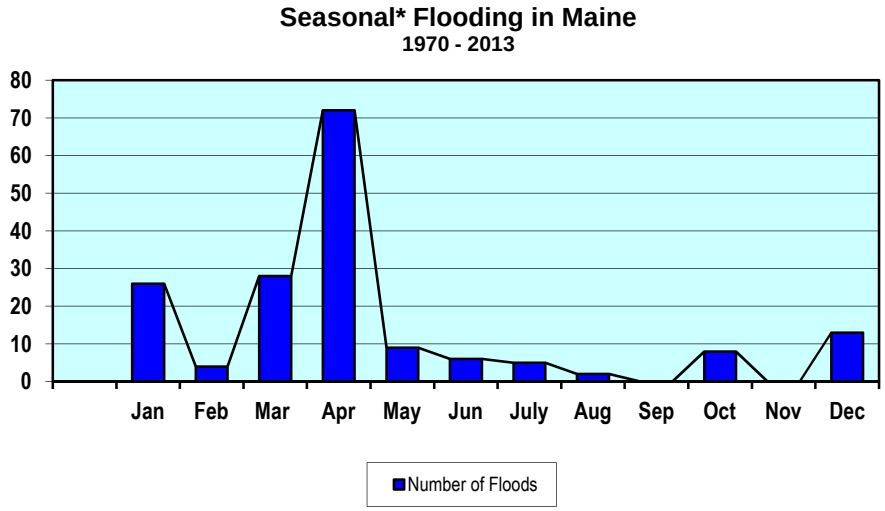
	State Regulated Dams	FERC Regulated Dams	Totals
Hazard	**# Dams**	**# Dams**	**Dams**
High	27	34	61
Significant	72	8	80
Low	507	122	629
Total	606	164	770

Map sample from MEMA
Dam Safety Program
Database - 2004

Maine law requires that High, Significant and Low hazard dams be inspected every 2, 4 and 6 years respectively and that High and Significant dams have Emergency Action Plans (EAPs) to mitigate the effects of a failure. The Federal Energy Regulatory Commission (FERC) regulates 34 High hazard and 8 Significant hazard dams in Maine and has 5 engineers to do the inspections. The State regulates 27 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 that produce electricity tend to have the most engineered inundation maps because their owners have a vested interest in their continued operation. For dams that no longer serve their original purpose of power production and/or that lack engineering staffs, the State has accepted maps from "www.terraserver-usa.com" or hand drawn flood lines on copies of Gazetteer maps. Current EAP compliance: 100% High Hazard and 60% Significant hazard dams. According to the Association of Dam Safety Officials (ASDSO) website, this is one of the highest compliance rates in the nation.

Figure 1



*Does not include floods from hurricanes – see "Hurricanes" section of Plan.

Previous Occurrences

Figure 2 summarizes a 40-year record of major seasonal flooding occurrence and the counties most susceptible to this natural hazard. Though the 70's, 90's, and the first decade of the twenty-first century were flood prone decades, note that the spring seasons of 1987, 1993, 2005 and 2007 (highlighted with bold **X's**) were the years where at least 75% of all Maine counties were affected. (County abbreviations are explained below.) Since 1987 was a 100 year event flood, it is further profiled.

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

Figure 2 Major Floods by County

Major Floods	AN	AK	CD	FN	HK	KC	KX	LN	OD	PT	PS	SC	ST	WO	WN	YK	Total Counties
Jan 1970				X					X		X		X				4
Feb 1972			X													X	2
Apr 1973		X		X					X	X				X	X		6
May1973		X															1
Jul 1973		X		X					X	X				X			5
Dec 1973		X				X		X		X		X	X	X			7
May 1974		X															1
May 1975			X				X									X	3
Feb 1976										X					X		2
Apr 1976		X															1
Aug 1976		X															1
Mar 1977	X		X						X							X	4
Apr 1979		X				X				X	X						4
Jun 1984	X		X			X				X		X	X				6
Jan 1986	X		X	X		X		X	X			X	X			X	9
Apr 1987	**X**		**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**14**
May1989	X			X					X								3
Apr 1991		X															1
Mar 1992	X		X	X		X	X		X	X			X	X		X	10
Apr 1993	**X**	**X**	**X**	**X**	**X**	**X**		**X**	**X**	**X**	**X**		**X**	**X**		**X**	**13**
Apr 1994		X															1
Oct 1995				X			X		X								3
Jan 1996	X			X					X	X	X		X	X			7
Apr 1996	X		X				X		X							X	5
Oct 1996			X						X							X	3
Jan 1998	X			X		X			X				X			X	6
Oct 1998			X													X	2
Mar 2000	X	X		X		X			X		X		X		X		8
Mar 2001				X		X			X	X					X	X	6
Dec 2004				X		X			X		X	X	X	X			7
Mar 2005	**X**	**X**		**X**	**X**	**X**	**X**	**X**	**X**		**X**		**X**	**X**	**X**		**12**
May2006																X	1
Mar 2007					X		X	X						X			4
Apr 2007	**X**		**X**	**X**	**X**	**X**	**X**	**X**	**X**			**X**	**X**	**X**	**X**	**X**	**13**
Jul 2007									X								1
Apr 2008		X					X	X		X	X		X	X			7
Jul 2008	X		X													X	3
Dec 2008	X		X				X	X				X		X		X	7
Jun 2009				X	X		X	X	X		X		X	X	X		9
Feb-Mar 2010			X				X	X				X				X	5
Dec 2010		X									X				X		3
TOTALS	**15**	**15**	**15**	**17**	**6**	**13**	**12**	**11**	**21**	**12**	**11**	**8**	**15**	**14**	**8**	**17**	86

Flooding* **Occurrence by County**

21 - OD
17 - FN
17 - YK
15 - ST
15 - CD
15 – AN
14 – AK
14 - WO
13 - KC
12 – PT
12 - KX
11 - LN
10 - PS
8 - SC
7 - WN
6 - HK

*floods resulting from coastal storm, heavy rains, snowmelt and/or ice

The susceptibility of the major river basins to flooding, and the counties within them, is assessed by three factors:

a) extent of the drainage area
b) fall of the river
c) extent of development on the floodplain

Even the smallest county in the state has at least two river basins.

Patriot's Day Storm, April 16, 2007. According to the Gulf of Maine Ocean Observing System website, the Patriot's Day Storm of 2007 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 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 1900s).

The National Weather Service's models had predicted a large snowstorm the week before that didn't occur. Instead, the jet stream carried the storm's energy over New England, dropping five to eight inches of rain along the coast, resulting in a significant coastal flooding event. During the Patriot's Day storm, there were four high tide cycles in which the water was near or above flood stage and the waves were greater than 10 feet in height. This combination caused the tremendous amounts of damage seen during the storm (Gulf of Maine Ocean Observing System web site).

Damage from Patriot's Day Storm, 2007
Photo by John Cannon, National Weather Service

Storm of Record – April 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 are available."

"Hydrometeorologic 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."[1]

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, an area 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."[2]

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.[3]

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.

[1] "Flood of April 1987 in Maine," US Geological Survey Water Supply Paper 2424, p.37
[2] Ibid, p.27
[3] Interagency Hazard Mitigation Report, FEMA-788-DR-Maine, April 1987, p.2.

Figure 3
History of Flood Occurrence
Key:

DR: Disaster Declaration
EM: Emergency Declaration
SBA: Small Business Administration
TBD: To be Determined

Month of Event	Year	County (ies)	Damages	Declaration
Mar 2	1896	Androscoggin	Unknown	n/a
Apr 30	1923	Kennebec Penobscot	**$2,000,000**	n/a
Mar 19	1936	Cumberland	**$25,000,000** **5 deaths**	n/a
Aug. 28	1946	Cumberland	**$200,000**	n/a
Apr 22	1950	Franklin Kennebec	3 bridges	n/a
Apr 12	1951	Aroostook		n/a
Mar. 27-30	1953	Androscoggin Cumberland Kennebec Oxford		n/a
May 28	1961	Washington (Machias)	**$1,000,000**	n/a
Jan-Feb	1970	Franklin Oxford Piscataquis Somerset	**$3,000,000** Severe storms, ice jams, flooding	***Presidential*** **FEMA-284-DR-ME**
Feb 12	1972	Cumberland York		n/a
Apr. 24	1973	Aroostook Franklin Oxford Penobscot Waldo Washington	**$908,404**	***Presidential Request – denied***
May 6	1973	Aroostook		SBA
July 1	1973	Aroostook Franklin Oxford Penobscot Waldo		SBA
Sept 24	1973			***Pres Request – denied***

Month of Event	Year	County (ies)	Damages	Declaration
Dec.	1973	Aroostook Kennebec Lincoln Penobscot Sagadahoc Somerset Waldo	**$3,000,000**	n/a
May 26	1974	Aroostook	**$3,000,000**	n/a
May 8	1975	Cumberland Knox York	**$300,000**	SBA
Feb. 9	1976	Penobscot (Bangor) Washington		SBA
Apr. 2	1976	Aroostook	**$200,000**	n/a
August	1976	Aroostook	Crop Damage	SBA
Mar. 20	1977	Androscoggin Cumberland Oxford York		SBA
Feb 8	**1978**	Statewide (16 Counties)	**$20,693,181** High winds, tidal surge, coastal flooding	***Presidential*** **FEMA-550-DR-ME**
Apr 30	1979	Aroostook Kennebec Penobscot Piscataquis	**$648,500**	SBA
June	1984	Androscoggin Cumberland Kennebec Penobscot Sagadahoc Somerset		n/a
Jan	1986	Androscoggin Cumberland Franklin Kennebec Lincoln Oxford Sagadahoc Somerset York	Roads, bridges, dams, clean up	n/a

Month of Event	Year	County (ies)	Damages	Declaration
April 1 (The "April Fool's Storm")	1987	Androscoggin Cumberland Franklin Hancock (1 town) Kennebec Knox (1 town) Lincoln (3 towns) Oxford Penobscot Piscataquis Sagadahoc Somerset Waldo York (2 towns)	**$100,000,000** Major damage to homes, businesses, public buildings (town halls, fire stations, libraries) parks and recreation areas, agricultural equipment and livestock; the pollution closed clam beds downstream and severely damaged water and sanitation district facilities; erosion to river banks.	***Presidential*** **FEMA-788-DR-ME**
May	1989	Androscoggin Franklin Oxford	**$1,396,120** Severe storms, flooding	***Presidential*** **FEMA-830-DR-ME**
Apr 10-12	1991	Aroostook (from ice jamming)	**$14,400,000** Severe ice jams and flooding caused evacuations and destroyed homes, roads and bridges resulting in a relocation project	***Presidential*** **FEMA-901-DR-ME**
March 27	1992	Androscoggin Cumberland Franklin Kennebec Knox (3 towns) Oxford Piscataquis Somerset, Waldo York[4]	**$3,462,787** Heavy rains and ice jams severely damaged gravel roads and culverts. Many small, rural communities could not cover the recovery costs.	***Presidential*** **FEMA-940-DR-ME**
April (The "Easter Flood")	1993	Androscoggin Aroostook Cumberland Franklin Hancock Kennebec Lincoln Oxford Penobscot Piscataquis Somerset Waldo York	**$3,476,507** Heavy rains, snow melt and ice jams damaged dirt roads and culverts damage, exceeding the annual road repair and maintenance budgets in a number of rural towns	***Presidential*** **FEMA-988-DR-ME**

[4] Maine State Hazard Mitigation Plan 1993

Month of Event	Year	County (ies)	Damages	Declaration
April 15	1994	Aroostook (Fort Fairfield)	**$5,700,000** Flooding and ice jams after mild temperatures and rain damaged 71 homes and businesses	***Presidential*** **FEMA-1029-DR-ME**
Oct. 21	1995	Franklin Knox Oxford		n/a
Jan	1996	Androscoggin Franklin Oxford Penobscot[5] Piscataquis Somerset Waldo	**$2,181,170** Dramatic January thaw and heavy rains caused flooding and ice jams that damaged culverts, roads and drainage systems.	***Presidential*** **FEMA-1106-DR-ME**
Apr 16-17	1996	Androscoggin Cumberland Knox Oxford York	**$2,671,119** Flooding and mudslides from heavy rains and snowmelt damaged roads, seawalls, several dams, 2 homes, and washed out culverts[6]	***Presidential*** **FEMA-1114-DR-ME** **(addendum to 1106)**
Oct 20-21	1996	Cumberland Oxford York	**$8,998,501** Record breaking rains (in excess of 19 inches at Camp Ellis) from combined effects of a strong northeaster and Hurricane Lily. 1,000 structures were inundated, several dams breached, and roads, bridges and culverts were destroyed	***Presidential*** **FEMA-1143-DR-ME**
Jun 13 to July 1	1998	Androscoggin Franklin Kennebec Oxford Somerset York	**$2,519,458** Infrastructure damage from heavy rains to public roads and drainage systems in rural areas	***Presidential*** **FEMA-1232-DR-ME**
Oct 8-11	1998	Cumberland York	**$1,997,555** Inland and coastal flooding; erosion resulting from slow moving storm, heavy rains	***Presidential*** **FEMA-1263-DR-ME**
Sep 11	1999			SBA

[5] Interagency Hazard Mitigation Team Report, FEMA-DR-1106-ME, April 1996, pp. 11-22.
[6] Interagency Hazard Team Report FEMA-DR-1114-ME, May 1996

Month of Event	Year	County (ies)	Damages	Declaration
March 28, April 26	2000	Androscoggin Aroostook Franklin Kennebec Oxford Piscataquis Somerset Washington	**$2,884,207** Flooding from heavy rains, spring run-off, ice jams	***Presidential*** **FEMA-1326-DR-ME**
Mar 5-31	2001	Franklin Kennebec Oxford Penobscot Washington York	**$1,761,573** Flooding from severe winter storms, record snowfall, high winds, heavy rains & run-off, ice jams	***Presidential*** **FEMA-1371-DR-ME**
Dec 10-31	2004	Franklin Kennebec Oxford Piscataquis Sagadahoc Somerset Waldo	**$1,500,000** (est.) Severe storms, flooding, snow melt and ice jams	***Presidential*** **FEMA-1508-DR-ME**
Mar 29 – May 3	2005	Androscoggin Aroostook Franklin Hancock Kennebec Knox Lincoln Oxford Piscataquis Somerset Waldo Washington York	Severe storms, flooding, snow melt and ice jams	***Presidential*** **FEMA-1591-DR-ME**
May 13 and counting (The "Mother's Day Storm")	2006	York	$2,800,000 Severe storms and flooding	***Presidential*** **FEMA-1644-DR-ME**
March 16-18	2007	Hancock Knox Lincoln, Waldo	**$22,000,000** Flooding	***Presidential*** **FEMA-1691-DR-ME**

Month of Event	Year	County (ies)	Damages	Declaration
April 15-23 (The "Patriot's Day Storm")	2007	Androscoggin Cumberland Franklin Hancock Kennebec Knox Lincoln Oxford Sagadahoc Somerset Waldo Washington York	**$22,000,000** Severe storms and inland and coastal flooding	***Presidential*** **FEMA-1693-DR-ME**
July 11-12	2007	Oxford	**TBD** Severe storms and flooding	***Presidential*** **FEMA-1716-DR-ME**
April 28 – May 14	2008	Aroostook Knox Lincoln Penobscot Piscataquis Somerset Waldo	**$5,000,000** Severe storms and flooding	***Presidential*** **FEMA-1755-DR-ME**
July 18 to August 16	2008	Androscoggin Cumberland York	**TBD** Severe storms, flooding, and tornadoes	***Presidential*** **FEMA-1788-DR-ME**
Dec 11-29	2008	Androscoggin Cumberland Knox Lincoln Sagadahoc Waldo York	**$10,000,000** Severe winter storm and flooding	***Presidential*** **FEMA-1815-DR-ME**
June 18– July 8	2009	Franklin Hancock Knox Lincoln Oxford Piscataquis Somerset Waldo Washington	**$2,500,000** Severe storms, flooding, landslides	***Presidential*** **FEMA-1852-DR-ME**
Feb 23 – Mar 2	2010	Cumberland Knox Lincoln Sagadahoc York	**TBD** Severe winter storms, flooding	***Presidential*** **FEMA-1891-DR-ME**
Mar 12 – Apr 1	2010	Hancock York	**TBD** Severe winter storms, flooding	***Presidential*** **FEMA-1920-DR-ME**

Month of Event	Year	County (ies)	Damages	Declaration
Dec 12-19	2010	Aroostook Piscataquis Washington	**TBD** Severe winter storms, widespread flooding	***Presidential*** **FEMA-1953-DR-ME**

Sources: FEMA website and MEMA records

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, and it has since been repaired.
- In 2011, the Southport Water Supply Dam showed signs of embankment leakage and has since been repaired.

Repetitive Loss Properties

FEMA maintains a file of 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.

Repetitive Loss Properties							
County	**Town/City**	**Residential Structures**			**Non-Residential Structures**		
		# Properties	**# Losses**	**# Mitigated**	**# Properties**	**# Losses**	**# Mitigated**
Androscoggin	Greene	1	2				
	Mechanic Falls	1	2				
Aroostook	Eagle Lake	1	2				
	Fort Fairfield	11	37	11	5	12	5
	Fort Kent	3	6	1	3	13	2
	Island Falls	1	2				
Cumberland	Cape Elizabeth	1	3				
	Casco	3	8				
	Falmouth	1	2				
	Gorham	1	2				
	Gray	1	3				
	Harrison	1	2				
	Scarborough	2	5				
	Westbrook				1	3	
Franklin	Carrabassett Val	1	2				
	Farmington				1	2	
	Temple	1	2	1			
Hancock	Blue Hill	1	2	1			
Kennebec	Augusta	2	5	1	6	27	1
	Gardiner	1	2		6	17	1
	Hallowell				5	20	
	Wayne	3	7				
	Winslow	2	5		2	4	
Knox	Owls Head	1	2				
Lincoln	Boothbay Harbor				1	6	
	Boothbay	1	2		1	2	1

Repetitive Loss Properties							
County	**Town/City**	**Residential Structures**			**Non-Residential Structures**		
		# Properties	**# Losses**	**# Mitigated**	**# Properties**	**# Losses**	**# Mitigated**
	Bristol	1	2				
	South Bristol				1	2	
	Southport	1	2				
Oxford	Bethel	1	2				
	Canton	5	12				
	Fryeburg	4	13				
	Mexico				1	2	
	Norway	1	2				
	Rumford	1	2	1	1	2	
Penobscot	Bradley	2	9				
	Chester	1	2				
	Drew Plantation	1	2				
	Glenburn	1	2				
	Grindstone T1 R7	4	10	3			
	Medway	2	5				
	Milford	4	11				
	Old Town	2	4				
Piscataquis	Brownville	1	2				
	Dover-Foxcroft	1	3	1	1	3	
	Guilford	4	10	2	1	2	
	Milo	2	5				
Sagadahoc	Bath				1	4	
	Bowdoinham	1	2				
	Phippsburg	1	3				
Somerset	Anson	1	3				
	Fairfield	1	2				

Repetitive Loss Properties							
County	**Town/City**	**Residential Structures**			**Non-Residential Structures**		
		# Properties	**# Losses**	**# Mitigated**	**# Properties**	**# Losses**	**# Mitigated**
	Hartland	1	2				
	Norridgewock	1	2				
	Skowhegan	1	2	1			
Waldo	Belfast				1	2	
	Lincolnville				1	3	
	Unity	1	3				
York	Acton	2	8				
	Arundel	1	2				
	Berwick	1	2		1	2	
	Biddeford	3	6	2			
	Buxton	1	2				
	Dayton	1	2				
	Hollis	1	2				
	Kennebunk	16	44		2	5	
	Kennebunkport	6	13		3	15	
	Kittery	1	2		1	3	
	North Berwick	1	3				
	Ogunquit	3	6		6	8	1
	Old Orchard Beach	6	14		1	2	
	Saco	11	26	4	1	3	
	Sanford	2	5		1	3	
	South Berwick	2	8				
	Wells	12	29				
	York	15	38	1	11	27	

Probability of Occurrence

Floods are described in terms of their extent (including the horizontal area affected and vertical depth of floodwaters) and the related probability of occurrence. Flood studies historical records to determine the probability of occurrence for different flood recurre intervals. The probability of occurrence is expressed in percentages as the chance of a fl of a specific recurrence interval in any given year. The most widely adopted design regulatory standard for floods in the United States is the 1-percent annual chance flood this is the standard formally adopted by FEMA. The 1-percent annual flood, also known as base flood, or regulatory flood, has a 1 percent chance of happening in any particular year is also often referred to as the "100-year flood." This expression is, however, merely a sim and general way to express the statistical likelihood of a flood. Actual recurrence periods variable from place to place.

Smaller floods occur more often than larger (deeper and more widespread) floods. Thu "10-year" flood has a greater likelihood of occurring than a "100-year" flood. The follow table shows a range of flood recurrence intervals and their probabilities of occurrence.

Flood Recurrence Intervals	Percent Chance of Occurrence Annual
10 year	10.0%
50 year	2.0%
100 year	1.0%
500 year	0.2%

Source: FEMA 386-2, August

As a point of clarification, the 100-year flood does not mean that it will happen once every c hundred years. There is, over an epoch of time, the likelihood that it will average out to o every 100-years but in any given 100 year period there is a 63% chance of the 1% flood.

Probability of Dam Failure/Breach. The Maine Dam Safety Law requires regular inspectio maintenance and current EAPs. Maine's approach to dam management recognizes that c failure probability studies are prohibitively expensive, and that establishing a definitive ris failure for specific dams is virtually impossible. Rather than insisting on the preparation expensive dam failure studies, Maine has chosen to require that EAPs be prepared for possibility of dam failure.

Issues and Challenges

The following is a partial list of the more important flooding issues and challenges fac Maine:

1. **Flood mitigation needs exceed available resources**. As noted previously in the 2 Plan and again in this update, the completion of FEMA-approved hazard mitigation pl for 16 counties and the jurisdictions within them, and the University of Maine System resulted in the identification of 2058 hazard mitigation projects amounting to $205.8 mill At least 90 - 95% of these projects are flood mitigation projects.

2. **The lack of detailed mapping is still a major issue.** In recent years, there have bee number of significant mapping initiatives, particularly along the coast. However:

- LIDAR based mapping is limited to a few coastal areas and a small portion of Oxford County. There has been LIDAR mapping of Maine's beaches, but this needs to be repeated every five years to keep up with the dynamic shoreline changes.

- Many communities are still struggling with older, less detailed Flood Insurance Rate Maps. There are 212 communities with floodplain delineations based on approximate data and vague floodplain delineations shown as approximate "A" zones. The "A" zones were based in part on local knowledge, aerial photo interpretation and soils data. Officials at the Maine Floodplain Management Program estimate that over 70% of the floodplains shown on Flood Insurance Rate Maps cannot be relied upon for establishing significant development regulations and attempting to protect life and property. While some communities have not been mapped, they are communities with little to low risk development in the Special Flood Hazard Areas.

- There is a concern that because Maine is seen as a low risk state from a national perspective, it is not getting the level of mapping as it had originally called for in its Map Modernization Business Plan first approved FEMA. As a result of FEMA Mid-Course Adjustment, Maine's mapping needs fell in relative importance in the national metric based on population and risk. Maine must continue to be active in the national arena and push for continued funding or extension of the Map Modernization program in order to afford its communities the opportunity to accomplish modern floodplain management. With Maine being a rather small population state with a sizable number of rural communities, it is unlikely that it will ever have the state or local resources to carry the burden of developing fully digital flood maps without the same monetary advantages provided to the rest of the nation.

3. **A number of repetitive loss properties are not insured.** FEMA's statistics on repetitive loss properties include only properties that have flood insurance. There are other properties that suffer repetitive flood losses but which are not insured. Statistics on these properties are not tabulated unless damaged during a declared individual disaster.

WINTER STORM

The Capitol Tree – MEMA photo archive – by Gene Maxim

General Definition

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

Types of Winter Storms in Maine

Blizzard. Sustained winds of 40 miles per hour (mph) or more or gusting up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life- threatening traveling conditions.

Ice Storms. Rain which freezes upon impact. Ice coating at least one-fourth inch in thickness is heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outage.

Nor'easter. Nor'easters are extratropical coastal storms that can produce tremendous amounts of precipitation and strong winds that can cause coastal flooding damage. When the precipitation is in the form of snow, sleet or freezing rain, it can damage overhead utility lines and become a highway driving hazard.

Sleet Storm. Frozen rain drops (ice pellets) which bounce when hitting the ground or other objects. Does not stick to objects, but in accumulated depths of two inches or more, produces hazardous driving conditions.

Heavy Snow Storm. A snowfall of fifteen inches or more within 12 to 24 hours which disrupts or slows transportation systems and public safety departments' response capability.

Nature of Hazard

During the winter months, Maine often has heavy snowfall, or snow combined with high winds, freezing rain or ice storms. Nor'easters, the most severe form, occur during the winter, spring and fall. They rarely develop during the summer. Precipitation amounts can exceed several inches of water equivalent (20-30 inches of snow or more), while wind speeds can be equal to or greater than those for hurricanes that reach Maine. The Groundhog Day nor'easter in 1976 produced 100-knot (115 mph) winds at Southwest Harbor. 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.

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 from lengthy records 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.

The snowfall season usually runs from late October (in the north) or November (most of the rest of the State) 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 in that month with December usually averaging out to be the second snowiest month.

The snowpack makes an important contribution to both surface and groundwater supplies, and years with a low snowpack can lead to water shortages 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.

Location of Hazard

The entire State is subject to severe storms every winter, but historically, western areas receive more snowfall while coastal areas are more likely to have freezing rain, sleet, tide surges and flood damage.

Previous Occurrences

The following is a summary of some of the most severe winter storms during the past 35 years.

Key:

DR: Disaster Declaration
EM: Emergency Declaration
TBD: To be Determined

Severe Winter Storm History

Month of Occurrence	Year	County (ies)	Damage (as noted in the declaration)	Declaration
Feb. 19 Snowstorm	1972	Hancock Knox Washington		State Aid
March 7 Ice Storm	1972	Cumberland Lincoln Sagadahoc York	$413,682 Severe storms, flooding	***Presidential*** **FEMA-326-DR-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*** **FEMA-3099-EM-ME**
Jan 5-25 "Great Ice Storm of 98"	**1998**	***Statewide***	**$47,748,466** **Power outages [Loss of heat, refrigeration, sanitation services]** **Forestry damage**	***Presidential*** **FEMA-1198-DR-ME**
Mar 5-31	2001	Androscoggin Aroostook Cumberland Franklin Hancock Lincoln Oxford Penobscot Piscataquis Sagadahoc Somerset Washington York	$4,483,918 Maine severe winter storm,	***Presidential*** **FEMA-3164-EM-ME**

Month of Occurrence	Year	County (ies)	Damage (as noted in the declaration)	Declaration
Dec 17 2002 - Jun 1, 2003	2003	Androscoggin Aroostook Cumberland Franklin Hancock Kennebec Lincoln Oxford Penobscot Piscataquis Washington	$2,144,457 Maine Extreme winter weather; severe cold and frost	***Presidential*** **FEMA-1468-DR-ME**
Feb 2-4	2003	Aroostook	$1.6 million Maine snowstorms Winter storms and extreme cold	***Presidential*** **FEMA-3174-EM-ME**
Dec 6-7	2003	Aroostook Cumberland Franklin Hancock Kennebec Oxford Penobscot Piscataquis Somerset	$1.7 million Maine snow Winter storms and extreme cold	***Presidential*** **FEMA-3190-EM-ME**
Dec 14-15	2003	Aroostook Franklin Hancock Penobscot Piscataquis Somerset Washington	Maine snow Winter storms and extreme cold	***Presidential*** **FEMA-3194-EM-ME**
Jan 22-23	2005	Cumberland York	$10 million Maine snow, winter storms and extreme cold	***Presidential*** **FEMA-3205-EM-ME**
Feb 10-11	2005	Androscoggin Aroostook Cumberland Franklin Hancock Knox Oxford Penobscot Piscataquis Somerset York	$10 million Maine snow, winter storms and extreme cold	***Presidential*** **FEMA-3206-EM-ME**
March 9	2005	Androscoggin Aroostook Cumberland Franklin	$10 million Maine snow, winter storms and extreme cold	***Presidential*** **FEMA-3209-EM-ME**

Month of Occurrence	Year	County (ies)	Damage (as noted in the declaration)	Declaration
		Hancock Oxford Penobscot Piscataquis Somerset York		
March 11-12	2005	Androscoggin Cumberland Oxford	$10 million Maine snow, winter storms and extreme cold	***Presidential*** **FEMA-3210-EM-ME**
Dec 25-27 "Christmas Storm"	2005	Aroostook	Maine snow, winter storms and extreme cold	***Presidential*** **FEMA-3265-EM-ME**
Dec 11	2008	Cumberland Knox Lincoln Sagadahoc Waldo York	Maine severe winter storm; winter storms and extreme cold	***Presidential*** **FEMA-3298-EM-ME**
Feb 8-9	2013	Androscoggin Cumberland Knox Sagadahoc Washington York	Severe winter storm (blizzard)	***Presidential*** **FEMA-4108-DR-ME**

Storm of Record: The "Great Ice Storm of '98." The storm began January 5th and continued through January 25, 1998. During this time, residents experienced effects from freezing rain, high winds, snow and ice.

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 the Maine Emergency Management Agency (MEMA) to expect a major ice storm. While temperatures warmed above freezing in some parts of Southern Maine, areas in the Central part of the State remained below freezing. Ice buildup was reported in several isolated areas.

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 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 and created severe conditions and safety concerns.

On January 10th and 11th, a weak cold front passed through the State and brought drier, colder air. Mixed precipitation developed on January 13th, as the low-pressure system moved eastward. A cold front that evening was preceded by strong southerly winds followed by west to northwest winds. Gusts were reported up to 50 miles per hour and brought much colder air into the state and

temperatures dropped to single digits in Central Maine and below zero temperatures in the mountains and the northern part of the State. Wind chills were in the minus twenty to minus forty-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.

Periods of light snow developed January 18th through the morning of January 20th, as a huge low-pressure system moved across the Atlantic Ocean well south of the State. An area of high pressure moving into the State on January 21st brought cold sunny weather that lasted through January 22nd.

On January 23rd, snow developed from south to north during the day, changed 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. Then, skies cleared in southern and central areas, but remained mostly cloudy with flurries in the north. Temperatures climbed to the mid-thirties in the south and to the mid-twenties in the north.

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. It will probably be recorded as the state's worst ice storm. 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.

On January 13th, President Clinton declared fifteen of Maine's sixteen counties 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. 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, seventeen 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 (MDOT) and the Maine Army National Guard (MeArNG) to restore power to the region and worked through frigid temperatures and snow to reconnect downed lines.

Central Maine Power (CMP) estimated their cost to restore power to the more than six hundred thousand residents at sixty million dollars. Clean-up and repair costs of local and state government agencies increased the estimate to more than eighty-seven 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 the 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.

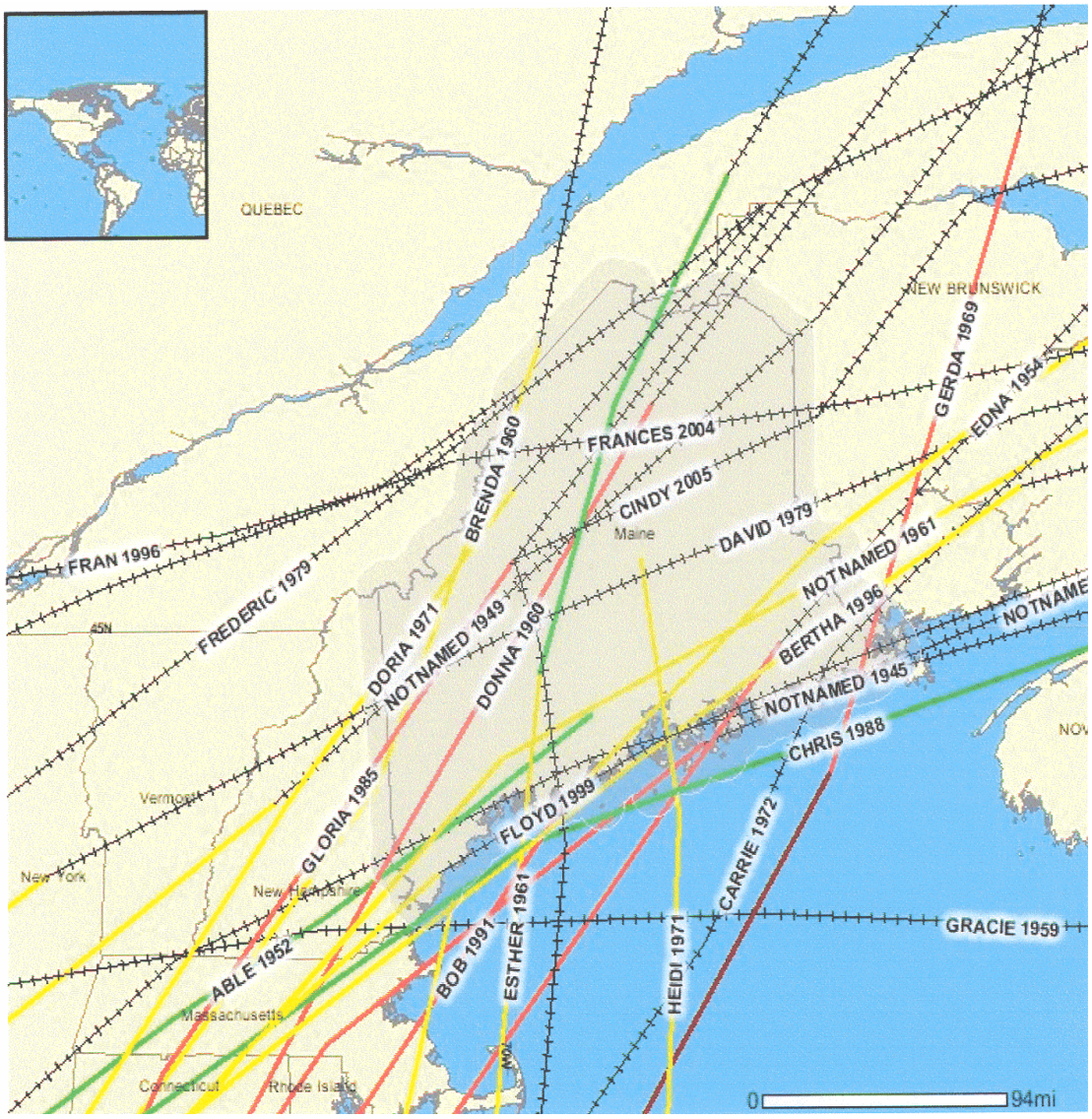
Frequency of Occurrence

On average, the length of annual maximum snow cover ranges from about 50 days along the coast to over 4 months in the Northern and particularly the Northwestern part of the State.

Probability of Occurrence

Maine's location in the Northeast, and the last 41 years of recording winter storm damages indicate that every year, between November and April there is a high probability that such storms will occur. Climate models suggest that Maine is likely to get more ice storms in the future because of warmer temperatures.

HURRICANE/MAJOR TROPICAL STORMS



Source of Map: NOAA Hurricane Center. Note: Hurricane Carol (1954) is not shown on this map because it tracked through New Hampshire.

Key:

- **Red: Hurricane**
- **Yellow: Tropical storm, winds above 50 knots**
- **Green: Tropical storm, winds below 50 knots**
- **Black: No longer a tropical storm**

General Definition

A hurricane is an intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach seventy-four miles per hour or more and blow in a large spiral around a relatively calm center called the “eye.” It produces damage and destruction from heavy rainfalls, high winds, and flooding.

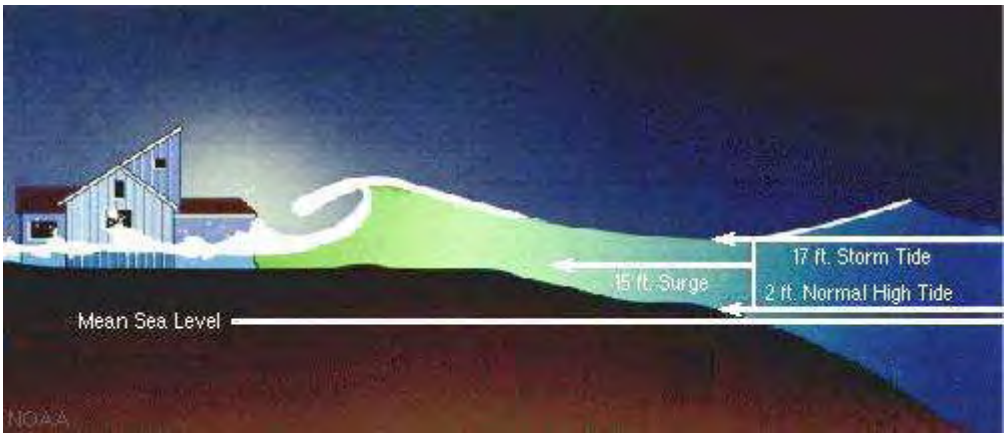
Nature of Hazard

Every few years between May and November, tropical storms reach Maine, usually with winds of less than 74 miles per hour, in the "post hurricane stage." When it comes to hurricanes in Maine, wind speeds do not tell the whole story. While hurricanes produce storm surges, and a threat to the State's coastal residents and businesses, they also produce inland flooding. As previously described in the flood section, the State's five major rivers provide ample opportunity for flooding in any of its 16 counties. Intense rainfall is not directly related to the wind speed of tropical cyclones, or hurricanes. In fact, some of the greatest rainfall amounts have occurred from weaker storms that drifted slowly or stalled over an area.

Hurricane Category. Hurricanes and their accompanying storm surges are often described according to the Saffir/Simpson Hurricane Scale, which assigns a Hurricane Category according to the maximum sustained wind speed within the hurricane. A condensed version of the Saffir/Simpson Hurricane Scale is shown in the table below.

Saffir/Simpson Hurricane Scale	
Category	**Maximum Sustained Wind Speed (mph)**
1	74-95
2	96-110
3	111-130
4	131-155
5	>155

Storm Surge. Based on information prepared by the National Weather Service in Caribou, Maine, the greatest potential for loss of life related to a hurricane is from the storm surge. Storm surge is simply water that is pushed toward the shore by the force of the winds swirling around the storm as well as low barometric pressure. This advancing surge combines with the normal tides to create the hurricane storm tide. This can increase the mean water level 15 feet or more in some areas. In addition, wind driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides.



Source: NOAA Website

In general, the more intense the storm, and the closer a community is to the right-front quadrant, the larger the area for potential evacuation. The problem is always the uncertainty about how intense the storm will be when it finally makes landfall. Wave and current action associated with the tide also

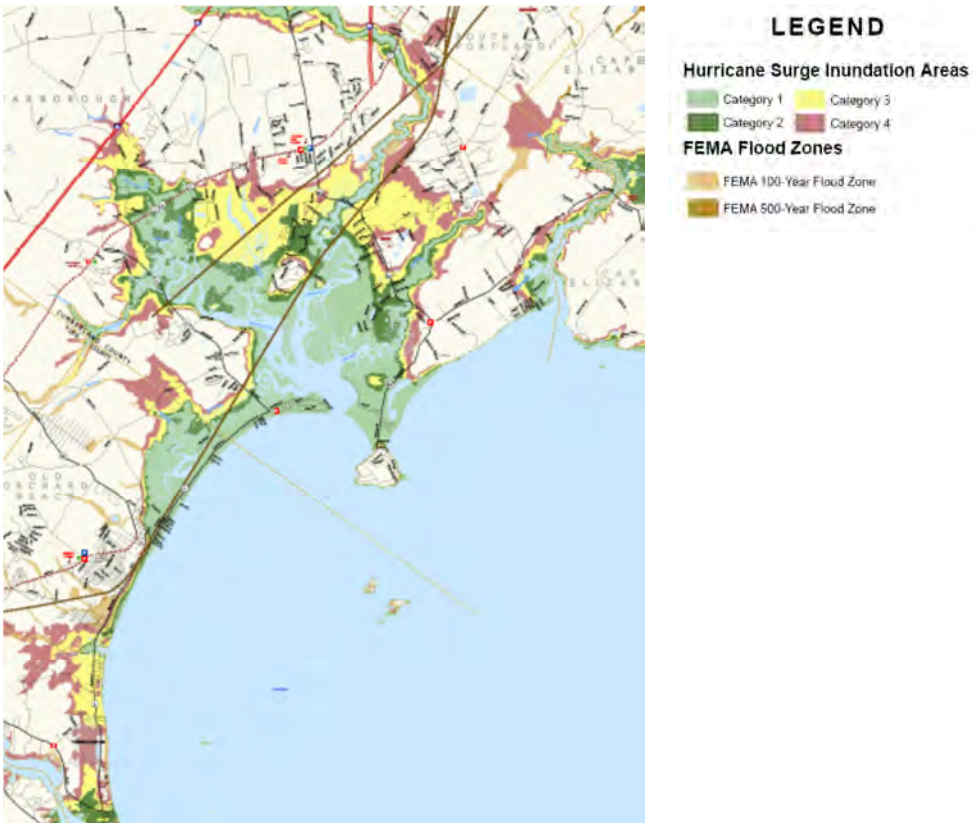
causes extensive damage. Water weighs approximately 1,700 pounds per cubic yard; extended pounding by frequent waves can demolish any structure not specifically designed to withstand such forces.

The currents created by the tide combine with the action of the waves to severely erode beaches and coastal highways. Many buildings withstand hurricane force winds until their foundations, undermined by erosion, are weakened and fail.

Location of Hazard

Although the entire State is vulnerable to the effects of a hurricane, the coastal and southern areas usually receive the highest impact. The coastal area in Cumberland and York Counties is the most susceptible to erosion from storms as there is more beach area and less high rocky coastline in this region. Most of the coastal islands have high rocky coasts that resist erosion.

Hurricane Surge Inundation Maps. The U.S. Army Corps of Engineers prepared Hurricane Surge Inundation Maps for Maine based on the SLOSH (Sea, Lake, and Overland Surges from Hurricanes) Model prepared by the National Weather Service. The Hurricane Surge Inundation Maps show, for each hurricane category, the areas that would be inundated from the worst-case combination of hurricane landfall location, forward speed, and direction at each location along the coast. These maps are available in digital format. The following is an excerpt of one of the maps for the Old Orchard Beach/Scarborough area:



Source of Map: Maine Hurricane Evacuation Study, U.S. Army Corps of Engineers, 2004/05

MEMA and County EMA offices maintain respective sets of the August 2004 version of the "Hurricane Storm Surge Inundation Maps" for the entire coastal region, including the tidal rivers of Maine. These

maps are currently being used as a disaster response planning tool. It should be noted that there are two sets of maps for the entire coast. The first set, prepared in 2004, is based on mean sea level. The second set, prepared about a year later, is based on mean high tide. The map shown on the previous page is from the latter set.

Previous Occurrences

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

History of Hurricanes

Month of Occurrence	Year	County (ies)	Estimated Damage	Declaration
Sep 21	1938	Androscoggin Cumberland York	$135,000	
Sep 14	1944	Cumberland		
Aug 31 "Carol"	1954	Cumberland Knox Lincoln Sagadahoc Waldo & York	$5,000,000 3 Deaths Power outages, Downed trees	SBA
Sep 11 "Edna"	1954	***STATEWIDE*** (flooding)	$7,000,000 8 Deaths, Power outages	***Presidential #24***
Sep 12 "Donna"	1960	Cumberland	$250,000 power outages[i]	
Oct 6 "Daisy"	1962	Cumberland (flooding)	2 Deaths Power outages	
Oct 29 "Ginny[ii]"	1963	***STATEWIDE***		
Aug 9-19 "Belle"	1976	Aroostook (flooding)	Agricultural loss (potato crop)[iii]	
Aug 10	1977	Aroostook	$4,000,000	SBA
Sep 6 "David"	1979	Coastal	Minor Damage	
Sep "Diana"	1984	Coastal Counties Threatened		

Month of Occurrence	Year	County (ies)	Estimated Damage	Declaration
Sep 17 "Gloria"	1985	Androscoggin Cumberland Franklin Kennebec Somerset York	3 Injuries Downed trees Power failures (up to 14 days, 250,000 people affected)	
Sep 10 "Bob"	1991	Androscoggin Cumberland Franklin Kennebec Sagadahoc York	$5,523,665 3 Deaths Power outages	***Presidential*** ***FEMA-915-DR-ME***
Sep 16-19 "Floyd"	1999	Androscoggin Cumberland Kennebec Oxford Somerset	$1,210,205	***Presidential*** ***FEMA-1308-DR-ME***
Aug 27-29 Tropical Storm "Irene"	2011	Franklin Lincoln Oxford York	TBD Extensive flooding, power outages, debris cleanup from high winds	***Presidential*** ***FEMA-4032-DR-ME***

In 1954 Carol and Edna occurred within a two week period, a highly unusual pairing that 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 raised awareness of the State's vulnerability; but event memories and lessons learned often fade within a period of only two or three years.

Since then, coastal populations have significantly increased and valuations of many coastal communities have increased more than a hundred fold. People insist on building in harm's way. Consequentially, it is expected that damage today from the likes of an Edna 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 still 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 coast counties, fishing, commercial and pleasure boating losses would have been significant if boats, gear, piers and wharfs had been severely damaged.

Through repeated warnings and advice via all social media prior to Irene, the general population was very aware of the impending storm. Stores were busy as customers stocked up and utility crews were prepositioned. However, the lack of recurrent Cat 1-5 hurricanes for the last four decades tends to moderate local attitudes toward making extensive preparations.

Storms of Record. To date, the worst hurricane damage occurred in 1954 when Hurricanes Edna and Carol swept into the state within a two week period. Maine suffered a total of eleven deaths and

damages of $17 million as a result of these two storms. The winds downed trees, limbs and power lines. The resulting flooding from the heavy rains washed cars into ditches.

Probability of Occurrence

Based on the last 75 years of past occurrences, there is a high probability that Maine can expect as many as three hurricanes or major tropical storms per decade to track over the State.

Issues and Challenges

1. **Lack of public awareness.** The Maine Emergency Management Agency has distributed digital copies of the hurricane surge inundation maps to coastal communities as a first step in raising public awareness about the extent to which hurricanes may impact coastal areas. To date, however, there seems to be very little public awareness or concern about the extent to which low-lying coastal areas, particularly in Southern Maine, may be inundated by even the lowest category of hurricanes, a Category 1 hurricane. If people are not aware of the risks, they may inadvertently build in areas subject to inundation and/or fail to construct hurricane-resistant structures.

2. **Confusion about maps.** There are actually two sets of hurricane surge inundation maps. The first set, prepared in 2004, is based on mean sea level. The second set is based on mean high tide and generally shows more land areas being impacted by various categories of hurricanes.

3. **No State hurricane policies.** To date, the State of Maine does not have any policies that would direct public facilities away from hurricane inundation areas, or require that they be constructed so as to be hurricane-resistant.

WILDFIRE

Wildland Urban Interface Fire in Georgetown, Maine 2008– Photo courtesy of Maine Forest Service

General Definition

Wildland fires are defined as those fires that burn vegetative cover: grass, brush, timer, or slash (Clayton 1985). Wildfire is a natural phenomenon initially finding its origin in lightning. However, humans have become the greatest cause of fires in Maine.

Wildland urban interface fires are created where homes meet with highly volatile forest fuels as shown in the photo above.

Nature of Hazard

Maine has 17.7 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 90%. 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 forest fire risks, but seasonal variations, rapidly draining soils and unusually dry periods can induce major blazes. In addition, insect damage (such as the hemlock woolly adelgid and spruce budworm) diseases, severe weather, and residential and commercial developments in wooded areas 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.

Several demographic factors make Maine's rural areas less resistant to the threat of fires. First, the outmigration of young people from rural areas often leaves an older, more vulnerable population and shrinking tax bases to fund local, usually 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 fire fighters to respond before the structures are destroyed, especially since 90% of all fire fighters in Maine are volunteers.

The Maine Forest Service employs 57 field Forest Rangers, who are the state's experts in forest protection, including wildfire management, natural resource law enforcement and incident management. The Division of Forest Protection, like most agencies in Maine State Government, has been plagued by budget cuts, resulting in cuts to the field staff and loss of funding for capital wildfire equipment purchases.

The Maine Forest Service's (MFS) Forest Protection Division provides forest wildfire protection services for all of Maine's forest lands. In the unorganized territories of Maine, which account for 44 percent of the State's total land area, the Maine Forest Service is the only fire suppression entity. MFS' goals are to keep the number of forest fire starts to less than 1,000 and annual acreage loss to less than 3,500. Since 2002, MFS has met those goals because of:

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

The Division utilizes fixed and rotary wing aircraft [helicopters] in its wildfire prevention, detection and suppression missions. Currently, the inventory includes 4 Bell UH-1H "Huey" helicopters, acquired from the Department of Defense through a loan agreement brokered by the US Forest Service. These aircraft, which are the backbone of the state's suppression fleet, are reaching the end of their useful age. Replacement of these helicopters is paramount for the Division to maintain its suppression acreage damaged burned. In 2007, the Division purchased a Bell 407 helicopter for its forest protection mission.

In 2001, Maine experienced a very active fire season. Although fire starts were held to a little less than 1,000, the fires that did occur were unusually destructive, and taxed the capabilities of the system to respond. During one particularly active period (38 lightning strikes in Northern Maine), two fires were just monitored from the air for a week because the other fires posed a greater risk. One fire in Addison burned 500 acres and caused the loss of two structures, prompting MFS to develop a Wildland Urban Interface Committee.

This committee was assigned the responsibility of assessing the risk of wildfire to homes within and near forested areas, such as the one shown in the picture above. MFS has printed and distributed over 4,000 brochures and has developed public service announcements alerting homeowners to the potential threat of wildfire in interface areas and what they can do to limit their exposure to the threat of wildfires. MFS has also partnered with the National Park Service to deliver software that can determine risk in Maine communities. The MFS has developed two DVDs showing MFS Rangers at different Maine locations pointing out the need for defensible space around property and how that can be achieved. These DVD's can be viewed on their website at www.maine.gov/doc/mfs.

Mitigation. MFS has also launched a community assessment program aimed at focusing its fire prevention efforts on geographical areas of the State with relatively high occurrences of wildfires. The assessment involves working with local officials and the public to identify vulnerable homes in the

urban/wildland interface. MFS then prepares a community wildfire protection plan that contains guidelines that homeowners can use to protect their homes. The emphasis is on maintaining a 30-foot defensible space around homes.

Location of Hazard

The Department of Conservation, Maine Forest Service Forest Protection Division tracks all reported fire occurrences in the state on an annual basis. These are coded by cause: campfire, children, debris burning – which can include backyard burning as well as the agricultural practice of "burning over" blueberry fields, incendiary (includes arson) lightning, machinery, miscellaneous, railroad and smoking. The number of fires by cause by county is shown in Table 1

Previous Occurrences

The worst fires in Maine's history occurred in the fall of 1947. In the spring of that year, probably no one could have imagined such a disaster. Winter had been mild with a normal snowfall. When unseasonably warm March weather had briefly pushed temperatures into the 80's, the prospect of an early spring seemed possible. But then, typical of Maine weather, it changed dramatically. The months of April, May and June were not only cold but filled with days and days of rain. Of necessity, farmers had to plant their crops late, and even then, the seed was slow to sprout.

"Only Maine's forest wardens must have welcomed the rain. To them the early melting of the snow had been an ominous sign, for forest fire danger is heightened when the snow disappears early from the woods. Until 1947 Maine's record for a low incidence of fires was one of the best of the eastern states. Unfortunately, that was about to change as the climate and human activities slowly intertwined for disastrous results.

It was after World War II, and returning veterans had created a post-war building boom. In response, lumbermen had set up dozens of portable and stationary sawmills to meet the demand for new houses. As a result, piles of slash had built up in the forests and sawmill yards. There was also Nature's slash, the debris left behind after the 1938 Hurricane. While the fire wardens were concerned about this, the public was generally unaware of any threat.

When the rains finally gave way to sunshine at the end of June, the business of summer went forward. Crops responded to the good weather, and the truck gardeners of York County, the potato farmers of Aroostook and the blueberry growers of Washington County looked forward to a good harvest. Sports camp owners hosted fisherman and made plans for the fall hunting season. Although ammunition was still scarce, hunters from all over the country were making reservations for the deer season. Farm wives were filling their pantries and cellars with preserves, while along the coast, cottagers were anticipating long, lazy days of swimming, boating and visiting.

The beautiful weather continued into fall. Maine, indeed all of New England, enjoyed one of the most glorious Indian Summers in living memory. Eventually, it would be apparent that the State was experiencing its severest drought in 30 years, but it wasn't until the opening of bird hunting season that the hunters realized just how serious conditions had become. Leaf mold, pine needles and moss were parchment dry. Streams, lakes and ponds had shrunk from their banks. By then, of course, farmers were keenly aware of the drought. Their wells had been going dry and the primary chore of tending livestock had become the daily transportation of water. Some farmers resorted to using empty vinegar and molasses barrels from local stores.

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

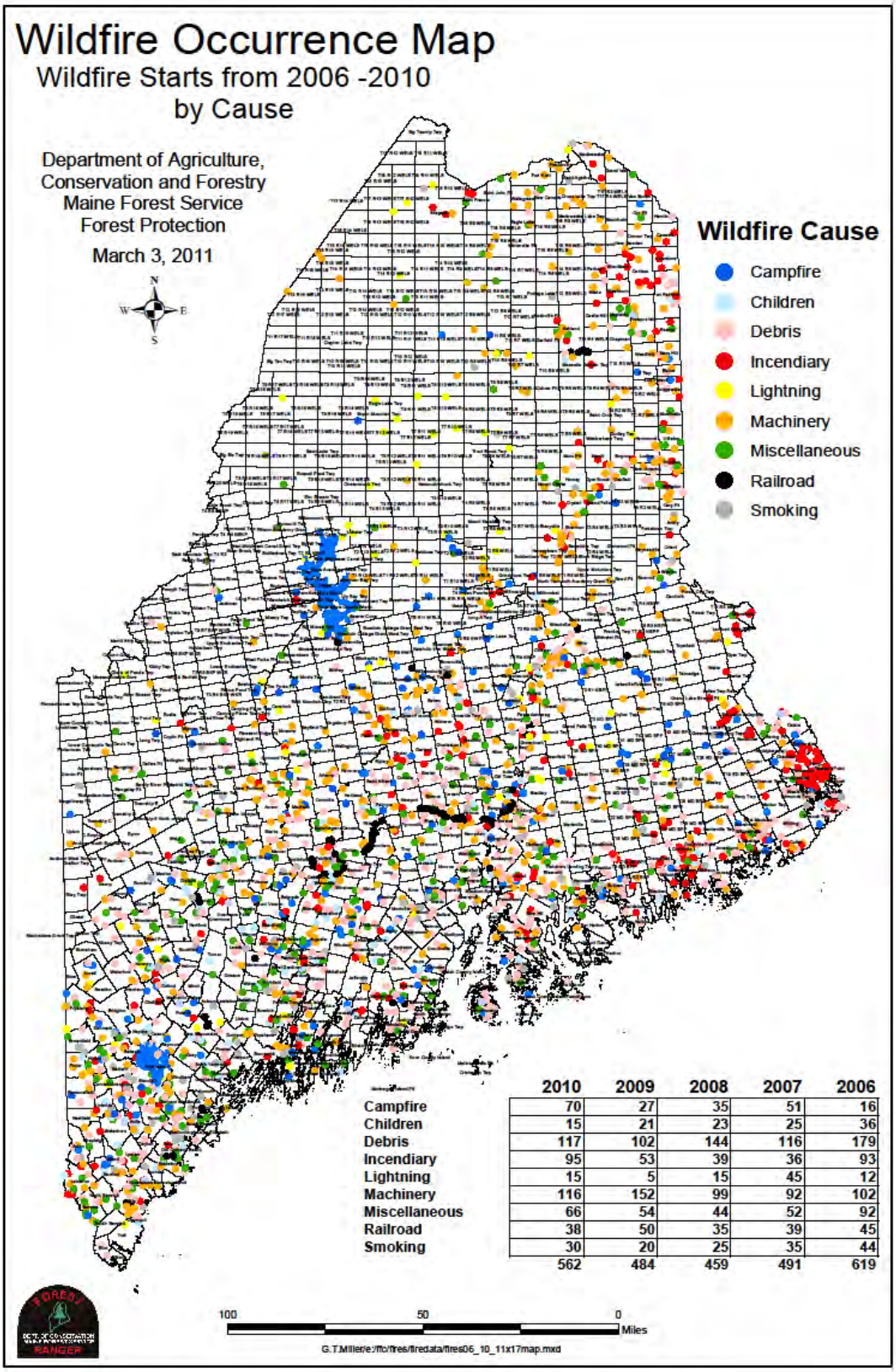
up, burning underground along the roots of trees. By then, other fire reports were coming into the Office of the Forest Service in Augusta. As sunny, dry weather continued, more fires burst to life:

- 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 files 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."

With hand pumps, brooms, shovels, bucket brigades, old fire trucks, and whatever could be used as makeshift water tanks, the citizens and firefighters did their best, but such equipment proved inadequate to the sheer magnitude of the task. Without a central command structure, or training at the local level, many well intentioned efforts could not be managed effectively. Without tracking and communications equipment, strategic information could not be passed quickly to where it was most needed.

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 were blackened stubble, and 3,000,000 feet of cut lumber had been destroyed. In many sections the earth itself had been consumed.

Families returned to the smoking cellar holes of what had been their homes. Farmers returned to find the charred remains of livestock that had been caught by the fire. Town officials returned to the ash of post offices, churches, town halls, tax records and the property on which the taxes were based. Cottagers returned to chimneys standing in the spaces where their beautiful summer homes had once faced the sea.



	2010	2009	2008	2007	2006
Campfire	70	27	35	51	16
Children	15	21	23	25	36
Debris	117	102	144	116	179
Incendiary	95	53	39	36	93
Lightning	15	5	15	45	12
Machinery	116	152	99	92	102
Miscellaneous	66	54	44	52	92
Railroad	38	50	35	39	45
Smoking	30	20	25	35	44
	562	484	459	491	619

Table 1
Number of Fire by Cause by County
2008-2012

County	Camp	Child	Debris	Arson	Light	Machin	Misc	RR	Smoke	5 Total	Annual Average
Androscoggin	5	5	10	6	1	5	7	3	5	47	9
Aroostook	7	6	48	46	9	127	29	1	11	284	57
Cumberland	8	11	25	21	0	19	14	6	17	121	24
Franklin	7	3	19	4	0	19	21	0	1	74	15
Hancock	6	0	63	17	3	28	20	3	9	149	30
Kennebec	17	19	42	14	7	46	36	18	7	206	41
Knox	9	2	26	3	1	7	6	1	4	59	12
Lincoln	2	4	11	7	0	5	7	1	1	38	8
Oxford	12	10	24	7	6	31	19	0	11	120	24
Penobscot	33	8	66	22	9	125	37	96	17	413	83
Piscataquis	24	3	17	10	19	42	10	2	4	131	26
Sagadahoc	6	2	9	5	3	19	3	0	3	50	10
Somerset	24	2	34	11	8	51	14	28	2	174	35
Waldo	5	4	18	2	0	8	12	6	7	62	12
Washington	18	8	75	110	10	42	19	0	6	288	58
York	16	11	49	29	2	34	26	4	6	177	35
Total	**199**	**98**	**536**	**314**	**78**	**608**	**280**	**169**	**111**	**2,393**	**479**

Source: Maine Forest Service, 2013

Table 2
HISTORY- MAJOR FOREST FIRES

Month of Event	Year	County(ies)	Estimated Costs	Acreage	Declaration
Jun 3-5	1934	Aroostook Lincoln Penobscot Piscataquis Sagadahoc	$300,000		
Oct 23	**1947**	**Cumberland Hancock Oxford York**	**$30,000,000**	**250,000**	
May 3	1951	Cumberland			
Sep 5	1960	Hancock Washington			
Jun	1962	Franklin (Kingfield)			
Sep	1964	Somerset (Jackman)			
Oct	1964	Cumberland (Standish)			
Aug	1965	Washington			
Jul 18	1977	Penobscot Piscataquis (Baxter State Park)		3,500	Federal Aid
Aug 23	1978	Washington (Machias)		10,000	State Aid
May 1	1985	Washington (near Whiting)		1,000	
May 19	1992	Aroostook (Allagash)		1,150	
Jun 18	1992	Piscataquis (Chesuncook Plantation)		862	
Apr 30	1994	Washington (Addison)		515	
Apr 13	1998	Washington (Addison)		657	
May 4	2001	Washington (Addison		495	
May 3	2007	Washington (Centerville TWP)		750	

Updated by Jeff Currier, Maine Forest Service 2010. There have been no major forest fires (over 1,000 acres) since 1992.

Frequency of Occurrence

Historically, forest fires were one of the State's most significant hazards, and Maine averages about 700 low acreage forest fires annually. Today, about 90% of all forest fires are caused by human activity while lightning causes about 10%. During dry periods, fire danger increases rapidly. Profiled in this section is the "1947 Fire," which 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. In July 1977, a forest fire, started by lightning in Baxter Park, burned more than 3,500 acres and seriously threatened the entire park and surrounding developed areas.

Probability of Occurrence

Based on historical records of fires, the Department of Conservation, Maine Forest Service Forest Protection Division anticipates that there will be between 600-700 low acreage fires (from all causes) each year (a low acreage fire is less than 1,000 acres). However, using the last 79 years of fire record in the table above, the probability of a major wildfire is once a decade and these are most 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 his 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 territories of Maine, resulting in fires ranging in size from 1 to 12 acres.

Sources for the above paragraphs: The 2005 Biennial Report on the State of the Forest; comments regarding fires courtesy of Bill Williams, Division Director, Forest Protection Division, Maine Forest Service, Department of Conservation; "Wildfire Loose: The Week Maine Burned," by Joyce Butler, 2010 updates by Jeff Currier, Maine Forest Service.

EROSION/COASTAL EROSION

Highly unstable bluff
Source: Maine Geological Survey

General Definition

The process of the gradual wearing away of land masses. In general, erosion involves the detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes. *Episodic erosion* is induced by a single storm event (From FEMA 55 the Coastal Construction Manual).

Nature of Hazard

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.

Other parts of Maine, however, have a "soft coast" of loose or unconsolidated materials that are subject to erosion. Maine's "soft coast" includes coastal beaches and coastal bluffs that are composed of sediment. 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.

Coastal beach erosion. Beaches, which are part of Maine's "soft coast," only account for about 2% of the State's 3,478 miles of tidal shoreline. Most of the larger beaches are concentrated in York and Cumberland Counties. Beaches are dynamic systems subject to erosion and accretion (building up) throughout the year, but because of the rising sea level, 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.

As ocean levels rise, coastal storm flooding is able to reach farther inland and overtop low-lying dunes more frequently. Net loss of sand to the offshore seafloor may occur as a result of coastal erosion. However, some sand may be preserved in the sand dune system if storm waves wash over the dunes

and carry the sand in a landward direction. In time, the erosion and landward deposition of sand may shift the frontal dune landward, over the back dune environment. In some locations, back dunes may form over adjacent salt or fresh water marshes. If dune areas are open to the flow of flood waters, the dunes can naturally migrate and build upward as sea level rises. Beach and dune 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 beach/dune system.

The Maine Geological Society (MGS) and the University of Maine's Department of Earth Sciences have used Maine Sea Grant and Maine Coastal Program grants since 1999 to monitor beach levels through the State of Maine Beach Profiling Project. In general, this project has documented a decline in beach profiles due to a net loss of beach sand through erosion (Slovinsky and Dickson, 2007). Not all beaches are eroding. Profiled beaches (from north to south) include:

- Willard (South Portland)
- Higgins (Scarborough)
- Scarborough (Scarborough)
- Western/Ferry (Scarborough)
- East Grand (Scarborough)
- Kinney Shores (Saco)
- Ferry Beach (Saco)
- Biddeford Pool/Fortune's Rocks (Biddeford)
- Goochs (Kennebunk)
- Laudholm (Wells)
- Drakes Island (Wells)
- Wells (Wells)
- Ogunquit (Ogunquit)
- Long Sands (York)

In April of 2013, the Army Corps of Engineers released a draft study aimed at mitigating erosion along Camp Ellis Beach. The study calls for the construction of a 750-foot long spur jetty that would be attached to the existing north jetty, the placement of about 365,000 cubic yards of sand on Camp Ellis Beach and beach nourishment about every 12 years.

Erosion of Coastal Bluffs. Coastal bluffs are also part of Maine's "soft coast." A bluff is 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. 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.

Roughly half the coast of Maine consists of coastal bluffs. Those that are less than 20 feet in height are subject to coastal erosion. 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. It becomes a hazard when it threatens something of value, such as a building near the edge of the bluff.

Coastal bluffs erode episodically. 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. 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.

The risk of coastal bluff erosion is described on Maine Geological Survey's Coastal Bluffs Maps which cover about 75% of the coast. Coastal bluff faces 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.

MGS's 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).

Location of Hazard

Coastal beach erosion is occurring in widely scattered locations, primarily on the State's larger beaches and sand dune systems located in York, Cumberland and Sagadahoc Counties.

Bluff erosion is occurring throughout the coast on highly unstable and unstable bluffs less than 20 feet in height.

Previous Occurrences

According to the Maine Geological Survey, during the past century, 30-40 buildings have been destroyed by beach erosion in Maine:

- A minimum of 22 houses have been lost at Camp Ellis in Saco and 33 lots are now in the ocean.
- At least 10 buildings, including a hotel, were lost at Popham Beach in Phippsburg. 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.

In the last 20 years, five houses in Saco were completely destroyed by erosion. Many others were damaged.

Frequency of Occurrence

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.

Probability of Occurrence

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.

Sources for the above paragraphs: Documents on the Maine Geological Survey Website, and MGS staff Stephen M. Dickson, Ph.D, State Marine Geologist, and Michael Foley, Geologist.

Issues and Challenges

The following is a partial list of some of the erosion issues and challenges facing Maine.

1. **Discontinuation of the beach profiling program.** The beach profiling program has been a cost-effective way to gather detailed information on changes in beach profiles every month. A grant program paid for a coordinator who guided the work of volunteers. Grant funds have now run out, so it is possible that without additional funding, the program will be discontinued.

2. **Maine's commitment to coastal geology is small.** 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.

3. **No user-friendly program for mitigating erosion.** Erosion problems that threaten or damage structures are widely scattered throughout the State and are not concentrated in a single political jurisdiction. While the Natural Resources Conservation Service provides some stabilization assistance, there really is no user-friendly program to comprehensively address the issue, or to provide assistance to homeowners who cannot afford to pay to "armor" their property.

4. **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.

5. **Increasing mitigation need.** As sea level continues to rise, and perhaps even accelerate, erosion will continue along the waterfront. Mitigation, including relocation of structures, infrastructure and environmentally sound coastal engineering, will be increasingly important in the coastal zone.

LANDSLIDES

Source: Maine Geological Survey Landslide Maps

General Definition

The rapid movement of earth materials down-slope under the force of gravity.

Nature of Hazard

Coastal Landslides. Coastal landslides are triggered by chronic bluff erosion in areas with mud banks that exceed 20 feet in height. In contrast to the erosion that occurs on the face of a bluff less than 20 feet in height, a coastal landslide is the result of the internal instability of sediment bluffs and their potential to rapidly move large amount of land down-slope under the influence of gravity.

There are a number of factors influencing landslide risk:

Bluff Characteristics

- **Height.** The risk of a landslide increases when mud bluffs have a height of 20 feet or more. In general, the higher the exposed bluff face, the greater the risk of a landslide.
- **Sediment type.** Clay and silt (muddy) sediment is the most unstable material that can make up a bluff. Landslides can occur in course-grained bluffs, although they are less frequent than muddy landslides along the Maine coast.
- **Slope.** Coastal bluffs have a relatively steep ocean-facing slope. In general, the steeper the slope, the easier it is for gravity to initiate a landslide.

Natural Conditions

- **Waves, tide and sea level.** A gradual, but ongoing rise in sea level at a rate of about six inches per decade is causing chronic erosion along the base of many bluffs. As sea level rises, wave action and coastal flooding can reach higher and farther inland and scour more sediment from a bluff.
- **Surface water.** Water that runs over the face of a bluff can wash sediment to the sea, increase the bluff face slope, and weaken the remaining sediment holding up the bluff face.

- **Ground water.** Seeps and springs on the bluff face contribute to surface water flow and destabilize the bluff face. In addition, a high water table can saturate and weaken muddy sediment and make the ground more prone to slope failure.
- **Weathering.** The seasonal cycle of freezing and thawing of the bluff face can lead to slumping after a thaw.
- **Earthquakes.** Landslides can be triggered by earthquakes.

Human Activity

- **Land use.** Actions that increase surface water flow to a bluff face add to natural processes that destabilize the bluff face. These actions include watering lawns or grading slopes, placing walkways down the face of a bluff, and sending water to a bluff face by means of roofs, driveways, paths, pipes, culverts, surface drains and septic systems.
- **Vegetation.** Clearing vegetation from the bluff face can lead to greater bluff erosion and a steeper bluff that is subject to a landslide.
- **Weight.** Adding weight to the top of a bluff (buildings, landscaping, fill) can increase the risk of a landslide.

The life cycle of a landslide is related to sea level rise. This rise allows waves to erode beaches and flats at the base of coastal bluffs. Over time, erosion removes material from the base of a costal bluff and steepens the face of it. Sediments at the base of the bluff stabilize it, so when they are removed, the bluff is no longer in equilibrium. Only the strength of the material within the bluff holds the bluff in place. Continued erosion or lubrication of the bluff materials by ground water may overcome this internal resistance, particularly in clay bluffs, and result in a landslide. A landslide restores the equilibrium of the bluff, and the slumped material at the foot of the bluff supports a new bluff face with a more gentle profile. Erosion, however, is a continuing process because the level of the sea is rising, and coastal waves and currents immediately begin to remove the edges of the displaced sediment. Eventually, erosion destroys the equilibrium of the bluff and leads to another landslide.

The Maine Geological Survey's Coastal Landslides Hazards Maps show known landslide sites, landslide risk areas, potential landslide areas, low coastal bluffs (less than 20 feet in height) and non-bluff shoreline areas.

Inland Landslides. Inland landslides can occur in almost any area of the State. Based on a landslide susceptibility analysis performed in four Maine communities (Wells, Cumberland, Greenbush and Bangor), there are a number of risk factors that are statistically significant in causing landslides and slope failure:

Geological factors: surficial geology including glacial marine deposits (marine clay of the Presumpscot Formation) and Holocene alluvial deposits; and

Topographic/geomorphic factors:

- Slope aspect - areas with a south-facing slope;
- Slope curvature - areas with concave surface topography;
- Slope height/local relief - areas with local relief greater than 20 feet.

The Maine Geological Survey has completed landslide susceptibility maps for the four above-mentioned communities as well as the towns or portions of towns in York County and Cumberland Counties that are underlain by the marine clay of the Presumpscot Formation.

Location of Hazard

Coastal landslides are occurring on landslide-prone bluffs in excess of 20 feet in height throughout the coast. Landslides occur in widely scattered locations. The Maine Geological Survey has just completed an update to its inventory of occurrences of landslides in Maine. Though it may not contain all small landslides and slope failures that have occurred in Maine, the data is comprehensive enough to provide statistically significant data to help produce the landslide susceptibility maps. The data is extremely important in helping determine areas of risk because of two basic principles of landslide risk:

1. It is likely that landslides will occur where they have occurred in the past; and
2. Landslides are likely to occur in similar geological, geomorphological, and hydrological conditions as they have in the past.

Previous Occurrences

There is no known comprehensive history of landslides in Maine, in part because landslides have affected individual properties, not entire communities. However, the Maine Geological Survey has compiled information on a number of occurrences.

- There was a significant landslide in Gorham in 1983.
- In 1996, a clay bluff on the north shore of Rockland Harbor failed in just a few hours, leading to the destruction of two homes and the formation of a new scarp about 200 feet landward of the original top of the bluff.
- Individual homes have been damaged or threatened by landslides that occurred in Wells in 2005, Cumberland in 2006 and Sanford in 2006.
- A landslide along the banks of the Penobscot River in Greenbush in 2006 led to the failure of Route 2.
- The patriot's Day storm of 2007 caused a major landslide in Brunswick where a house was condemned, and roads in western Maine were damaged and closed by landslides.
- In July of 2009, a landslide occurred on the banks of the Sandy River along a sharp bend on an unpaved section of the Sandy River Road in Norridgewock.
- In May of 2010, a landslide occurred on the banks of the Sandy River in Chesterville, destroying a portion of the George Thomas Road and threatening access to two residential properties. With an HMGP grant, the town completed a by-pass in 2012.
- In 2011, erosion accelerated on the banks of the Sandy River in Farmington. Despite emergency measures, the erosion is threatening Whittier Road which carries close to a 1000 vehicles per day. As of this writing, the town has ordered barriers to close the road while pursuing an HMGP grant to stabilize the bank.

Frequency of Occurrence

There have been no studies to document the frequency of landslides, but based on MGS' mapping of known landslide locations, they are fairly common.

Probability of Occurrence

Maine's experience with landslides, coupled with the continual rise in the level of the sea, indicate that there is a high probability that landslides will continue to occur on an annual basis in various locations along the Maine coast.

Sources for the above paragraphs: Documents on the Maine Geological Survey website, and MGS staff Stephen M. Dickson, Ph.D, State Marine Geologist, and Michael Foley, Geologist.

Issues and Challenges

The following is a partial list of some of the landslide issues and challenges facing Maine.

1. **Maine's commitment to coastal geology is small.** 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.

2. **No user-friendly program for mitigating landslides.** Landslide problems that threaten or damage structures are widely scattered throughout the State and are not concentrated in a single political jurisdiction. While the Natural Resources Conservation Service provides some stabilization assistance, there really is no user-friendly program to comprehensively address the issue, or to provide assistance to homeowners who cannot afford to pay to "armor" their property.

3. **Limited insurance for geological risks.** It may be extremely difficult or prohibitively expensive for individuals to purchase landslide insurance for their properties. As such, many of the landslide hazards represent uninsurable risks.

4. **Increasing mitigation need.** As sea level continues to rise, and perhaps even accelerate, coastal landslides will continue along the waterfront. Mitigation, including relocation of structures, infrastructure and environmentally sound coastal engineering, will be increasingly important and increasingly expensive in the coastal zone.

SUMMER STORM

MEMA photo archives – toppix 52901

General Definition

A violent weather phenomenon producing winds, heavy rains, lightning, and hail that can cause injuries, and destruction of property, crops, and livestock.

Types of Summer Weather Events

Hurricane. An intense tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach seventy-four miles per hour or more and blow in a large spiral around a relatively calm center called the “eye” (see separate Hurricane section).

Lightning. An electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, lightning appears as a ”bolt.” This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning reaches a temperature approaching 50,000 degrees Fahrenheit in a split second. The rapid heating and cooling causes thunder.

Thunderstorm. A 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.

Tornado. A violently rotating column of air extending downward from a thunderstorm to the ground. The distinctive slender, funnel shaped cloud, with wind velocities of up to 300 miles per hour at the central core, destroys everything along its narrow ground path.

The Fujita Tornado Scale (abbreviated)

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

Nature of Hazard

In the summer, southwest to southerly winds may become quite 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 summer months. When severe summer storms arrive in the State, high winds can fell trees and branches onto power lines, causing power and communication outages. Heavy rains that often accompany thunderstorms can result in flash flooding or erosion. 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.

The impact of summer storms in Maine is usually restricted to flooding caused by the copious amounts of moisture these storms can carry. Interestingly, the interaction of extratropical storms *and* hurricanes can produce events of a significant magnitude such as the floods of October 1996 and, in particular, the All Hallows Eve or "The Perfect Storm" of October 1991. The latter storm produced tremendous coastal damage in Southern Maine from several days of excessive waves and tidal levels.

Location of Hazard

The entire State is vulnerable to one or more severe summer storms each year, usually in the form of thunderstorms. Fortunately, the effects are usually 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.

Previous Occurrences

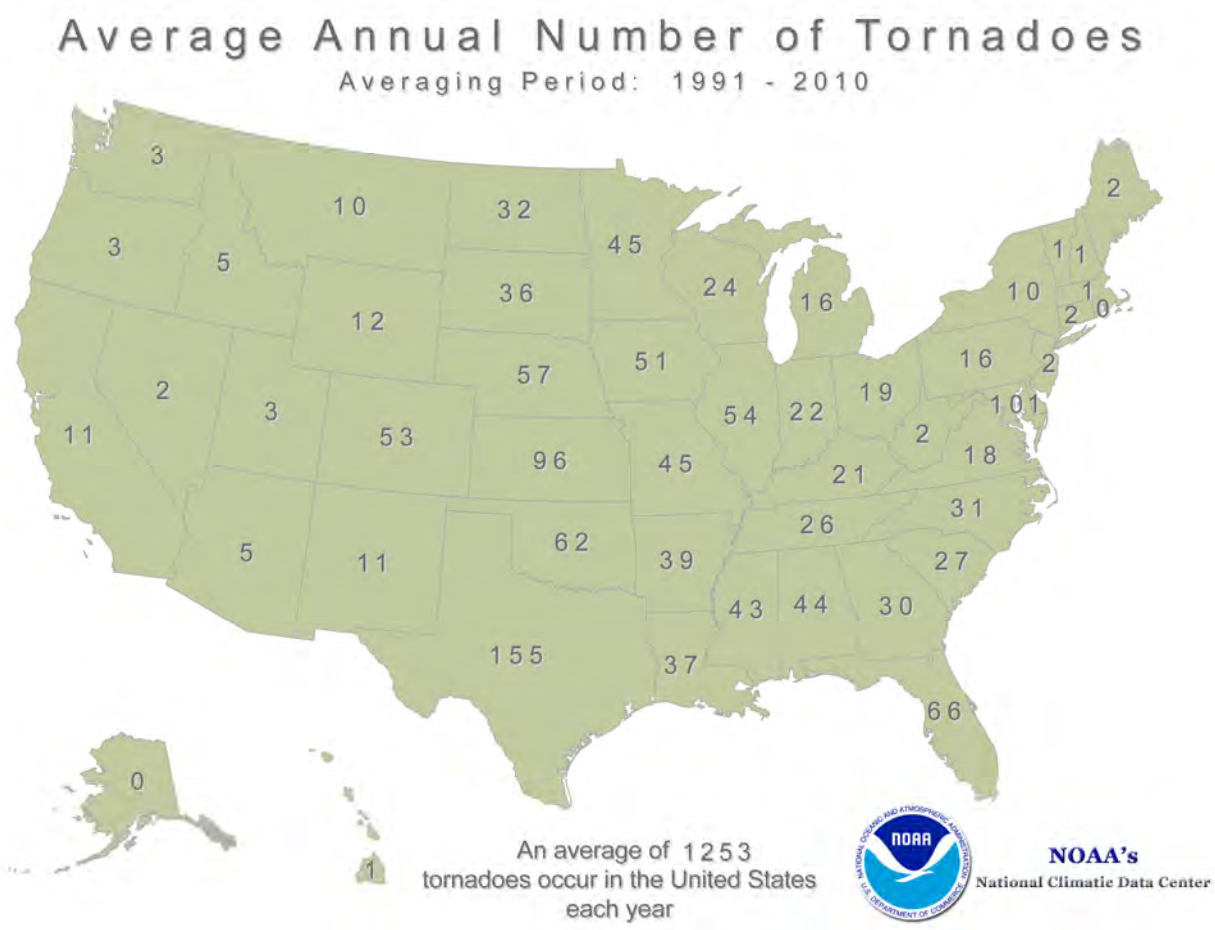
Unlike the other hazards, "summer storms" do not have a table of occurrence since the most severe form, hurricanes, has already been profiled in its own section (see Hurricane). However, since tornados in Maine have been documented on the NOAA website, a table of occurrence is shown below. Because there have been no F3 or greater tornados reported, only the worst occurrences, F2s, are captured there. When the history of occurrences in Maine is considered, there have been 20 F2 tornados over a 63 year period, which averages 0.317 per year. The NOAA map on the next page shows that Maine has averaged 2 tornados a year between 1991 and 2010.

F2 Tornados in Maine
1950 - 2013

Tornado (F2+)	Year	AN	AK	CD	FN	HK	KC	KX	LN	OD	PT	PS	SC	ST	WO	WS	YK	Total Counties
07 Jul	1954														X			1
11 Aug	1954		X															1
16 Sep	1957		X															1
15 Aug	1958		X															1
16 Aug	1959										X							1
04 Sep	1961													X				1
15 Sep	1961															X		1
20 Aug	1962													X				1
14 May	1963																X	1
10 Oct	1966																X	1
30 Jun	1971										X							1
31 Jul	1971	XX					X											2
07Nov	1971										X X			X				2
08 Jul	1996						X											1
09 Aug	2000													X				1
Summer	2011		X															1
Total Tornados		**2**	**3**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**4**	**0**	**0**	**4**	**1**	**1**	**2**	

Table developed by MEMA using NOAA website information – 2013

F2 or greater tornado occurrences per county resulting from heavy thunderstorms
1953 –2013
4 – PT, ST
4 - AK
2 – AN, KC, YK
1 – WO, WS
0 - CD
0 - FN
0 - HK
0 - KX
0 - LN
0 - OD
0 - PS
0 - SC



Source: NOAA website

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 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.

Probability of Occurrence

Summer Storm. Based on past experience~~s~~, and the frequency of National Weather Service Warnings, ~~the~~ there is a high probability that the state can expect thunder and lightning every year, especially in the summer months.

F2-5 Tornado. While the state has not done probability studies, historically, the probability of an F2-5 tornado is low and will not be considered further in the Plan.

DROUGHT

General Definition

A prolonged period without rain: A twelve month period during which precipitation is less than 85% of normal as defined by the National Weather Service (44 inches is the average precipitation level per year in Maine).

Nature of Hazard

Although Maine is considered a "wet" state with its generous rainfall and abundant wetlands and lakes, drought conditions do occur just about every decade. Some of the most severe droughts have occurred in the late 1940s, mid-1960s and the recent 2001-2003 period. In late summer and early fall, drought conditions can lead to very high forest fire threat. Forest and brush fire hazards are even more 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.

For the State's agricultural economy, drought is the number one risk factor. Maine agriculture is the basis of over 1.2 billion dollars of food and fiber products annually. It employs 22,000 workers statewide, preserves a lifestyle for over 5,500 Maine families, and provides stewardship of over 1.5 million acres of land and wildlife habitat. When root systems of crops and trees wither, erosion can become a secondary problem.

Since approximately 510,000 people (45% of the state's population) rely on dug or shallow wells, any prolonged drought period increases the risk of dry wells. About 760,000 (55% of the population) rely on 2,200 public water systems which can also be adversely affected when water tables are lowered.

The driest months in Maine have had precipitation amounts below one inch. Such was the recorded 0.56 inches in August of 2002 in Caribou, in Aroostook County. That month was the driest August on record for the State. The driest year on record (2001) was the 29.5 inches on average. This was almost 2 inches less than the previous record year of 1965. Two of the greatest impacts found in drought years are the increased threats of wildfire and wells that go dry due to the lowered ground water levels.

Location of Hazard

Since Maine is 90% forested, drought years tend to affect the whole state.

Previous Occurrences

The following is a summary of the cyclical drought periods that have occurred in Maine.

Drought Table

Month of Event	Year	County (ies)	Damages	Declaration
	1911	Statewide (16)		
	1941	Statewide		
	1947-51	**Statewide**	**Widespread fires**	
	1952	Statewide	Crop Damage	
	1957	Statewide	Crop Damage	
	1960	Aroostook	Crop Damage	
	1963	Statewide		
	1964	Coastal		
	1965	Statewide		
	1974	Statewide		
Aug	1978	Statewide		
	1981	Statewide		
Sep	1993	Statewide		
May - Dec	1995	Statewide		Secretarial Disaster Declaration
	1999		Blueberry Crop	
	2001-2003	Statewide **-2001** driest year **-2002** driest August	$32,000,000 crop damage and market losses	

The U.S. Geological Survey has identified the following drought periods in Maine:

1938-43 1947-50 1955-57 1963-69 1984-1988 2000-2003

Emergency Declaration. The Palmer Drought Index is used for activating the Drought Emergency Plan. The Drought Severity Index (Palmer 1965) was developed to measure the departure of the moisture supply at specific locations. The index is based on the supply-and-demand concept of the water balance equation, taking into account precipitation and temperature data, as well as the local Available Water Content (AWC) of the soil. The objective of the Palmer Drought Index is to provide measurements of moisture conditions that were standardized so that comparisons using the index could be made between locations and between months. The index is a composite of evapotranspiration, recharge, runoff loss and precipitation.

The Drought Emergency Plan is basically a set of water conservation measures. The River Advisory Committee becomes the Drought Task Force and works through its member State agencies to notify the public. The Plan is activated at -2.00 (moderate drought) on the Palmer Drought Index. At -3.00 (severe) the MEMA/Drought Task Force recommends that the Governor issue an Emergency Proclamation**.**

Drought of Record. As indicated at the end of the Drought Table, Maine's 2000-2003 drought period has been the most damaging to date. According to a recent study by the Department and the Soil and Water Conservation Districts, Maine farmers lost over $32 million dollars due to the drought. Hardest hit counties were Aroostook and Washington where potatoes and blueberries are the primary crops.

Frequency of Occurrence

As indicated in the preceding drought table, drought periods occur on a cyclical basis in Maine.

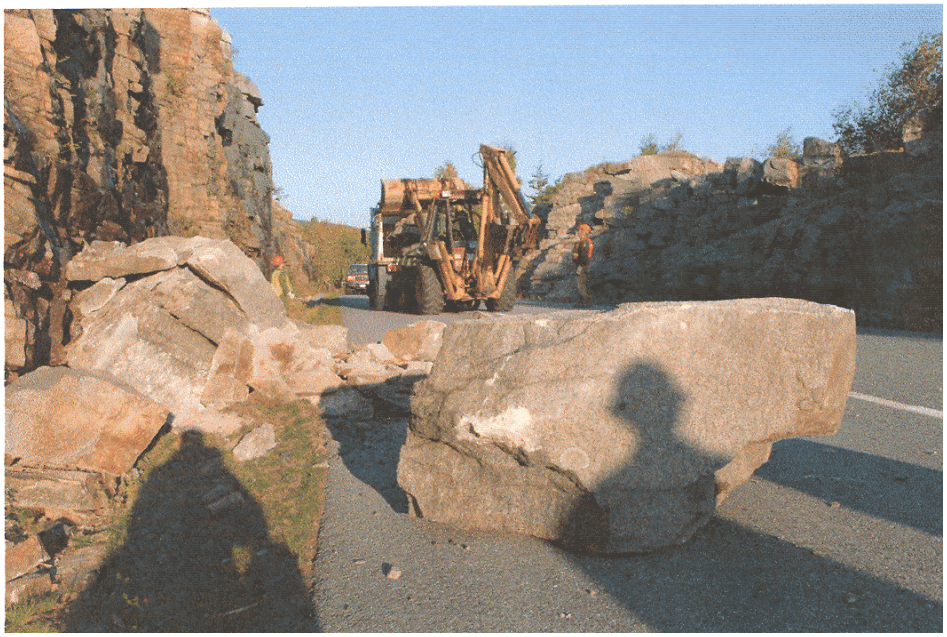
Probability of Occurrence

Based on over 100 years of record keeping and the cyclical nature of drought, there is a moderate risk that the state can expect such conditions about every decade.

Sources for above paragraphs

Dave Struble, Maine Department of Conservation; letter of March 25, 1996 to Governor King from Dan Glickman, Secretary, Department of Agriculture, Washington, D.C; Growing Agriculture, Sustainable Agriculture Water Source and Use Policy and Action Plan, Maine Agricultural Water Management Advisory Committee, March, 2003; U.S. Army Corps of Engineers, New England Division, The National Study of Water Management During Drought.

EARTHQUAKE



Rock slide on Loop Road, Acadia National Park, caused by minor earthquake, 2007

General Definition

A sudden motion or trembling that is 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.

Nature of Hazard (Based on Maine Geological Survey documents)

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.

Most Maine earthquakes are of small magnitude (less than 2.0 on the Richter scale), too small to feel. No Maine earthquake has caused significant damage. The persistent activity, however, indicates that some crystal 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. 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 results from people being struck or trapped by falling debris.

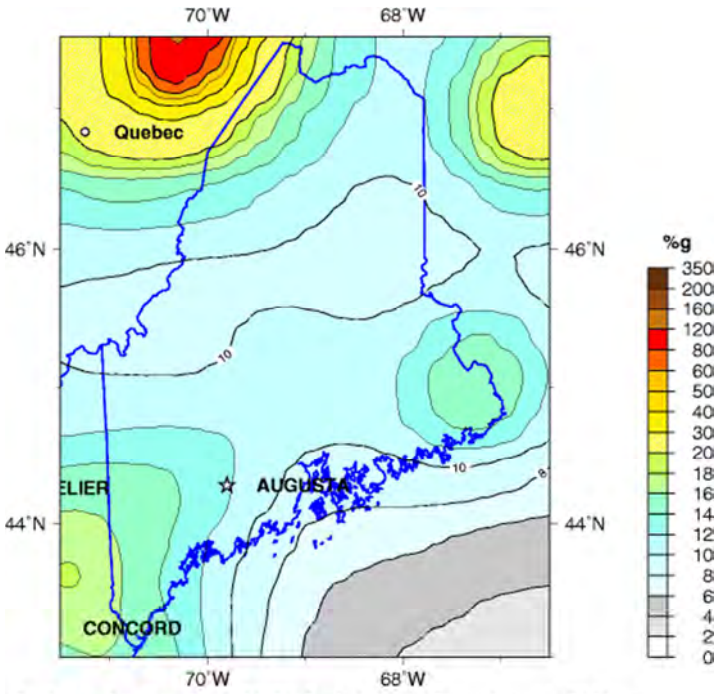
Other possible concerns in an earthquake emergency would be the disruption of infrastructure facilities, such as road access, gas and oil pipelines, sewer systems, electricity and water supplies, and the disruption of emergency services such as police, firefighting, ambulance, and hospital services.

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.

Location of Hazard

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 the map below, the three areas of most seismic activity in Maine are in: northwestern Aroostook, Eastport in Washington County and York County. Of the three, there is virtually no population in Northwestern Aroostook, and Eastport has a population of 1,640 people. York County, with a population of ~~186,742,~~ 197,131, profiled this hazard in their local Plan.

SEISMIC Hazard Map of Maine



Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary
National Seismic Hazard Mapping Project (2008)

Source: http://neic.usgs.gov/neis/states/maine/hazards.html

Previous Occurrences

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.

The largest earthquake recorded in Maine between 1747 and 1992 was near Eastport in 1904. The largest accurate measurement was in 1973 just on the Quebec side of the border from Oxford County (magnitude 4.8). 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.

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	2512

Historic Record. 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.

MAINE EARTHQUAKES WITH INTENSITY VI OR GREATER			
Date	Place (County)	Intensity	Magnitude
1857	Lewiston (Androscoggin)	VI	5.0 – 5.9
1869	Passamaquoddy Bay (Washington)	VI	5.0 – 5.9
1904	*Eastport (Washington) – ME's largest earthquake*	*VII*	*5.0 – 5.9*
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
1928	Milo (Piscataquis)	VI	5.0 – 5.9
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

Modern Record. The following is a summary of significant earthquakes with a magnitude of 3.4 from the modern record (since 1975). Data are from the New England Seismic Network operated jointly by Weston Observatory of Boston College and MIT, Massachusetts.

Summary of Earthquakes with a Magnitude 3.0 or more in Maine since 1979			
Date	**Place**	**Magnitude**	**Intensity**
4/17/79	Bath	4.0	V
5/29/83	Dixfield	3.9	V
1/19/84	Machias	3.8	IV
12/28/88	Albion	4.0	IV
9/15/94	Springfield	3.9	IV
4/29/97	Near Wilton	3.0	
2/25/99	Approximately 7 miles SE of Waterville	3.7	
12/24/99	Newport-Etna area	3.0	
1/3/00	Turner-Livermore area	3.4	
1/17/00	Approximately 10 miles N of Rumford	3.4	
9/7/00	Approximately 15 miles SE of Waterville	3.2	
10/24/01	Approximately 2 miles S of Howland	3.3	
9/25/05	8 miles NW of Pembroke	3.5	
7/14/06	15 miles NW of Portage, Aroostook Co	3.8	
9/22/06	E of Cadillac Mountain, Mount Desert Island	3.4	
10/2/06	E of Cadillac Mountain, Mount Desert Island	4.2	
12/20/06	E of Cadillac Mountain, Mount Desert Island	3.1	
3/30/10	Near Orrington-Bucksport line, about 7 miles N of Bucksport	3.0	
2011	"Swarms" of minor earthquakes at MDI	Less than 2.5	
10/16/12	E Waterboro, about 13 miles NW of Saco	4.5	

Source: Maine Geological Survey

Summary of Earthquakes in the Area Surrounding Maine				
Date	**Place**	**Magnitude**	**Intensity**	**Comments**
1755	Cape Ann, Massachusetts	6.0?	VIII	Toppled chimneys in Boston
1925	La Malbaie, Quebec	6.4 -6.6?	IX	90 miles from Quebec City. Damaged some types of stone and brick walls over 100 mile away
1935	Temiscaming, Quebec	6.2	VII	
1940	Ossipee, NH (2 events)	5.5, 5.5	VII	Some chimneys in Augusta cracked
1982	Miramichi, N.B.	5.7	VII	Felt across Maine
1988	Chicoutimi, Quebec	6.0	VIII	Felt in New York City. Largest in Eastern North America since 1935.
1997	Quebec City	5.1	VII	Felt across Maine
4/20/02	Near Plattsburgh, N.Y.	5.3		
3/6/05	Northeast of Quebec City	5.4		Felt widely across Maine

Source: Maine Geological Survey
NOTE: the earthquake in Virginia in 2011 that damaged structures in DC, including the National Monument certainly heightened awareness of east coast earthquake possibilities.

Earthquake of Record. 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.

Probability of Occurrence

Based on 119 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 earthquake 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.

Sources for the above paragraphs: Henry Berry, Physical Geologist, Maine Geological Survey.

Assessing Vulnerability by Jurisdiction (County)	
Requirement §201.4(c)(2)(ii).[The risk assessment shall include] an overview and analysis of the State's vulnerability to the hazards described in this paragraph (c)(2), based on estimates provided in local risk assessments as well as the State risk assessment. The State shall describe vulnerability in terms of the jurisdictions most threatened by the identified hazards, and most vulnerable to damage and loss associated with hazard events. State owned critical or operated facilities located in the identified hazard areas shall also be addressed.	
Requirement §201.4(d). (The) plan must be reviewed and revised to reflect changes in development.	
Element	*A. Does the new or updated plan describe the State's vulnerability based on estimates provided in local risk assessments as well as the State risk assessment?*
	B. Does the new or updated plan describe the State's vulnerability in terms of the jurisdictions most threatened and most vulnerable to damage and loss associated with hazard events?
	C. Does the updated plan explain the process used to analyze the information from the local risk assessments, as necessary?
	D. Does the updated plan reflect changes in development for jurisdictions in hazard prone areas?

A. Description of State's Vulnerability based on Local and State Assessments

Since the Mitigation Act of 2000 required every jurisdiction to have a hazard mitigation plan and due to the number of and size of most Maine municipalities, it was decided to define a jurisdiction in terms of a Maine county. Although county government in Maine is very small, 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 were offered FEMA Pre-Disaster Mitigation funds in order to develop and complete their hazard identification, risk assessment, and mitigation strategy and to publish a County Hazard Mitigation Plan.

The Emergency Management Agency in each county was used to host and facilitate a County Hazard Mitigation Planning Team. These teams used a variety of methods to identify and profile the hazards that their counties could experience. One method used by several counties and the State included a multi-criteria spreadsheet that multiplied severity values by occurrence values to determine a priority rating of the hazards. This method is demonstrated in this section of the State Hazard Mitigation Plan. Another method of hazard identification, which several other counties used, was using the existing Maine Emergency Management Agency "Hazard Assessment Workbook" which identifies which hazards are likely to occur with a certain level of severity. It does not prioritize the hazards.

B. Jurisdictions Most Threatened and Vulnerable to Damages from Hazards

Based on the 2011-2012 County Hazard Mitigation Plan Updates, the following table identifies the jurisdictions that are most threatened by various hazards, as determined by the hazard rating methodologies described above. These are also the hazards that were profiled in each of the county plans.

Jurisdictions most Threatened by Hazards						
County	**Flood**	**Winter Storm**	**Hurricane**	**Wild Fire**	**Summer Storm**	**Landslide**
Androscoggin	X	X		X	X	
Aroostook	X	X		X	X	
Cumberland	X	X		X	X	
Franklin	X	X		X		X
Hancock	X	X		X	X	
Kennebec	X	X		X	X	X
Knox	X	X		X	X	
Lincoln	X	X	X	X		
Oxford	X	X		X	X	X
Penobscot	X	X		X		
Piscataquis	X	X		X	X	
Sagadahoc	X	X		X	X	
Somerset	X	X		X	X	
Waldo	X	X	X			
Washington	X	X	X	X		
York	X	X	X	X		

For a more detailed discussion of specific jurisdictions that are most vulnerable to specific hazards, see pages 3-20 through 3-21, 3-34, 3-35 through 3-39, and page 3-88 (the jurisdictions with the highest potential damages are the ones with the most risk). For a detailed list of participating jurisdictions in the County Plans whose hazard vulnerabilities have been reviewed by the state, see Appendix B.

C. Process Used to Analyze Information from County Risk Assessments

In the preparation of this Plan, all of the county 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, Winter Storms 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, as shown on page 3-88, (the jurisdictions with the highest potential damages are the ones with the most risk).

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.

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.

Winter storms. In all Maine counties, winter storms 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 more often. Conversely, the more northern 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 not profiled in any county plan, it has become clear through this planning effort that coastal erosion and landslides along the coast and in some interior locations, are a serious 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. The challenge for Maine will be to raise awareness of this ongoing and growing threat.

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.

Summer storms. Severe summer storms, in the form of thunderstorms, microburst, 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.

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.

D. Changes in Development for Jurisdictions in Hazard Prone Areas

All of the county plans used 2010 Census data in the preparation of their risk assessments. The latest Census data show that Maine as a whole grew by 4.2% between 2000 and 2010. 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 26,451 people, or 49% of the State's total growth during that period. Growth pressures along the coastal areas of both 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 in those two counties (and elsewhere) probably hasn't resulted in much of an increase in hazard potential because shoreland zoning setbacks and floodplain management ordinance elevation requirements do a great deal to mitigate risk in those areas.

Change in County Population 2000 - 2010				
County	**2000 Population**	**2010 Population**	**Change 2000-2010**	
			#	**%**
Androscoggin	103,793	107,702	3,909	3.8
Aroostook	73,938	71,870	-2,068	-2.8
Cumberland	265,612	281,674	16,062	6.0
Franklin	29,467	30,768	1,301	4.4
Hancock	51,791	54,418	2,627	5.1
Kennebec	117,114	122,151	5,037	4.3
Knox	39,618	39,736	118	0.3
Lincoln	33,616	34,457	841	2.5
Oxford	54,755	57,833	3,078	5.6
Penobscot	144,919	153,923	9,004	6.2
Piscataquis	17,235	17,535	300	1.7
Sagadahoc	35,214	35,293	79	0.2
Somerset	50,888	52,228	1,340	2.6
Waldo	36,280	38,786	2,506	6.9
Washington	33,941	32,856	-1,085	-3.2
York	186,742	197,131	10,389	5.6
Maine - Total	**1,274,923**	**1,328,361**	**53,438**	**4.2**

*Source: 2000 and 2010 U.S. Census

Assessing Vulnerability of State Facilities	
Element	*A. Does the new or updated plan describe the types of State owned or operated facilities located in the identified hazard areas?*

The Maine Emergency Management Agency hosted and facilitated a State Hazard Mitigation Planning Team. The State Mitigation Planner used a multi-criteria spreadsheet that multiplied severity values by occurrence values to determine a priority rating of the hazards in order to identify and profile the hazards that the State could experience. The Mitigation Team members provided information in the form of e-mail messages and attachments, phone calls, and person-to-person visits to provide the data necessary to calculate the severity and occurrence values. The hazards identified for profiling in the State plan include flooding, winter storms, hurricanes, erosion/landslides, wildfires, blight & infestation, summer storms, drought and earthquakes.

The State Hazard Mitigation Plan Risk Assessment was accomplished independently of the county risk assessments, yet in both the State and county assessments, flooding, winter storms and wildfires are considered the highest priority hazards for nearly all areas of Maine. The State also assessed hurricanes as a top priority. However, the most damaging effects of hurricanes in Maine flooding which is already identified as the top hazard.

All of the hazards identified, except flooding and wildfires, can happen at any and all locations within the State of Maine. Therefore, it is not possible to select only those facilities located in these unquantifiable hazard areas. It is not possible to cause structural damage from the hazards of blight & infestation and drought, and it is generally unlikely in Maine to have structural damage caused by winter storms, hurricanes, summer storms, and earthquakes. A remote chance exists for such things as a lightning strike causing a building fire or a wind-damaged tree to fall on a certain building, but these are impossible to determine or map in advance. Finally, there is no data available in Maine to map the wildland-urban interface, using geographic information systems (GIS), and therefore it is not possible to specifically identify state structures located in this ambiguous interface area.

Flooding is the only hazard that has been modeled as a quantifiable area. The Maine Department of Administration and Financial Services provided a spreadsheet containing location data on all state-owned and operated facilities. With this information, the Northeast States Emergency Consortium (NESEC) 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 FIRM data in GIS format and so this also makes it very difficult to determine what State facilities are located in flood zones in those areas.

From this analysis, it was determined that no State facilities that would be used during an emergency or disaster for response or recovery are located in the flood zone. There were two facilities valued over a million dollars which are potentially located within the flood zone. Both of these facilities (a classroom/shop and an administration building) are located at the Port Authority in the City of Eastport in Washington County. The next two most expensive State facilities on this list of potential flood zone facilities are also located at the Port Authority in Eastport.

Critical Infrastructure and Key Resources (CIKR) have been identified throughout the State of Maine in accordance with the sectors found at the following link: http://www.dhs.gov/critical-infrastructure-sectors. 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).
For a discussion of the risk and damages from hazards other than flooding to other state owned or operated facilities, see pages 90-91.

Estimating Potential Losses
Requirement §201.4(c)(2)(iii). [The State risk assessment shall include an] overview and analysis of potential losses to identified vulnerable structures, based on estimates provided in local risk assessments as well as the State risk assessment. The State shall estimate the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities located in the identified hazard areas.
Requirement§201.4(d). (The) Plan must be reviewed and revised to reflect changes in development

Estimating Potential Losses by Jurisdiction	
Element	*A. Does the new or updated plan present an overview and analysis of the potential losses to the identified vulnerable structures?*
	B. Are the potential losses based on estimates provided in local risk assessments as well as the State risk assessment?
	C. Does the updated plan reflect the effects of changes in development on loss estimates?

A. Overview and Analysis of Potential Losses to Identified Vulnerable Structures

This section will incorporate the findings of the county hazard mitigation plans to provide an overview of the total loss estimates for the State. This review will describe the distribution of losses across the State, with specific reference to quantifying losses to local critical facilities.

The following table represents the estimated losses to critical facilities, roads, bridges, utilities and homes by county. The estimates were taken from the submitted local County hazard mitigation plans. Several counties did not provide estimates for one or more of the hazards identified in their hazard mitigation plans, as noted in the table below.

B. Potential Losses Identified in Local Risk Assessments

Potential Losses Identified in County Hazard Mitigation Plans						
County	**Flooding**	**Winter Storm[2]**	**Hurricane[3]**	**Wildfire[1]**	**Summer Storm[4]**	**Landslide[5]**
Androscoggin	$450,883,125					
Aroostook	$8,419,863	$36,997,761*		$371,591,056	$36,997,761*	
Cumberland	$10,752,244	$100,161,236*		$3,960,793,305	$100,161,236*	
Franklin	$5,175,848	$1,689,640		$15,234,000		
Hancock	$1,153,685	$2,659,136		$334,996	$1,020,531	
Kennebec	$19,040,134	$7,363,700		$60,547,938		
Knox	$6,536,500	$63,980,000		$4,000,000	$77,078,000	$1,180,390
Lincoln	$1,886,121	$1,661,119	$6,723,200	$17,379,472		
Oxford	$406,000	$611,274,375*			$611,274,375*	
Penobscot	$2,681,926	$6,516,404		$4,659,369,315		
Piscataquis	$3,134,015	$31,683,491*		$549,278,256	$31,683,491*	
Sagadahoc	$795,865	$1,731,275		$17,505,328	$7,164,479	
Somerset	$13,936,091	$2,528,996		$25,905,088	$2,245,804	
Waldo	$11,120,000	$7,198,400	$18,318,400			
Washington	$54,219,265	$1,856,732	$6,669,768	$16,296,576		
York	$25,000,000	$900,000				
Total	**$615,140,682**	**$98,085,402**	**$31,711,368**	**$9,698,235,330[1]**	**$835,942,186**	**$1,180,390**

Source: County Hazard Mitigation Plans

Note:
*Combined figure for winter and summer storms because effects would be similar (downed power lines, debris, erosion, flooding)
[1]**Wildfire**, while very low probability due to type of climate (abundant precipitation), could have high impact if it occurred. This would be due to the loss of homes and buildings which have a very high value. See wildlife profile, pages 3-53 through 3-60 for specific jurisdictions subject to wildfires. Wildfires occur in scattered locations, but are generally more frequent in more populated areas.
[2]The actual **winter storm** risk on a year-to-year basis is highly variable. Most of the damages are confined to public infrastructure (roads, culverts) and include debris and snow removal, not damage to homes and public buildings.
[3]Most of the damages from **hurricanes** occur as the result of flooding of low-lying coastal areas (see hurricane profile, page 3-47 for jurisdictions that have been subject to hurricanes.)
[4]The actual **summer storm** risk on a year-to-year basis is highly variable. Most of the damages are confined to public infrastructure (roads, culverts) and include flooding and debris removal, not damage to homes and public buildings.
[5]The risk from **landslides** affects individual properties, not entire communities. See landslide profile, page 3-65, for a discussion of specific areas subject to landslides.

C. 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 amount of roads, bridges, critical facilities and utility distribution lines in 2013 as it had when the county plans were prepared between 2010 and 2012.

As the population growth table on page 3-85 demonstrates, for the most part there were relatively minor changes in Maine's population during the 2000-2010 period, with slight gains in some counties, and minor population decreases in others. In the 2000-2010 timeframe, there were no significant large-scale increases in either commercial or residential development in Maine. Multi-jurisdictional plans covering each of the state's 16 counties affected by new development have noted these minor changes and the potential impact on areas of vulnerability. See discussion on page 3-90 for more analysis of growth during the 2000-2010 period.

Estimating Potential Losses of State Facilities	
Element	*A. Does the new or updated plan present an estimate of the potential dollar losses to State owned or operated buildings, infrastructure, and critical facilities in the identified hazard area?*

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

Flooding (100 Year). Flooding is Maine's major natural hazard and the only hazard that the State can currently identify State owned or operated facilities that are potentially located within the flood zone. The following chart identifies those State owned or operated facilities that are potentially located in a flood zone. The chart includes the name and address of the facility name, the value of the contents, the building value and the total valuation. Those facilities which show a zero figure for building value are leased facilities. As of this writing, the State has no information on State-owned buildings, infrastructure, or critical facilities that are in an identified hazard area.

State Facilities with Potential Vulnerability to Flooding

PROPERTY NAME	STREET ADDRESS	TOWN	CONTENT VALUE	BLDG VALUE	TOTAL VALUE
Bar Harbor District Court	93 Cottage Street	Bar Harbor	150,000	0	150,000
Three Bay Garage	70 Fish Hatchery Road	Casco	35,424	29,520	64,944
Generator Building	70 Fish Hatchery Road	Casco	17,711	14,170	31,881
Cold Storage Building	70 Fish Hatchery Road	Casco	17,711	59,039	76,751
Hatchery Pool Roofs	70 Fish Hatchery Road	Casco	0	66,000	66,000
Dwelling	70 Fish Hatchery Road	Casco	33,821	300,000	333,821
Two Car Garage	70 Fish Hatchery Road	Casco	1,050	20,000	21,050
Ultra Violet Building	70 Fish Hatchery Road	Casco	119,363	100,000	219,363
Dwelling	62 Fish Hatchery Road	New Gloucester	2,625	64,431	67,056
Pump House	500 State Park Road	Dover-Foxcroft	15,000	30,000	45,000
Ranger's Residence	500 State Park Road	Dover-Foxcroft	8,295	75,000	83,295

PROPERTY NAME	STREET ADDRESS	TOWN	CONTENT VALUE	BLDG VALUE	TOTAL VALUE
Tool Shed	500 State Park Road	Dover-Foxcroft	5,000	10,000	15,000
Service Building	500 State Park Road	Dover-Foxcroft	20,000	100,000	120,000
Bathhouse & Latrine	500 State Park Road	Dover-Foxcroft	1,260	120,000	121,260
Check In Station	500 State Park Road	Dover-Foxcroft	6,000	60,000	66,000
Bathhouse & Latrine	500 State Park Road	Dover-Foxcroft	1,700	120,000	121,700
Woodshed	500 State Park Road	Dover-Foxcroft	2,520	21,210	23,730
Bathhouse & Latrine	500 State Park Road	Dover-Foxcroft	1,700	120,000	121,700
Bathhouse & Latrine	500 State Park Road	Dover-Foxcroft	1,700	120,000	121,700
Bathhouse & Latrine	500 State Park Road	Dover-Foxcroft	2,000	120,000	122,000
Bathhouse & Latrine	500 State Park Road	Dover-Foxcroft	2,000	120,000	122,000
Administration Building	16 Deep Cove Road	Eastport	123,500	3,491,978	3,615,478
Boiler Building	16 Deep Cove Road	Eastport	100,000	698,396	798,396
Pier	16 Deep Cove Road	Eastport	0	800,000	800,000
Classroom and Shop	16 Deep Cove Road	Eastport	947,500	3,491,978	4,439,478
Shelter & Tool Shed	Warren Island	Islesboro	2,000	12,000	14,000
Float & Pier	Warren Island	Islesboro	0	150,000	150,000
Office Cabin	Warren Island	Islesboro	8,000	30,000	38,000
Information Center	Warren Island	Islesboro	0	3,675	3,675
Shelter	Warren Island	Islesboro	0	10,000	10,000
Shelter	Warren Island	Islesboro	0	10,000	10,000
				Total	**$11,993,277**

It is not expected that the State-owned and operated buildings will suffer 100% losses from a flooding event in Maine. It is estimated that flood damages will account for approximately 20% of the building valuation. Because flooding in Maine is usually a slow process, it is not expected that there will be any losses to the contents in these facilities. During a flood event, State employees would relocate the building contents to prevent content loss.

The total building valuation is $10,367,397. Therefore, 20% would equal $2,073,780. All State Facilities are insured for flood damages.

Winter Storm (Every few years). 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 clear 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 (see Winter Storm profile on 3-40).

Hurricanes (CAT 1). 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 clear State-maintained roads of debris. Although utilities can be damaged during winter storms, the utilities are owned and operated by private utility companies (see Earthquake profile on 3-77).

Wildfires (50 Year Events)

The State of Maine is unable to determine the proximity of State-owned and operated facilities in the wildland-urban Interface. However, the most likely structures are small buildings operated by the Department of Conservation at State parks that would not be considered critical or of high value. Costs typically come from the overtime use of Maine Department of Conservation and municipal firefighters and equipment to fight wildfires.

Erosion/Landslides

Damages to state owned or operated buildings or infrastructure are not likely from erosion/landslides, because none are known to be located in areas subject to erosion and/or landslides.

Summer Storms (1-3 Years)

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 (see Summer Storms profile on 3-69).

Drought (10 Year Events)

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 personnel to assist farmers and private well owners.

Earthquakes (R 5)

Earthquake damages to state owned or operated buildings or infrastructure are no more likely than damages to other buildings or infrastructure because Maine does not have earthquakes that cause structural damages (see Earthquake profile on 3-77).

SECTION 4 – MITIGATION STRATEGY

Mitigation Strategy
Requirement §201.4(c)(3): [To be effective, the plan must include a] Mitigation Strategy that provides the State's blueprint for reducing the losses identified in the risk assessment.

INTRODUCTION

According to §201.4(c)(3) 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, objectives and actions that are based on the risk assessment and are consistent with goals from other state and local plans and policies. The goals, objectives and actions contained in this section are aimed at achieving long-term hazard protection. The State has also assessed its own as well as its local jurisdictions' capabilities to staff programs or projects and fund measures to achieve the goals of the plan. The State has identified funding from federal, local, and private sources to complement its own limited resources.

This section includes the following four subsections as follows:

Hazard Mitigation Goals	
Requirement §201.4(c)(3)(i): (The State mitigation strategy shall include a) description of State goals to guide the selection of activities to mitigate and reduced potential losses.	
Requirement §201.4(d): The) plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities…	
Elements	*A. Does the new or updated plan provide a description of State mitigation goals that guide the selection of mitigation activities?*
	B. Does the updated plan demonstrate that the goals were assessed and either remain valid or have been revised?

A. Description of goals

See pages 4-19 through 4-32 for the State's hazard mitigation goals, objectives and actions, including changes from the 2010 plan.

B. Assessment of Goals

Each of the goals was assessed during the individual meetings with state, county and federal agencies (see page 2-2 for a more complete description of this process).

STATE CAPABILITY ASSESSMENT	
Requirement §201.4(c)(3)(ii). [The State mitigation strategy shall include a] discussion of the State's pre- and post-disaster hazard management policies, programs, and capabilities to mitigate the hazards in the area, including: an evaluation of State laws, regulations, policies and programs related to hazard mitigation as well as development in hazard-prone areas; and a discussion of State funding capabilities for hazard mitigation projects.	
Elements	*A. Does the new or updated plan include an evaluation of the State's pre-disaster hazard management policies, programs and capabilities?*
	B. Does the new or updated plan include an evaluation of the State's post-disaster hazard management policies, programs and capabilities?
	C. Does the new or updated plan include an evaluation of the State's policies related to development in hazard prone areas?
	D. Does the new or updated plan include a discussion of State funding capabilities for hazard mitigation projects?
	E. Does the new or updated plan address any hazard management capabilities of the State that have changed since approval of the previous plan?

A.,B. Evaluation of State's Pre-disaster and Post-disaster Hazard Mitigation Policies, Programs and Capabilities

There have been several changes in the organizational structure of state government since preparation of the 2010 plan. The first is that the State Planning Office was abolished by the Legislature in 2012. The second is that the Department of Agriculture, Food and Rural Resources and the Department of Conservation have been combined to form a new department, the Department of Agriculture, Conservation and Forestry. The Maine Forest Service and the Maine Geological Survey are located in this new department. Many of the programs administered by the former State Planning Office, including the Maine Floodplain Management Program, are now administered by the Department of Agriculture, Conservation and Forestry. The effect of this government reorganization has been to change the location of several programs, such as Maine's floodplain management program, but not the overall effectiveness of the programs.

Pages 4-8 through 4-12 include a summary and evaluation of the State's pre-disaster and post-disaster hazard mitigation policies, programs and capabilities.

Note: Outdated chart of state government organization has been removed. An official replacement chart has not yet been prepared.

The table which follows describes in summary the current capabilities of the State of Maine by Hazard category and whether these programs are pre-disaster or post-disaster mitigation activities.

State Mitigation Capabilities by Hazard Matrix

HAZARD	TYPICAL DAMAGES or LOSSES	AGENCY TASKED	PROGRAMS	PRE- OR POST-DISASTER
Flooding	All Structures	Dept. of Agriculture, Conservation and Forestry	Maine Floodplain Management Program Community Assistance Program Risk Map Program	Pre-disaster
Flooding	Local Roads State Roads	Dept of Transportation	Maine Local Roads Center Capital Improvement Projects	Pre-disaster Pre-disaster
Flooding	New Public Property	Office of Community Development	Economic Development Infrastructure Grants Public Facilities Grant Program	Pre-disaster
Flooding	Environment	Dept of Environmental Protection	Erosion & Sedimentation Control, Natural Resources Protection Act, Shoreland Zoning & Stormwater Program	Pre-disaster
Flooding	Structures/Roads	Maine Emergency Management Agency	Dam Safety Law (37-B, Chapter 24)	Pre-disaster
Flooding	Evacuations & Mass Care	American Red Cross	Disaster Shelter Management Program	Post-disaster
Flooding	Environment	Maine Geologic Survey	Beach mapping program	Pre-disaster
Flooding	Environment	Maine Geologic Survey	Coastal bluffs mapping program	Pre-disaster
Flooding	Environment	Maine Geologic Survey	Landslide hazard mapping program	Pre-disaster
Flooding	Environment	Maine Geologic Survey	Beach erosion	Pre-disaster
Flooding	Environment	Maine Geologic Survey	Tsunami potential	Pre-disaster
Wildfires	Timberland	Maine Forest Service	Forest Protection Division	Post-disaster
Wildfires	Timberland	Maine Forest Service	Forest Health and Monitoring	Pre-disaster
Wildfires	Residential Structures	Maine Forest Service	Cooperator Assistance Program Federal Excess Property Program Volunteer Fire Assistance Program	Post-disaster
All-Hazards	All Types	Maine Emergency Management Agency	Emergency Mgmt Performance Grants Pre-Disaster Mitigation Grants Public Education & Information	Pre-disaster
All-Hazards	All types	Maine Emergency Management Agency	Hazard Mitigation Program Grants	Post-disaster
All-Hazards	Life & Safety	Emergency Services Comm Bureau	Enhanced 911	Post-disaster
All-Hazards	Public Property	Bureau of General Services	Inventories all State Owned Property Maintains construction plans and costs	Post-disaster
All-Hazards	Public Property	Bureau of General Services	Insurance on State Owned Property	Post-disaster

Evaluation of State Programs as they relate to Hazard Mitigation

In general terms, the goals of the State Hazard Mitigation Plan are to motivate and assist state, county and local government elected and appointed officials, and public and private agencies to mitigate against the effects of natural hazards.

As observed in the previous table, there are a number of fairly 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 (FEMA 55). 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 storms, erosion, severe summer storms, drought and earthquakes. These are dealt with in the all-hazard mitigation programs and efforts shown in the table above.

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.

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 along the shores of rivers, lakes and the coastal waters. Currently, there are four major state programs that work to mitigate the effects of flooding.

1. **Road repair and local technical assistance.** The Maine Department of Transportation MaineDOT is responsible for the repair, maintenance and upgrade work to State-owned highways. When funds are available, the MaineDOT upgrades and/or elevates road surfaces to reduce the possibility of flood damage to roads. The MaineDOT also maintains the Maine Local Roads Center which provides technical assistance to municipalities for completing the same actions. There is seldom sufficient funding, both at the state and municipal level, to complete all the road work that is necessary.

   Maine has made significant progress in recent years in the area of 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 by stabilizing banks, fill, rip-rap, 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, and there continues to be a constant turnover of elected local officials, including Road Commissioners. Thus a new group of local officials that could benefit from similar workshops is constantly being created.

2. **Floodplain Management Program.** Maine Department of Agriculture, Conservation and Forestry's Floodplain Management Program provides technical assistance, model floodplain ordinances to municipalities, training for local officials and professional groups (e.g. professional land surveyors, insurance agents and lenders), 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. The requirement for every municipality to have a floodplain ordinance is not mandatory. However, 93% of the communities in Maine have enacted a floodplain management ordinance. Some communities were never given a map. Maine's Floodplain Management Program has been effective because local participation in one of the highest in New England.

   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 with the NFIP Community Rating System (CRS) that 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 more communities in the CRS than any other New England state with 17 communities currently enrolled in the CRS Program. The 17 communities represent more than one third 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 past eight years or so, progress has been made:

- Hurricane Surge Inundation Maps have been completed by the Army Corps of Engineers, and MEMA has distributed copies to all affected municipalities;

- FEMA's Risk Map Program has produced a number of new, digital flood plain maps that are much more detailed and easier to use than the earlier FIRMS. Digitized maps for Oxford County became final on July 7, 2007. Preliminary digital maps have been prepared for Androscoggin, Kennebec, Cumberland and York Counties.

- LIDAR data has been generated by a consortium of agencies including NOAA and the Army Corps of Engineers for York and Cumberland Counties the entire coast and for portions of Androscoggin, Oxford and Kennebec Counties. The LIDAR data has been used to develop better coastal flood modeling for some areas at the local level.

On the downside, LIDAR based mapping is limited to an area within a few hundred feet of the coast, and some of the models are now being challenged by several communities as being too conservative. Many communities are still struggling with aging FIRMS. FEMA did not complete its Map Modernization Program for Maine within the initial timeframe envisioned by Congress (2009).

3. **DEP Programs.** The last set of state programs that effectively deals with flooding are the Department of Environmental Protection's (DEP) Stormwater Management, Shoreland Zoning and Dam Licensing statutes, regulations and programs. These programs and regulations deal with the man-made causes of stormwater capability reduction 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.

4. **FEMA Mitigation grant programs.** Though the Hazard Mitigation Grant Program (HMGP) is a federal program, it is administered by the Maine Emergency Management Agency (MEMA) as are FEMA's Flood Mitigation Assistance (FMA) and Pre-Disaster (PDM) programs. MEMA is responsible for the maintenance of the State Emergency Operations Plan (EOP) and State Hazard Mitigation Plan (HMP) which helps State agencies to prepare for and respond to natural disaster hazard events. However, due to insufficient agency staffing, more technical assistance is needed by county and municipal governments in order for these local officials to have a better awareness and understanding of hazard mitigation policies, plans and programs. In addition, completion 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.

Winter Storms. The second greatest amount of damage caused by a natural disaster hazard event is severe winter storms. Winter storm damages typically involve downed overhead utility lines, flooding from ice jams and melt off, and debris in the roads (since flooding has been covered in the preceding section, it will not be reviewed in this section). Currently, there is one major State program that works to mitigate the effects of severe winter storms.

The MaineDOT is responsible for snow and debris removal on all State highway roads. MaineDOT garages are well placed around the state to complete this task in a timely manner. MaineDOT also provides technical assistance to municipalities for the road debris clearance with the Maine Local Roads Center. At times, the MaineDOT 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.

Hurricanes. Historically, hurricanes in Maine have always been a Level 1, and excluding the flooding, have not caused significant destruction. However, the damaging effects of hurricane storm surge and flooding have caused major damage in Maine in the past. As such, State programs that work to mitigate the effects of flooding have already been described in a preceding section. There are no mitigation programs in the State of Maine dedicated solely to lessening the impacts of hurricanes. Unfortunately, in many instances, the storm surge inundation flood areas are much greater than the 100 year FIRM flood areas and it is these areas that are not regulated by the current state and local floodplain management programs in Maine. However, completion and distribution to municipalities of the hurricane surge inundation maps provides new information to local officials to help them better regulate development in areas that could be impacted by hurricanes. This is the first step in educating the public about the potential impacts of hurricanes on the Maine coast.

Erosion/. Some inland areas and about half of the Maine coast, including many of its beaches, are slowly eroding, but erosion generally goes unnoticed until a home or other structure is threatened or destroyed. The biggest losses are to individual properties, although there have been instances of damage to public roads. 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 the HMGP and PDM-C programs are such that municipal applications aimed at helping individuals protect their properties are not competitive.

Landslides. 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. As discussed under “Erosion,” immediately above, there are no mitigation programs for homeowners already located in a landslide hazard area.

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. Forest fires could cause a huge loss of residential structures in the State due to the very high percentage of Maine homes located in the wildland-urban interface and the general lack of pre-disaster mitigation efforts. Land use planning and 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 ~~five~~

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.

Severe Summer Storms. The types of severe summer storms in Maine include thunderstorms and tornadoes. Tornadoes are rare and due to the low population density have not been a major concern. Thunderstorms have caused damages to structures, mostly from overturned trees. Lightning has caused injuries and deaths, mostly from individuals being struck. There are no mitigation programs in the State of Maine dedicated solely to lessening the impacts of severe summer storms, excluding that of all-hazards emergency management planning and emergency response agencies (see page 4-3).

Drought. Maine is not a "dry" state in terms of climate, however there have been periodic periods of drought conditions. The impacts of Maine droughts are higher instances of dry water wells, poor performance of annual agricultural products, and greater opportunities for forest fires. There are no mitigation programs in the State of Maine dedicated solely to lessening the impacts of drought.

Earthquake. The recent magnitude 4.3 earthquake in Bar Harbor demonstrates that earthquakes of this size can cause damage (see photo at beginning of Earthquake portion of Section 3). 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 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.

C. Evaluation of State's Policies related to Development in Hazard Prone Areas

The table on the next page contains an evaluation of the State's policies related to development in hazard prone areas.

Maine Hazard Mitigation Strategy
State Mitigation Capability Assessment Matrix

State Department, Agency, Authority, Board, Commission, Division	**Mitigation-related** Programs, Plans, Policies, Regulations, Funding or Practices	**Effect on Loss Reduction (X)** State Mitigation Initiatives			**Evaluation of Effect on Mitigation Initiatives**
		Provides Funding	Supports Implementation	Conflicts with	
Governor's Office Executive Department	-Executive Order dated March 4, 1968, precluding the uneconomic, hazardous, or unnecessary use of flood plains in connection with State facilities.		X		Essentially Prohibits new State facilities from being located in flood plains – still in effect.
Agriculture, Conservation and Forestry Bureau of Geology and Natural Areas	- Inventories, maps, assess, and interprets Maine's geology. - Invasive Species Awareness and Prevention Plan		X		Through the study of Maine's geology, the program evaluates Maine's likelihood of damaging earthquakes, landslides, and coastal erosion. Identifies, reviews and builds strategies to reduce impact of invasive species. The MGS website has been very effective in providing relevant information regarding various hazards. MGIS has also worked effectively with communities to model the effects of sea level rise. MGS's work with municipalities is data-based, and has been effective in helping local communities visualize the effects of coastal storms and rising sea levels.
Agriculture, Conservation and Forestry Land Use Planning Commission	- Planning and zoning authority for unorganized areas of Maine, encompassing 10.4 million acres		X		By regulating development in the unorganized areas, the program 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 unorganized territory, including inappropriate floodplain development.

State Department, Agency, Authority, Board, Commission, Division	**Mitigation-related** Programs, Plans, Policies, Regulations, Funding or Practices	**Effect on Loss Reduction (X)** State Mitigation Initiatives			**Evaluation of Effect on Mitigation Initiatives**
		Provides Funding	Supports Implementation	Conflicts with	
					However, the agency's work is hamstrung by the lack of detailed flood data throughout the UT.
Agriculture, Conservation and Forestry Maine Forest Service	- Forest Protection Division		X		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.
Agriculture, Conservation and Forestry Maine Forest Service	- Cooperator Assistance Program - Federal Excess Property Program - Volunteer Fire Assistance Program	X	X		Provides grant funds, training and equipment to communities for forest fire protection suppression. MFS has been very effective in its wildfire prevention efforts as noted in the Wildfire hazard profile.
Defense, Veterans and Emergency Management Maine Emergency Management Agency	- Dam Safety Law (37-B, Chapter 24) - State Emergency Operations Center - Emergency Management Education - Disaster Preparedness Information		X		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.
Defense, Veterans and Emergency Management Maine Emergency Management Agency	- Emergency Management Performance Grants	X			Oversees and manages the Federal funding of the Emergency Management program in Maine. Provides personnel for planning and mitigation efforts at the state and county level. MEMA has been effective in building hazard mitigation partnerships with other agencies, counties and towns.

State Department, Agency, Authority, Board, Commission, Division	**Mitigation-related** Programs, Plans, Policies, Regulations, Funding or Practices	**Effect on Loss Reduction (X)** State Mitigation Initiatives			**Evaluation of Effect on Mitigation Initiatives**
		Provides Funding	Supports Implementation	Conflicts with	
Defense, Veterans and Emergency Management Maine Emergency Management Agency	- Hazard Mitigation Grant Program (HMGP) - Pre-Disaster Mitigation Grants (PDM)	X			Oversees and manages federal funding of hazard mitigation, local and state plans and local mitigation programs and construction projects. Mitigation grants have been effective in addressing hazards, but the need far exceeds available funds.
Economic & Community Development Department Office of Community Development	- Economic Development Infrastructure Grant Program - Public Facilities Grant Program	X			The CDBG program is not a source of mitigation funds, but some grant categories may include mitigation as a side benefit (e.g. a new storm drain system to reduce flooding on local streets. Includes public projects for flood and drainage improvements and for the construction of fire stations, homeless shelters, piers and dams in qualifying areas. Projects must meet flood protection standards.
Environmental Protection State Statutes	- Erosion & Sedimentation Control - Hydropower & Dams - Natural Resources Protection Act - Shoreland Zoning - Stormwater Program -Site Location of Development Act		X		Most of these laws are aimed at regulating development to protect the environment; they are not mitigation laws. Enforcement of laws requiring a DEP permit has been effective because applicants must meet standards to get a permit. Enforcement of laws administered at the local level, such as shoreland zoning, may vary from community to community.
Environmental Protection Dept of Water Quality	- Watershed Protection Grants	X			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.

State Department, Agency, Authority, Board, Commission, Division	**Mitigation-related** Programs, Plans, Policies, Regulations, Funding or Practices	**Effect on Loss Reduction (X)** State Mitigation Initiatives			**Evaluation of Effect on Mitigation Initiatives**
		Provides Funding	Supports Implementation	Conflicts with	
Agriculture, Conservation and Forestry Floodplain Management Program	- Maine Floodplain Management Program		X		Provides technical information, FIRM maps and model ordinances to Maine communities. Provides information about flooding and the NFIP. 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.
Agriculture, Conservation and Forestry Land Use Office	- Land Use Planning - Community Planning & Investment Program (CPIP)	X	X		Provides technical and financial assistance to municipalities, advises the legislature, coordinates with other State agencies, and advocates for sound land use planning. Administers the CPIP, covering the topic areas of community planning, growth management and smart growth. This program has been effective because it has helped the majority of municipalities prepare comprehensive plans. This is not mitigation per se, but sound planning has helped a number of communities enact ordinances to better guide growth.

State Department, Agency, Authority, Board, Commission, Division	**Mitigation-related** Programs, Plans, Policies, Regulations, Funding or Practices	**Effect on Loss Reduction (X)** State Mitigation Initiatives			**Evaluation of Effect on Mitigation Initiatives**
		Provides Funding	Supports Implementation	Conflicts with	
Department of Economic and Community Development Code Enforcement Training and Certification Office	- Municipal Code Enforcement Training Program	X	X		Trained, testing and certifying in all land use codes, including building, shoreland zoning, and floodplain management. This is not a mitigation activity, but it has resulted in better trained and better informed code enforcement officers.
Agriculture, Conservation and Forestry Maine Coastal Program	- Coastal Zone Management Program		X		Provides technical assistance to municipalities, advises the legislature, coordinates with other state agencies, and advocates for sound land use planning in Maine coastal areas.
Transportation Bureau of Planning Community Services Division	- Maine Local Roads Center		X		Provides training, technical assistance, and information to municipalities for constructing, maintaining, and managing local roads & bridges. The training brings to local officials the most up-to-date information (such as the use of geo-synthetics) on managing local infrastructure.
Transportation Environmental Office	- Natural Resources Mitigation Program		X		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.

D. Summary State Funding Capabilities for Hazard Mitigation Projects

Because the State of Maine has a small population 1,328,361, based on 2010 Census), it does not have significant state, county and local government staffs or budgets dedicated to hazard mitigation. There are no State-funded grants for local floodplain projects. There are only three State personnel working in the Local Roads Center, providing technical assistance to communities. There are no State personnel who deal with hurricane, earthquake, drought or severe summer storm mitigation. There does appear to be sufficient staffing for the annual spread of wildfires, however, there is a severe shortage of trained and equipped state and local manpower for a wildfire disaster of the 1947 magnitude. Many of these existing programs are already funded in part by federal sources. Since publication of the 2010 State Hazard Mitigation Plan, there has been no improvement in state funding for hazard mitigation.

E. Hazard Management Capabilities of the State that have Changed

There have been a number of recent improvements in the State's hazard management capabilities.

- Having a draft strategy ready before any Joint Field Office opened;
- Streamlining the joint Public Assistance and Mitigation briefings;
- Revising and streamlining the state HMGP application to make it easier for towns to apply and for state and FEMA to review;
- Revising and streamlining grant workshops for applicants;
- Using 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;
- Partnering 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:

- One MEMA staff person was trained on the HAZUS program through a NOAA grant but has since left the agency;
- Brochures on earthquake hazard were developed;
- As noted on page 3-40, updated hurricane storm surge maps were developed by the Army Corps of Engineers; these have been distributed to the coastal counties;
- As noted on page 4-7 Shoreland Zoning regulations were strengthened to protect against landslide hazard;
- State adopted International Building Codes effective December 2010; now all state code officers are required to be retrained and recertified before they can inspect using the new standards;
- FEMA's Risk Map Program has produced a number of new, digital flood plain maps that are much more detailed and easier to use than the earlier FIRMS. Digitized maps for Oxford County became final on July 7, 2007. Preliminary digital maps have been prepared for Androscoggin, Kennebec, Cumberland and York Counties;
- 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 tsunamis;

- Since all 16 county plans have been reapproved, County Emergency Management officials are far more up-to-date about hazard mitigation planning and implementation than they were just a few years ago, and are committed to helping their counties deal with mitigation issues;
- More county directors continue to be heavily involved in post disaster work.

LOCAL CAPABILITY ASSESSMENT	
Requirement §201.4(c)(3)(ii): [The State mitigation strategy shall include a] general description and analysis of the effectiveness of local mitigation policies, programs, and capabilities.	
Elements	*A. Does the new or updated plan present a general description of the local mitigation policies, programs, and capabilities?*
	B. Does the new or updated plan present a general analysis of the effectiveness of local mitigation policies, programs and capabilities?

A., General Description and Analysis of Local Mitigation Policies, Programs and Capabilities

Since 2003, the Maine Emergency Management Agency has worked with the County Emergency Management Agencies on the development of their County multi-jurisdictional Hazard Mitigation Plans. 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.

The majority of Maine's communities have less than 5,000 residents. Especially in many of the smaller, rural communities, there are few if any regulations other than the municipal shoreland zoning ordinance and a floodplain management ordinance. This is because Maine has a history and culture that is steeped in independence, a distrust of big government, a belief in personal responsibility, respect for the property of others, and a tradition of neighbor helping neighbor in times of need. These small town values, rather than government mandates, govern much of life throughout rural Maine. Many of Maine's smaller towns do not have the staff or money to undertake much in the way of hazard mitigation. That being said, there are a number of very positive trends:

- Most of Maine's towns conduct business with computers, use digital cameras to document events, and communicate via email and teleconferencing, all of which tend to reduce time and distance factors;
- The use of modern technology has led to greater documentation and mapping capabilities;
- There are increasing instances of local communities responding effectively with a high level of sophistication to emergency needs.

B. General Analysis of Effectiveness of Local Policies, Programs and Capabilities.

Flooding. Some Maine communities have taken advantage of the Maine Department of Transportation's MaineDOT Maine Local Roads Center and have acquired technical assistance and training on maintenance and upgrades to local roads, especially in terms of stormwater 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.

Most Maine communities (93%) 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 LURC's LUPC's permit review process.

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 listed on page 2-9 of this Plan 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.

Winter Storms. The biggest impact to many municipal budgets from winter storms 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 resources to accomplish these pre-disaster mitigation activities.

Hurricanes. 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 that are 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% return frequency and consequently cause flooding beyond the National Flood Insurance Program's 1% 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 cover more time and as the ocean's temperatures continue to rise there may be

an increase in the more severe hurricanes. Major structures have been built on the coast recently that were outside the FIRM Special Flood Hazard Areas, but have been shown to be possibly 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.

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.

Landslides. 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.

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.

Summer Storms. 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.

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.

Earthquake. The recent magnitude 4.3 earthquake in Bar Harbor demonstrates that earthquakes of this size can cause damage (see photo at beginning of Earthquake portion of Section 3). 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.

General Summary
Local Mitigation Activities 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
Flooding	Local Roads	Road Commissioner or Public Works Director	• Maine Local Roads Center • Municipal Capital Improvement Projects	Pre-disaster
Flooding	Environment	Code Enforcement Officer	• Municipal land use ordinances • Erosion & sedimentation control • Natural Resources Protection Act • Shoreland Zoning & Stormwater Program • Wildland Firefighting Program	Pre-disaster
Winter Storms	Roads	Road Commissioner or Public Works Director	Winter Road Maintenance program.	Post-disaster
Hurricanes	Environment	Code Enforcement Officer	Shoreland Zoning & Stormwater Program	Pre-disaster
Wildfires	Residential Structures	Municipal/Volunteer Fire Department	Wildland Firefighting program	Post-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-Hazards	All types	Municipal Elected Officials	Hazard Mitigation Program Grants	Post-disaster

*See preceding pages for an analysis and evaluation of local capabilities.

MITIGATION ACTIONS	
Requirement §201.4(c)(3)(iii): (State plans shall include an) identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering and an explanation of how each activity contributes to the overall mitigation strategy. This section should be linked to local plans, where specific local actions and projects are identified.	
Requirement §201.4(d): (The) Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities…	
Elements	*A. Does the new or updated plan identify cost-effective, environmentally sound, and technically feasible mitigation actions and activities the State is considering?*
	B. Does the new or updated plan evaluate these actions and activities?
	C. Does the new or updated plan prioritize these actions and activities?
	D. Does the new or updated plan explain how each activity contributes to the overall State mitigation strategy?
	E. Does the mitigation strategy in the new or updated section reflect actions and projects identified in local plans?

A. IDENTIFICATION OF GOALS, OBJECTIVES AND STRATEGIC MEASURES (ACTIONS)

The actions set forth on the following pages relate to the role that the Maine Emergency Management Agency has assumed relative to mitigation:

- The provision of technical assistance and training;
- The preparation of plans and updates;
- Support for improved information including better hazard-related maps; and
- Support for county and municipal hazard mitigation projects.

Note: All of these actions have been evaluated relative to environmental soundness, technical feasibility and cost effectiveness. Those that require additional funding beyond day-to-day agency operations will be further evaluated, using these criteria, prior to funding.

KEY TO ABBREVIATIONS

Abbreviations used in the following table include the following:

$F	Federal funds
$S	State funds
$C	County funds
$L	Local funds
DEP	Maine Department of Environmental Protection
FEMA	Federal Emergency Management Agency
MEMA	Maine Emergency Management Agency
MFS	Maine Forest Service
MGS	Maine Geological Survey
ACF	Maine Department of Agriculture, Conservation and Forestry

GOALS/OBJECTIVES AND STRATEGIC MEASURES (ACTIONS)

ADMINISTRATION

Goals: Enhance the State hazard mitigation capabilities.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
1. 406 Program. Utilize the 406 program to the maximum extent possible to implement mitigation projects.	**A. Education**. Immediately following a disaster, use workshops to inform officials of 406 program requirements.	Existing Staff $ F, S,	MEMA	Education of local officials on opportunities for implementation of mitigation projects	2010-2013 MEMA has included information on the 406 program in all briefings and workshops on DR 1053, DR 4032 and DR 4108. As planned.
	B. Project identification. Use county and local mitigation plans as a basis for identifying infrastructure improvements that might be funded under the 406 program.	Existing Staff $ S	MEMA	Maximum completion of hazard mitigation projects	Since Patriot's Day Disaster in 2007 MEMA and County Directors have advised towns to seek 406 funding for projects already listed in the plans. As planned.
2. Long-range planning. Continue long-range hazard mitigation planning efforts.	**A. Plan integration.** Integrate county hazard mitigation plans into an overall State plan and establish overall, statewide hazard mitigation priorities.	Consultant $ F, S	MEMA	Integration of multi-jurisdictional plans	Since 2012 is the first time county plans have been concurrent with the state plan, there has been more opportunity for integration. As planned.
	B. County plan updates. Provide leadership and guidance to county EMA offices and local officials as county multi-jurisdictional plans are updated, giving priority attention to counties with the most serious hazard mitigation issues.	Existing Staff $ F, S, C, L	MEMA	More effective county-wide, multi-jurisdictional plan updates	2009 –MEMA developed plan guidance for the 2010-2013 county plan updates and provided technical assistance to the counties during the plan update process. As planned.
	C. Standardization. Work with county EMA officials to standardize the format and presentation of updated county hazard mitigation plans.	Existing Staff $ S, C, L	MEMA	More effective county-wide, multi-jurisdictional plan updates	2009 - MEMA developed a guide for plan updates. As planned.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
	D. State plan. Maintain and update a State Hazard Mitigation Plan.	Existing Staff $ F, S	MEMA	Better protection of Maine residents	MEMA is committed to updating the State Plan every three years, but, along with other states, supports a five year time frame. As planned.
3. Mitigation awareness. Build county and municipal officials' and residents' awareness of mitigation and proven, cost-effective mitigation measures and the need for mitigation.	**A. Website.** Continue to use MEMA's website to post the State's Hazard Mitigation Plan as well as articles and other educational materials dealing with hazard mitigation, and to post notice of meetings, workshops and training exercises.	Webpage $ S	MEMA	Provision of mitigation information to local officials and the general public	2010-2013 MEMA uses its website to post the State Mitigation Plan, training, exercises and workshops. Twitter and Facebook are also used as media tools. As planned.
	B. Community outreach • Continue the highly successful annual Maine Preparedness Conference . • Continue to revise, update, and make available materials aimed at educating local officials and the public about hazard mitigation.	Existing Staff $ F, S	MEMA	Provision of mitigation to local officials and the general public	MEMA has held the Maine Partners in Preparedness Conference in 2009, 2010, 2011, 2012 and 2013. Other outreach efforts are ongoing. As planned.
	C. Workshops. Continue to hold mitigation workshops for local officials, interested engineering firms and others, focusing on parts of the State with the most serious hazard mitigation issues.	Existing Staff $ F, S, L	MEMA	Provision of mitigation information where it is most needed	2010-2013 MEMA held workshops on a continuing, statewide basis. As planned.
	E. Early warning systems. Within the limits of available funding, 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.	$ F, S, L	MEMA	More time and data for emergency managers for effective decision-making	2009-2010 new river gauges funded through HMPG for Mousam, Kennebec, Kenduskeag and Penobscot Rivers. As planned. 2012 many gauges discontinued due to federal sequester of funds.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
4. Technical assistance. Continue to provide technical assistance to and coordinate with local jurisdictions on state, county and municipal level mitigation efforts.	**A. Additional staff.** Hire additional staff to improve the agency's hazard mitigation capabilities.	$ F, S	MEMA	More effective hazard mitigation program	MEMA hires only replacement staff.
	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.	Existing Staff $ S	MEMA	Targeting of mitigation technical assistance to public officials for effective mitigation decision-making	Due to its limited resources, MEMA has to prioritize based on plan life spans, disasters and budget cycles. As planned.
5. Better coordination. Better coordinate the mitigation and data collection efforts of State agencies.	**A. Mitigation Committee Working Group.** Meet with mitigation experts consisting of MEMA and key State agency leaders to review state programs for opportunities to combine capabilities and resources on mitigation strategies.	Existing Staff $ S	MEMA, State Agencies	Cost-effective hazard mitigation with every public dollar	MEMA continues to meet with federal and state mitigation experts. As planned.
	B. Leveraging Partnerships • Continue holding Maine Preparedness Conferences undertaken with Maine Municipal Association and Associated General Contractors. • Continue disaster-response partnerships with Associated General Contractors, Wal-Mart, Poland Springs and other businesses. • Continue to meet annually in March with the River Flow Advisory Commission to assess flooding potential (the Commission includes MEMA, local EMAs and dam owners) • Continue to work with MaineDEP , MGS, USGS and other agencies to monitor the impacts of climate change including changes in precipitation and sea level rise	Existing Staff $ S	MEMA	Pooling of resources for maximum effectiveness; better preparedness for disaster response	2010 – 2013, Ongoing; have held conferences, done outreach, signed contracts, and/ or had presence at the meetings or conferences of "old" and "new" state partners. As planned. Further state work on the climate change adaptation report has been halted due to budgetary and other constraints

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
	C. Hazard additions to State GIS system. Add hazard occurrence information to the State's GIS system.	Existing Staff $ S	MEMA, Maine OGIS	Greater availability of hazard occurrence data	Has not been implemented; lack of staff
	D. Potential losses. Collect vulnerability and potential loss data to estimate losses for State-owned and operated buildings, infrastructure and critical facilities associated with the most likely hazard events.	Consultant $ S, L	MEMA	Better data for hazard mitigation assessment and decision making	2011 – MEMA began initial work but staff member doing the work left, so work has not been completed.
6. State projects. Develop a process for better review and evaluation of State-funded or managed projects for compliance with good mitigation practices and standards	**A. Best practices manual.** Develop a Best Management Practices (BMP) Manual (similar to DEP's Erosion Control BMP Manual) for the review and evaluation of State-funded or managed projects for compliance with good mitigation practices and standards.	Consultant $ S	MEMA, State Agencies	Provision of ideas and technical know-how to public officials and the private sector on methods to incorporate hazard mitigation into their projects	Not done – lack of staff time
	B. Administration plan. Revise the hazard mitigation prioritization criteria in the Administration Plan to include communities at highest risk, with consideration for repetitive loss and most intense development pressures.	Existing Staff $ S	MEMA	Simplification of the process for choosing Hazard Mitigation Projects	Plan was re-updated for DR 1953, DR 4032, and DR 4108. As planned.

FLOODING:

Goals: Reduce loss of life, injury and property damage in Maine caused by flooding.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
1. Outreach. Help local officials develop more effective ways of mitigating flood damages to local roads, bridges, culverts and ditches.	**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.	Existing Staff $ F, S	MDOT Local Roads Center/ MEMA	Better approaches to mitigating flood damages	Workshops were held. As planned.
2. Improved mapping. Support efforts to improve flood plain mapping. **(see also summer storms/hurricanes)**	**A. Risk Map.** Support FEMA's Risk Map Program including: • Preparation of a flood insurance rate map (FIRM) for every community in Maine; • Preparation of LIDAR-based mapping to the maximum extent possible	Existing Staff $ F	State Agencies	Better floodplain management	2010 – 2013 York, Cumberland, Androscoggin, Kennebec and Oxford County maps digitized; 11 counties remain; FEMA $ support has fallen short in completing FIRMS for every community. As planned.
	B. Coastal LIDAR. As time and resources permit, use LIDAR- data to prepare detailed maps of potential storm flooding and extreme tidal flooding events for coastal communities.	$ F, S	MGS	Better prediction of infrastructure and evacuation routes subject to frequent coastal flooding	2010 – 2012 Data gathering flights have been completed. As planned.
3. Sea level rise. Continue to monitor sea level rise and its implications for Maine.	**A. Monitoring.** Continue to track changes in sea level and evaluate future projections and: • Recommend priorities to FEMA for updating inundation maps (e.g., FIRMS, hurricane surge: tidal rise scenarios) giving priority to the areas most vulnerable to storm surge flooding and hurricane surge inundation; • Provide information to municipalities, utilities and the public on the implications of sea level rise.	Existing Staff $ F, S	MGS	Improved geographic information on flooding vulnerability created by rising floodplains and tides	MGS continues to monitor sea level rise; information including maps and presentations continues to be provided to towns and public. As planned.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
4. Watershed management. Minimize increased downstream flooding caused by runoff from upstream development.	**A. Monitoring.** 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.	Existing Staff $ F, S, L	DEP	Development of information on how the dynamics of watershed development adversely impact downstream properties	FEMA was involved in developing info for Mousam River watershed in Southern Maine – 2007 No similar monitoring since that time
5. Dams. Improve State management of dams.	**A. GIS mapping.** Refine GIS mapping of high hazard and significant hazard dam locations at the time of inspections and through Emergency Action Plan revisions.	Existing Staff $ S	MEMA	Assessment of downriver flooding vulnerabilities from dam failures (breaches) for better land use and emergency planning	Not done, lack of staff
6. County plan updates. Provide guidance to county EMAs and others involved in updating county hazard mitigation plans.	**A. Strategy guidance.** As county plans are updated, encourage consideration of consistent flood strategies including, but not limited to: • Monitoring preparation of Emergency Action Plans (EAPs) for dams, and participation in EAP drills • Encouraging municipalities to incorporate updated flood hazard information such as coastal surge/SLOSH maps, and hurricane inundation maps into their ordinances • Maintaining awareness of people with disabilities who would be adversely impacted by flooding • Participating in hazard mitigation grant programs, particularly the 406 program, where applicable • Developing plans to upgrade roads, culverts,	Existing Staff $ F, S, C, L	MEMA	Development of more effective county plans	2009 - MEMA developed plan guidance including recommended strategies and a standardized format for easier reviews and cross referencing 2010-2013 all 16 Counties used the plan guidance to develop consistent plans. As planned.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
	ditches and drainage systems to make roads and structures safe from flooding				
7. Repetitive loss properties. Take steps to reduce repetitive loss properties	**A. Priority for assistance.** Give priority to repetitive loss properties, as long as it is cost beneficial.	Existing Staff $ F, S	MEMA	Reduction of repetitive loss properties	2009 MEMA developed guidance including recommended strategies; – this guidance continues to be in effect. As planned.

WINTER STORMS

Goals: Reduce loss of life, injury and property damage in Maine caused by winter storms.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
1. County plan updates. Provide guidance to county EMAs and others involved in updating county hazard mitigation plans.	**A. Strategy guidance.** As county plans are updated, encourage consideration of consistent winter storm strategies including, but not limited to: • Continuing public education service announcements • Maintaining awareness of people with disabilities who would be adversely impacted by winter storms • Participating in hazard mitigation grant programs, particularly the 406 program, where applicable • Installing back-up power at all critical facilities	Existing Staff $ F, S, C, L	MEMA And Counties	Development of more effective county plans	2009 - MEMA developed plan guidance including recommended strategies and a standardized format for easier reviews and cross referencing 2010-2013 all 16 Counties used the plan guidance to develop consistent plans. As planned.

SUMMER STORMS/HURRICANES

Goals: Reduce loss of life, injury and property damage in Maine caused by summer storms and hurricanes.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
1. Coastal storm surge flooding/hurricane surge inundation. Provide for better management of potential damages from coastal storm surge flooding and hurricane surge inundation.	**A. State Floodplain Management Program.** Develop recommendations for the use of hurricane surge inundation maps in: • Local ordinances • Public education and awareness efforts	Maps and model ordinances $ S	MEMA ACF	Better regulation of development in all flood zones	Not yet implemented
	B. Public Education. Within the limits of available resources, continue to provide public education at the local level about areas subject to hurricane surge inundation.	Existing Staff $ S	DEP	Better management of areas subject to hurricane inundation	MGS has worked with individual communities on modeling the impacts of storm surges. As planned.
2. County plan updates. Provide guidance to county EMAs and others involved in updating county hazard mitigation plans.	**A. Strategy guidance.** As county plans are updated, encourage consideration of consistent summer storm/hurricane strategies including, but not limited to: • Continuing public education service announcements • Maintaining awareness of people with disabilities who would be adversely impacted by winter storms • Participating in hazard mitigation grant programs, particularly the 406 program, where applicable • Installing back-up power at all critical facilities • Developing plans to upgrade roads, culverts, ditches and drainage systems to make roads safe from hurricanes	Existing Staff $F, S, C, L	MEMA	Development of more effective county plans	2009 - MEMA developed plan guidance including recommended strategies and a standardized format for easier reviews and cross referencing 2010-2013 all 16 Counties used the plan guidance to develop consistent plans. As planned.

EROSION/LANDSLIDES

Goals: Reduce property damage in Maine caused by erosion and landslides.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
1. Landslide assessment. Provide information for local regulation of high hazard landslide areas in interior Maine.	**A. Inland Landslide Mapping.** Map inland landslide risk areas.	$ F, S	DOC/ MGS	Better management of high hazard landslide areas	Mapping has been done for Wells, Cumberland, Greenbush and Bangor. As planned.
2. Beach monitoring. Enhance decision-making by providing better information on beaches and coastal sand dunes and their vulnerability to erosion.	**A. Coastal Beach Mapping.** Update geological boundaries of the coastal sand dune system in GIS and release the update via web products. Provide DEP with digital data.	Maine Coastal Program $ F	DOC/ MGS	Increased community resiliency, Enhanced storm protection through natural dunes, Expedited permitting	2012 Data gathering flights have been completed. As planned.
	B. Analysis. Calculate beach erosion rates and map erosion hazard areas for short- and long-term processes and sea level rise.	Maine Coastal Program $F	DOC/ MGS	Increased community resiliency, Enhanced storm protection through natural dunes, Expedited permitting	Beach erosion documented, but updates are unfunded
	C. Maine Beach Monitoring Project. Continue to monitor the change in beach profiles and dune edge along the southern and mid-coast regions.	Sea Grant $ F, S, L	DOC/ MGS	Documentation of erosion trends for beach management and planning	Beach monitoring funds have lapsed

WILDFIRES

Goals: Reduce loss of life, injury and property damage in Maine caused by wildfires.

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
1. Urban/Wild land interface. Provide for better management of the urban/ wild land interface.	**A. Community assessments.** Continue to offer community assessments in high fire incident areas, and continue to educate homeowners on steps they can take to reduce the risk of fire to their properties.	Existing Staff, $ F, S	SPO and MFS	Reduction of the possibility of residential losses due to wild fires	The Maine Forest Service continues to implement its fire-wise community program and has included DVDs on its website. As planned.
1. County plan updates. Provide guidance to county EMAs and others involved in updating county hazard mitigation plans.	**A. Strategy guidance.** As county plans are updated, encourage consideration of consistent strategies for wildfires including, but not limited to: • Continuing public education service announcements • Maintaining access to gated roads • Maintaining awareness of special needs people who would be adversely impacted by wildfires • Participating in hazard mitigation grant programs, particularly the 406 program, where applicable • Installing back-up power at all critical facilities	Existing Staff $ F, S, C, L	MEMA	Development of more effective county plans	2009 - MEMA developed plan guidance including recommended strategies and a standardized format for easier reviews and cross reference 2010-2013 all 16 Counties used the plan guidance to develop consistent plans. As planned.

DROUGHT

Goals: Reduce loss of life, injury and property damage in Maine caused by drought

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
1. Management. Continue to provide for management of drought	**A. Monitoring**. Continue to monitor drought conditions on an as-needed basis.	Existing Staff $ S, L	Drought Task Force	Guidance to Governor and State on what to do in the event of another drought	There have been no droughts since 2003. The River flow Advisory Commission becomes the Drought Task Force as necessary
	B. Action Plan. Advise the Governor, as needed, on emergency actions the Governor can take to lessen the impacts of drought.	Existing Staff $ S	Drought Task Force	Guidance to Governor and State on what to do in the event of another drought	There have been no droughts since 2003. The River flow Advisory Commission becomes the Drought Task Force as necessary

EARTHQUAKE

Goals: Reduce loss of life, injury and property damage in Maine caused by earthquake

Objectives	Actions	Resources	Agency	Results of Action	Status Report 2013
1. Monitoring. Continue to monitor earthquakes.	**A. Monitoring**. Continue instrumental monitoring of earthquake occurrences and collection of intensity reports.	Existing Staff $ F, S, L	MGS	Compilation and analysis of data base on earthquake occurrences and effects	MGS monitors seismic activity throughout the State. As planned.
	C. Communication. Communicate with regional seismologists to gather information. Continue to educate and inform the public and other State and local agencies.	Existing Staff $ S	DOC/ MGS	Guidance to private and public decision-makers	USGS now managing system

B, C. Evaluation and Prioritization of Actions

Each of the preceding goals, objectives and actions were analyzed, evaluated and prioritized by the Hazard Mitigation Team using the following criteria:

- Population benefited
- Environmental soundness
- Probability of funding
- Technical feasibility for implementation
- Improved information for better hazard mitigation

The criteria table that was used to evaluate and prioritize the preceding actions is shown below.

MITIGATION ACTION CRITERIA TABLE

Criteria Category	4 Points	3 Points	2 Points	1 Point	0 Points
Population Benefited	Over 1 Million	500,000 to 999,999	100,000 to 499,999	10,000 to 99,999	1 – 9,999
Environmental Soundness	Greatly improves the environment	Small improvement to environment	Neutral impact to environment	Small impact to environment	Causes harm to environment
Probability of Funding	Funds are already available	Grants with matching funds required	Requires one year investment	Requires long term investment	No chance of funding
Technical Feasibility	Very easy to implement	With effort, can put into place in 1 year	Requires regulatory changes only	Requires statutory changes	No chance of implementation
Informed Decision-Making	Greatly improves info for better management	Small improvement in info for better mgt	Public service information only	Information for small # of people	No improvement in info for better mgt
Cost Effectiveness	Highly Cost Effective	Moderately Cost Effective	Somewhat Cost Effective	Possibly Cost Effective	Unknown, or Not Cost Effective

The criteria points worksheet used to evaluate each of the actions is shown on the next page.

MITIGATION ACTIONS – CRITERIA POINTS WORKSHEET

Actions	Pop. Ben.	Envir. Sound.	Prob. Fund.	Tech. Feas.	Inform. Dec.	Cost Effect.	Total Points
Administration							
1A 406 program education	4	2	4	4	4	4	22
1B 406 program - project identification	4	2	4	4	4	4	22
2A Plan integration	4	2	3	3	3	4	19
2B County plan updates	4	2	3	3	3	4	19
2C Standardization	4	2	3	4	4	4	21
2D State plan update	4	2	3	4	4	4	21
3A MEMA website	4	2	4	4	4	4	22
3B Community outreach	4	2	4	3	2	4	19
3C Workshops	4	2	4	3	4	4	21
3E Early warning systems	4	2	3	3	4	4	20
4A Additional staff	4	3	1	4	4	4	20
4B Prioritization MEMA staff	4	2	4	4	4	4	22
5A Mitigation committee	4	3	4	4	4	4	23
5B Leveraging partnerships	4	4	4	4	4	4	24
5C Hazard additions to GIS system	4	4	3	3	4	4	22
5D Potential loss data, State facilities	4	2	3	3	4	3	19
6A Best practices manual	4	4	3	3	4	3	21
6B Administration Plan	4	2	4	4	4	3	21
Flooding							
1A Workshops on geo-synthetics	4	4	3	3	4	4	22
2A Map modernization	3	4	4	4	4	4	23
2B Coastal LIDAR maps	3	4	3	4	4	4	22
3A Monitor sea level rise	4	4	3	4	4	4	23
4A Monitor watershed development	4	3	2	3	3	3	18
4B Watershed recommendations	3	3	3	3	2	3	17
5A GIS mapping of dams	1	2	2	3	1	2	11
6A County plan updates	4	3	3	3	3	3	19
Winter Storms							
1A County plan updates	4	3	3	3	3	3	19
Summer Storms/Hurricanes							
1A Flood plain mgt recommendations	1	2	3	3	3	2	14
1B DEP project review	1	3	3	3	3	2	15
2A County plan updates	4	3	3	3	3	3	19

Actions	Pop. Ben.	Envir. Sound.	Prob. Fund.	Tech. Feas.	Inform. Dec.	Cost Effect.	Total Points
Erosion/Landslides							
1B Policy development	1	3	4	3	3	4	18
1A Coastal beach mapping	1	2	4	3	4	4	18
2A Analysis	1	2	4	3	4	4	18
2B Maine Beach Monitoring Project	1	2	4	3	4	4	18
Wildfires							
1A Community assessments	1	2	3	3	1	4	14
2. County plan updates	4	3	3	3	3	3	19
Drought							
1A Continue monitoring	4	2	3	3	4	4	20
1B Action plan when needed	4	0	2	3	0	3	12
Earthquake							
1A Continue monitoring	4	2	3	3	4	4	20
1B Communication	4	2	4	4	4	4	22

D. How each Activity Contributes to the Overall State Mitigation Strategy. The format of the Goals, Objectives and Actions contained on the previous pages demonstrates how each action relates to the overall strategy:

- The overall strategy is arranged by topic area (Flooding, Winter Storms, Wildfire, etc.).
- For each topic area, there is a general goal (for example ”reduce loss of life, injury and property damage caused by flooding.”
- For each topic area, there are a series of broad objectives aimed at achieving the goal(s),
- For each objective, there are one or more actions aimed at implementing the objective.
- For each action, there is an indication of the resources required for implementation, the responsible agency, the time frame, and a summary of the results of the action.
- The “Results of Action” column contains a brief description of how the specific action contributes to the overall strategy.
- The “Status Report” column describes what has been done to implement the strategies.

E. Actions and Strategies Contained in County, Local and University System Plans

This 2013 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 in this Plan of all of the goals, objective, strategies and recommended projects from these plans would very cumbersome and redundant. Copies of these plans are on file with MEMA and some are available on line 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.

FUNDING SOURCES	
Requirement §201.4(c)(3)(iv). [The State mitigation strategy shall include an] identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities.	
Elements	*A. Does the new or updated plan identify current sources of Federal, State, local or private funding to implement mitigation activities?*
	B. Does the new or updated plan identify potential sources of Federal, State, local or private funding to implement mitigation activities?
	C. Does the updated plan identify the sources of mitigation funding used to implement activities in the mitigation strategy since approval of the previous plan?

A, B, Current and Potential Sources of Federal, State, Local or Private funding for Mitigation. The State of Maine and local jurisdictions use several funding sources to implement hazard mitigation activities. The majority of the funding comes from federal and municipal programs. Federal funds are typically managed by the State. Over the past three years, there has been no improvement in federal or state funding capabilities for hazard mitigation.

The State is interested in pursuing other sources of funds and encouraging municipalities, Maine residents and local businesses to invest in hazard mitigation measures. Some existing and potential funding sources are included in the table below.

Current and Potential Funding Source	**Purpose**	**Hazard**	**Pre- or Post-Disaster**	**Estimated Amount (Annual)**
FEDERAL				
Hazard Mitigation Grant Program **(HMGP)**	Implement long-term mitigation strategies	All-Hazards	Post	15% of declared Disaster damage
Pre Disaster Mitigation Grant **(PDM)**	Provide planning and projects to lessen impacts of disasters	All-Hazards	Pre	Unknown; needs Congressional approval
Flood Mitigation Assistance Program **(FMA)**	Planning, Project & Technical Assistance Grants	Flooding	Pre	Unknown; varies from year to year
Community Development Block Grant **(CDBG)**	Improve community services and facilities	Flooding	Pre	$3,000,000
FEMA FIRE Grants	Upgrade community emergency services	All-Hazards	Post	$10,000,000
Homeland Security Grants	Upgrade community emergency response and homeland security capabilities	All-Hazards	Post	$3,400,000 in 2013
US DOA National Resources Conservation Service **(NRCS)**	Provide funds to farmers and individuals to incorporate erosion control and stormwater management into their farming practices or private property.	Flooding	Pre/post	Varies
Emergency Management Performance Grants	Funds to help educate the public on natural and technological hazards	All-Hazards	Pre	$1,700,000
Disaster Housing Program	Small grants to incorporate hazard mitigation into home repairs	All-Hazards	Pre	% of disaster

Current and Potential Funding Source	Purpose	Hazard	Pre- or Post-Disaster	Estimated Amount (Annual)
STATE				
Maine Highway Fund **(MaineDOT)**	Provide funding for highway road maintenance and capital improvements	All hazards	Post	Varies
Environmental Protection Permits **(DEP)**	Enforce compliance with stormwater management and erosion control	Flooding	Pre	Varies
MUNICIPAL				
Municipal Mitigation Projects	Construct long-term upgrades to local roads and bridges	Flooding	Pre	Varies by community
Municipal rainy day funds	Funding for unanticipated needs including emergencies	All Hazards	Post	Varies
PRIVATE				
Individual households	Purchase flood insurance	Flooding	Pre	Varies
Individual households	Purchase homeowners' insurance	Fire, wind, other	Pre	Varies

*The majority of these funding sources are highly competitive and the amounts can differ greatly. In addition, some funding sources (Community Development Block Grants, Maine Highway Fund, Land Use Impact Fees) are only **marginally** related to hazard mitigation.*

C. Sources of Potential Mitigation Funding The following is a summary of the funding sources that were used to implement various implementation actions.

- Hazard Mitigation Grant Program (HMPG)
- Pre-Disaster Mitigation Grant Program (PDM)
- Flood Mitigation Assistance – for insured policy holders only (FMA)
- Homeland Security Grants
- Emergency Management Performance Grants (EMPG)

SECTION 5 – COORDINATION OF LOCAL MITIGATION PLANNING

Local Funding And Technical Assistance	
Requirement §201.4(c)(4)(i) [The section on the Coordination of Local Hazard Mitigation Planning must include a] description of the State process to support, through funding and technical assistance, the development of local mitigation plans.	
Element	*A. Does the new or updated plan provide a description of the State process to support, through funding and technical assistance, the development of local mitigation plans?*
	B. Does the new or updated plan describe the funding and technical assistance the State has provided in the past three years to assist local jurisdictions in completing approvable mitigation plans?

A. Description of State Process to Support Development of Local Plans

Through the FEMA PDM-C grants, administered through MEMA, Maine's 16 counties received funding for updating their Multi-jurisdictional Hazard Mitigation Plans. While not *direct* funding, the State's 800 number, classroom space for meetings, and staff travel time all made it easier and less expensive for the local municipalities to participate in the planning process.

In addition, 13 MEMA staff members are involved in constant workshops and training exercises. Providing technical assistance to the towns and counties is greatly affected by distances and weather conditions. It requires a day of driving to travel the miles between the towns of Kittery (York County) and Fort Kent (Aroostook County). However, as previously documented in Section 2 (planning), representatives from the State and FEMA have provided technical assistance by driving to all sixteen counties and all corners of Maine, quite literally to the furthest points east, south, north and west. This effort paid off, as demonstrated in the table of re-approved FEMA plans contained in Section 2.

Additional face-to-face meetings occurred monthly when the County Directors met at MEMA. Time on the agenda was often used to update information relevant to the county and state plans. When travel or meetings are not possible, emails and telephone conference calls (TELCOMs) are used extensively to answer questions ranging from mapping hazards to writing narratives.

A combination of mail, email, and MEMA Website calendar notices are used to inform the 492 jurisdictions and 16 County Directors, respectively, of the FEMA "Grant Development and Cost Benefit Workshops."

Lastly, TELCOMs between FEMA, MEMA, Counties, consultants and local officials assure that all parties are getting the same information in real time. Topics range widely from TELCOMs used for planning, alerting and State response during a disaster, to narrative descriptions to mapping to documentation. This clarified plan requirements as well as minimized travel.

B. Description of Funding and Technical Assistance, Last Three Years

Section 2 of this plan includes a summary of key planning meetings and conferences that were held since 2010 as the counties updated their plans. Additionally, in each county plan there are details of planning meetings with state and/or federal staff. As previously stated, there are no state funds for mitigation assistance, but Maine has provided workshops, training exercise, conferences and technical assistance.

To provide technical assistance on a broader scope, an annual schedule of workshops was delivered throughout the state. Despite the distances, it was rare that a county did not receive at least one workshop per year. In instances when the State receives multiple declarations, a number of the hardest hit counties may receive multiple workshops. Between 2010 and 2013, there were three disaster declarations in Maine. These declarations, and the counties they included, are:

- DR 1953 (Aroostook, Piscataquis, Washington)
- DR 4032 (Franklin, Lincoln, Oxford, York)
- DR 4108 (Androscoggin, Cumberland, Knox, Sagadahoc, Washington, York)

Technical assistance was also steadily available through FEMA Disaster Assistance Employees (DAEs). Depending on their areas of expertise, they have been deployed in Maine to assist in project identification, planning guidance, hazard analysis and/or to provide additional technical information.

Local Plan Integration	
Requirement §201.4(c)(4)(ii) ***Local Plan Integration.*** *[The section on the Coordination of Local Mitigation Planning must include a] description of the State process and timeframe by which the local plans will be reviewed, coordinated, and linked to the State Mitigation Plan.*	
Element	*A. Does the new or updated plan provide a description of the process and timeframe the State established to review local plans?*
	B. Does the new or updated plan provide a description of the process and timeframe the State established to coordinate and link local plans to the State Mitigation Plan?

A. Description of Process and Timeframe to Review County Multi-Jurisdiction Plans

For the first time in 10 years, the multi-jurisdiction plans were updated about the time the state hazard mitigation plan was being updated (2012-2013). This allowed for better roll-up of information from the county multi-jurisdiction plans. As previously described in the risk assessment, MEMA provided guidance so that the county plans followed a standardized format. MEMA reviewed each section of the plans as they were completed and, where warranted, suggested changes to better address the requirements.

B. Description of Process and Timeframe to Coordinate and Link Local Plans to the State Mitigation Plan

As previously described, MEMA developed plan guidance in 2009 that the counties used to update their multi-jurisdictional hazard mitigation plans between late 2009 and the end of 2012. The guidance required consistent formats for easier comparisons. These included checklists for participation in the planning section and profiling each hazard in the "location, extent, occurrence, probability" sequence required by the federal code in the risk section. This greatly facilitated the state review process of the county plans and the incorporation of relevant information from them into the state plan.

Prioritizing Local Assistance	
Requirement §201.4(c)(4)(iii): ***Prioritizing Local Assistance.*** *[The section on the Coordination of Local Mitigation Planning must include] criteria for prioritizing communities and local jurisdiction that would receive planning and project grants under available funding programs, Which should include consideration for communities with the highest risks, repetitive loss properties, and most intense development pressures.* *Further, that for non-planning grants, a principal criterion for prioritizing grants shall be the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs.*	
Requirement §201.4(d): (The) Plan must be reviewed and revised to reflect changes in development, progress in statewide mitigation efforts, and changes in priorities…	
Element	*A. Does the new or updated plan provide a description of the criteria for prioritizing those communities and local jurisdictions that would receive planning and project grants under available mitigation funding programs?*
	B. For the new or updated plan, do the prioritization criteria include, for non-planning grants, the consideration of the extent to which benefits are maximized according to a cost benefit review of proposed projects and their associated costs?
	C. For the new or updated plan, do the criteria include considerations for communities with the highest risk?
	D. For the new or updated plan, do the criteria include considerations for repetitive loss properties?
	C. For the new or updated plan, do the criteria include considerations for communities with the most intense development pressure?

A. Description of Criteria for Prioritizing Jurisdictions that Would Receive Planning and Project Grants

The criteria for planning and project grants are specific and are spelled out in the Administrative Plan that is at the end of this section. Re-approved in April 2013 for DR-4032 and re-approval again on 23 July 2013 for DR-4108, it clearly identifies:

- All projects must have a benefit/cost ratio of at least one
- Eligibility
- Applicant notification
- Project identification
- Application procedures
- Review, ranking and selection of projects
- Project management, including closeout

B. Consideration of Cost Benefit Analysis

The cost benefit criteria is heavily stressed in the following ways:

- it is stressed in all field work and technical assistance meetings
- it is stressed in mailings to towns announcing new rounds of hazard mitigation funding
- it is stressed in MEMA's "Grant Development Workshops"
- It is stressed in MEMA's brochures and handouts
- It has been prominent on the YES/NO eligibility page on MEMA's web site for five years

C. Consideration of Communities with Highest Risk

See Section 7.B 2, page 5-12.

D. Consideration for Communities with Repetitive Loss Properties

A few communities with repetitive loss properties were identified in the updated versions of the County Hazard Mitigation Plans. When potential projects meet the new benefit to cost analysis (BCA), and where communities are willing to apply on behalf of the owners, applications with scores of 70 or greater from the Review Council are forwarded to FEMA for funding.

E. Consideration for Communities with Most Intense Development Pressure

In considering which communities need the most assistance, the strategy is to examine those jurisdictions with the most repetitive damages as evidenced by declarations, public assistance records and grant requests.

State of Maine
HAZARD MITIGATION ADMINISTRATIVE PLAN

(Public Law 93-288, Section 404)

Prepared by

Maine Emergency Management Agency
Department of Defense, Veterans, and
Emergency Management

For Disaster Declaration 4108

1. INTRODUCTION

A. PURPOSE

The State Administration Plan outlines how the State of Maine will administer the Hazard Mitigation Grant Program.

B. AUTHORITIES AND REFERENCES

The State will comply with the following:

1) Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended, Section 404 and 409 and the Disaster Mitigation Act of 2000, section 322.

2) FEMA Regulations, 44 CFR, Part 206, Subparts M and N.

3) FEMA Regulations, 44CFR, Part 13, Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments.

4) Executive Order 12612, Federalism.

5) Single Audit Act of 1984, as amended.

C. DEFINITIONS

1) “Application” means the formal request for funding, submitted to FEMA by the state of Maine.

2) "Governor’s Authorized Representative (GAR)" means the individual designated by the governor to represent the State in activities related to the implementation of Public Law 93-288, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, and in ongoing State disaster/emergency preparedness, response and hazard mitigation activities.

3) "Grant" means an award of financial assistance.

4) "Grantee" means a government to which a grant is awarded and which is accountable for use of the funds provided. The Grantee is the entire legal entity even if only a particular component of the entity is designated in the grant award document. The State is the Grantee except as noted.

5) “Hazard Mitigation Plan” (HMP) means a plan prepared by the state, or a local or tribal governments as a condition of receiving federal hazard mitigation funds under Section 322 of the Robert

T. Stafford Disaster Relief and Emergency Assistance Act, as amended by Section 104 of the Disaster Mitigation Act of 2000 (DMA2000).

6) "Interagency Hazard Mitigation Team (IHMT)" means the mitigation team that is activated following declared disasters.

7) “MEMA” means Maine Emergency Management Agency.

8) "Project" means hazard mitigation projects that meet Stafford Act guidelines, proposed by eligible applicants to reduce risk of future damage, hardship, loss or suffering from disasters. The terms “project” and “measures” are used interchangeably.

9) "State Hazard Mitigation Officer (SHMO)" means the individual designated by the Governor and the one who is responsible for all matters related to the Section 404 Hazard Mitigation Grant Program, and all other State of Maine FEMA-funded hazard mitigation programs.

10) "State Hazard Mitigation Program" means the ongoing program that coordinates efforts of local, State and Federal agencies to reduce the threat to people and property from natural and technological hazards.

11) “State Hazard Mitigation Review Council” means the State Hazard Mitigation Officer and her/his appointed panel. The Council represents appropriate State agencies and other representatives who assist the SHMO in identifying and ranking potential projects.

12) "Sub grant" means a grant award of financial assistance to an eligible Sub grantee.

13) "Sub grantee" means the government or other legal entity to which a Sub grant is awarded and which is accountable to the Grantee for the use of the funds. Sub grantees may be a State agency, local government, private nonprofit organization, or Native American Nation.

2. RESPONSIBILITIES

A. State Government

1) 44 CFR, Part 206, Subpart N, Section 206.433 a-c states:

a. Grantee. The State will be the Grantee to which funds are awarded and will be accountable for the use of those funds. There may be sub grantees within the state Government.

b. Priorities. The state will determine priorities for funding. This determination must be made in conformance with Section

206.435.

c, Hazard Mitigation Officer. The State must appoint a Hazard Mitigation Officer, as required under 44 CFR part 206, Subpart M, who serves as the responsible individual for all matters related to the Hazard Mitigation Grant Program.

c. Administrative Plan. The State must have an approved administrative plan for the Hazard Mitigation Grant Program in conformance with Section 206.437.

2) MEMA, within the Department of Defense, Veterans and Emergency Management (DVEM), is designated to administer all Hazard Mitigation Programs including Section 404 programs as defined in this plan.

3) The SHMO, within MEMA, is designated to manage activities of the State Hazard Mitigation Team and is responsible for project management.

4) The State Hazard Mitigation Team members are designated by the appropriate Directors or Commissioners of State Agencies having hazard mitigation expertise and responsibilities. State agencies represented on the State Hazard Mitigation Team are listed in Appendix B to this plan.

B. Local / County Government

The jurisdiction's Chief Executive Officer will designate the point(s) of contact on all matters related to the application.

3. FUNDING

A. The federal share of any selected FEMA 404 project will not exceed 75% of the total project cost. The total federal funds available will not exceed 15% of the Federal share of the FEMA estimate of total damage.

B. The Non-Federal [local] share may exceed the Federal share and may be a combination of other State, local or private funding. The local share may be composed of local government generated revenue, private sector resources, and/or other grant money that law or regulation does not prohibit for this purpose. Any specific requirements for cost-share will be established in FEMA-State Agreements.

4. ELIGIBILITY REQUIREMENTS

The State of Maine's eligibility requirements conform to or exceed Federal standards. Federal definitions are used to determine eligibility.

A. Eligible Grant Applicants are:

1) State and local units of government
2) Private nonprofit organizations or institutions that own or operate a private nonprofit facility as defined in 206.221 (e) 44 CFR
3) Native American Nations and tribal organizations
4) All applicants must be participating in a FEMA approved Hazard Mitigation Plan and in good standing with the National Flood Insurance Program.

B. Eligible Grant Projects must:

1) Solve the problems they are intended to address
2) Conform to the State and Local Hazard Mitigation Plans
3) Address a problem that has been repetitive, or a problem that poses a significant risk to health and safety if left unsolved
4) Have a cost to benefit ratio of at least 1.0
5) Be the most practical, effective and environmentally sound alternative among a range of alternatives that have been considered
6) Contribute, to the extent practicable, to a permanent or long-term rather than temporary or short-term solution to the problem that it is intended to address and avoid unintended consequences
7) Have a direct beneficial impact upon the designated disaster area, whether or not the project is located in the designate area (IAW 44 CFR 206.434[c][2]) and benefit the community rather than an individual
8) Meet all local, state and federal codes, standards, and regulations applicable to the locale.

5. PROJECT IDENTIFICATION

A. List of Projects

Potential Hazard Mitigation projects have been identified and are contained in each local and multi-jurisdictional hazard mitigation plans that have been approved by FEMA. These projects can be updated at any time by the communities through notification of the SHMO and County EMA Director.

B. Public Damage Assessment (PDA) Teams

In addition to the projects already identified in the FEMA-approved local hazard mitigation plans, information acquired during Preliminary Damage Assessments (PDAs) may highlight additional projects. Prior to fieldwork, PDA teams will be briefed on HMGP project eligibility requirements. The PDA teams will forward potential projects directly to the SHMO and not to potential applicants.

6. APPLICANT NOTIFICATION

A. Public Assistance Briefings

The State will coordinate the presentation of information on the Hazard Mitigation Grant Program at Public Assistance and Applicant's Briefings. **The intent of Applicant Briefings is to create an early awareness of 406 and 404 Mitigation opportunities.**

B. Notice to Potential Applicants

When sufficient funding is available for the Hazard Mitigation Grant Program (HMGP) to warrant the solicitation of new applications, an invitation to apply will be sent to the chief elected official of each community and the County Emergency Management Directors in Maine. The State will solicit projects already developed and ranked by the communities in the FEMA-approved Hazard Mitigation Plans.

C. Special Briefings and Workshops

As necessary, detailed Hazard Mitigation Grant Program briefings or workshops will be scheduled in areas that have been most impacted. The briefings or workshops will describe eligible activities application procedures, benefit cost analysis, key deadlines, award and funding process and Sub grantee administrative requirements.

7. APPLICATION AND REVIEW PROCEDURES

A. Submission of Applications to the State

1) Application forms**,** ranking criteria and guidelines are available on line at the MEMA website. Additionally, informational materials and workshops will be provided**.** (See MEMA website:http://www.maine.gov/mema/mitigation/mema_mit_grants.shtml)

2) Applications from sub grantees will be completed by the responsible community entity or private nonprofit organization and signed by the Chief Executive Officer of the jurisdiction or organization.

3) Applications must indicate that the work can be completed one year from the date of FEMA approval of the grant, i. e. the

performance period. An exception may be granted to this requirement if circumstances warrant.

4) Applications must include a detailed scope of work that matches the cost estimates of the project, including any administrative costs.

5) Sub grantee applicants must include written commitment to its cost share and to future maintenance.

6) **Applications must be submitted to the SHMO by 5:00PM** on the announced due date.

B. Review, Ranking and Selection of Projects

1) Review

The State Hazard Mitigation Grant Program Review Council reviews and recommends 404 grant projects to the SHMO for funding.

2) Ranking

The Council reviews and ranks each application based on ten criteria found on the State Ranking Sheet. (See MEMA website: http://www.maine.gov/mema/mitigation/mema_mit_grants.shtml)
This ranking will be in accordance with the criteria in Section IV B and 44 CFR Section 206.434 (c).

The proposed mitigation project:

a. Will protect life and safety

b. Will protect primary residences, essential services and critical facilities

c. Will have the greatest potential for reducing future disaster losses and breaking the damage/repair cycle

d. Will comply with the community's flood plain ordinance

e. Is well-designed, well-organized, and demonstrates the technical capacity to undertake and successfully complete the proposed measures;

f. Indicates a degree of commitment and support by the community(ies) that it impacts (e.g. active participation, including financial, by local beneficiaries, public and private);

g. Accomplishes, where practical, multiple objectives or multi-purpose projects versus single purpose projects, including environmental enhancement and economic recovery;

h. Complies with the Local and State Hazard Mitigation Plans

i. Encourages regional or multi-agency cooperation

3) Selection - Applications with Council scores of ***70 or better*** will be forwarded to FEMA. Applications with lower scores may be re-considered if the project and or application can be improved.

C. Notification of Decision to Applicants

Following selection of projects to be submitted to FEMA for 404 funding, the SHMO will notify each applicant of the decision, including their scores and Council comments.

D. Submission of Selected Projects to FEMA

1) The SMHO will ensure that program requirements are met and that each application contains the items listed in Appendix A and below:

a. A statement that the project meets all eligibility requirements as listed in Section IV

2) The SHMO will send a complete package of the highest scoring applications to FEMA. If not already submitted, the package will include SF 424 (Application for Federal Assistance) and a SF 424D (Assurance for Construction Programs) for each disaster.

3) The SF 424 must be signed by the GAR and forwarded to FEMA within 60 days of the disaster declaration. If this deadline cannot be met a request for extension shall be submitted to FEMA within 60 days.

8. PROJECT MANAGEMENT

A. Administration

1) All 404 mitigation funding approval for the Grantee and Sub grantee is based on 75-25 cost sharing provisions outlined in the FEMA-State Agreements or other published guidance. The Non-Federal share may exceed the Federal share and may be a combination of other State, Local or private funding.

2) Obligation of Federal funds will not take place until approval has

been received for the project from FEMA.

3) A financial record keeping system will be implemented for the duration of the project and archiving. The Sub grantee will submit quarterly progress reports to the SHMO, beginning the first full quarter after receipt of the funding. These reports will describe the status and projected completion date of the project, and any problems affecting the completion date, scope, or cost, which could result in non-compliance with approved grant conditions. The SHMO will submit reports to FEMA as required. The final report will be a complete assessment of project accomplishment.

4) Roles and responsibilities

    a. Sub grantee (applicant)

        i. Insures that all work complies with local, state and federal codes, specifications and standards

        ii. Implements monitoring procedures and submits quarterly progress reports to the SHMO as directed at the time grant is awarded

        iii. Maintains financial records and receipts to document all expenditures connected with the project

    b. Grantee (State/SHMO):

        i. Is responsible for overall grant administration

        ii. Serves as Project Manager; overseeing project from conception through completion.

        iii. Monitors and evaluates project, adherence to work schedule and budget, reviews all documents leading to project completion

        iv. Maintains financial records and progress reports documenting how funds were distributed to Sub grantee(s). Reviews and submits quarterly reports to FEMA as required

        v. Provides technical assistance to Sub grantees as necessary

        vi. Assures necessary interagency coordination

on all aspects of the Program

c. Governor's Authorized Representative (GAR).

i. Certifies that all claims and costs are eligible and in compliance with provisions of the FEMA/State Agreement. Submits claims to the Regional Director for payment.

B. Financial Administration

1) MEMA is the Grantee for project financial administration in accordance with 44 CFR, Part 13. Sub grantee(s) (applicants) are accountable to the Grantee for funds that have been awarded.

2) Allowable costs associated with administering the program are authorized in accordance with Section 206-439, 44 CFR and the new 44 CFR Part 207 Part III D.1.3. Management costs will not be passed through to sub grantees. The 4.8% management costs will be used for additional technical assistance and shown as separate line items approved by the GAR.

Upon receipt of the initial Lock-In notice, MEMA will request 25% funding of management costs identified in that notice. When the 12 Month Lock-In amount is established, MEMA will request 100% of available management costs.

3) Reimbursement

a. The Grantee and Sub-grantee will establish reasonable procedures to ensure timely payment of the funds

b. The Grantee will pay Sub grantees on a reimbursement basis. Upon receipt and review of invoices and project status reports funds will be drawn down

c. Only up to 80% of the federal share will be paid until after the project is completed and meets inspection in accordance with the FEMA "Record of Environmental Consideration" and the "Project Review and Conditions Status."

d. Final federal share will be paid after: project completion, successful inspection, and all required forms and reports have been signed and received.

4) Audit Requirements

a. State Audit

i. The Grantee, and each Sub grantee, that receives $25,000 or more in federal financial assistance, shall have audits made in accordance with 44 CFR Part 14

ii. The GAR shall assure that these audits are performed on a timely basis

iii. The GAR shall review audits completed for the Grantee and Sub grantees. If adverse findings are reported, the GAR shall assure that appropriate action is taken and report that action to FEMA

iv. The GAR shall provide a copy of all audits performed on Section 404 projects to the FEMA Inspector General.

b. Federal Audit

FEMA may elect to conduct a federal audit of the Section 404 Grant or on any of the sub grants

C. Appeals

1) Applicant Responsibility

a. The applicant may appeal a decision on applications for mitigation grants

b. The appeal will be submitted in writing and contain sufficient information to warrant reconsideration by the GAR

c. Appeals must be submitted to the GAR within 60 days from the date of the action being appealed

2) GAR Responsibility

a. The GAR may, on behalf of an applicant or the state, appeal any FEMA determination of federal assistance. Local appeals must be submitted in writing through the GAR.

b. The GAR appeal shall be in writing and submitted to FEMA within 60 days from the date of the action being appealed.

D. Cost Overruns

1) Before work is done, that might incur cost overruns, sub grantee must notify SHMO in writing and provide legitimate rationale.

2) The SHMO and GAR evaluate every cost overrun and when justified, and funds are available, may approve an additional amount if it meets the cost/benefit criteria. Cost overruns will be approved only when grant funds are available

3) The SHMO will forward cost overruns exceeding 10% of project cost to the FEMA Regional Director for appropriate action

E. Project Closeout

1) When all final inspections and reports are complete and payments of funds have been disbursed, the project is closed.

2) The GAR determines eligible administrative allowance and requests reimbursement from FEMA.

3) MEMA will document the closeout and send FEMA a letter requesting project closeout, and no further disbursements will be made.

9. PLAN REVIEW

To ensure compliance and implementation of new local, state and federal laws, policies and regulations, this plan will be reviewed annually, or at the time of disaster declarations or program administration changes. The State will then submit it to FEMA Region I for approval.

Note: This administrative plan is already part of the State's overall emergency response and operations plan, specifically on pages J-4 and J-6 of Annex J (ESF 14) Long-term Community Recovery & Mitigation of the *"Comprehensive Emergency Management Plan* State of Maine" published in March 2007.

SECTION 6 – PLAN MAINTENANCE PROCESS

Monitoring, Evaluating, and Updating the Plan	
*Requirement §201.4(c)(5)(i) [The Standard State Plan Maintenance Process **must** include an] established method and schedule for monitoring, evaluating, and updating the Plan.*	
Element	*A. Does the new or updated plan describe the method and schedule for monitoring the plan? (e.g., identifies the party responsible for monitoring, includes schedule for reports, site visits, phone calls, and/or meetings)*
	B. Does the new or updated plan describe the method and schedule for evaluating the plan? (e.g., identifies the party responsible for evaluating the plan, includes the criteria used to evaluate the plan)
	C. Does the new or updated plan describe the method and schedule for updating the plan?
	D. Does the updated plan include an analysis of whether the previously approved plan's methods and schedule worked, and what elements or processes, if any, were changed?

A. Monitoring the Plan

Since mitigation actions are now tied to the goals in the Plan, Section 4 of the Plan has been monitored monthly as part of regular meetings with county and state officials and also after Disaster Declarations as described in the next section on "Activities." As previously noted in the Planning section, the County Directors meet monthly at MEMA and immediate concerns about the Plan can be addressed then. Since the public has occasionally also used those meetings as a way to address specific issues, there is another opportunity for input.

B. Evaluating the Plan

As before, 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. MEMA's evaluation of the Plan will be based on State needs, budget, laws or new federal guidelines. It will be updated as needed to reflect hazard changes, additional mapping resources, regulatory changes or to generally improve mitigation program management.

C. Updating the Plan

The Plan will be revised within three years. To accomplish this, it will be reviewed on an annual basis by the State Hazard Mitigation Officer and the Senior Planner. A review will occur after the winter and usual spring flooding months to properly assess any changing storm impacts and to review reports from the River Flow Advisory Committee. 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.

D. Evaluation of whether Previous Plan's Methods and Schedules Worked

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 and other plans are updated, they will follow the same format, thus allowing better coordination between local plans and the State Plan. That helped tremendously with the 2013 update, as previously described **in**

Section 2 (planning), especially in comparing the Risk sections, but further standardization will be developed to include one methodology for assessing financial impacts of the profiled hazards.

Monitoring Progress of Mitigation Activities	
Requirement §201.4(c)(5)(ii) [The Standard State Plan Maintenance Process must include a] system for monitoring implementation of mitigation measures (actions) and project closeouts.	
Requirement §201.4(c)(5)(iii) Monitoring Progress of Mitigation Activities[The Standard State Plan Maintenance Process must include a] system for reviewing progress on achieving goals as well as activities and projects in the Mitigation Strategy.	
Element	*A. Does the new or updated plan describe how mitigation measures and project closeouts will be monitored?*
	B. Does the new or updated plan identify a system for reviewing progress on achieving goals in the Mitigation Strategy?
	C. Does the new or updated plan describe any modifications, if any, to the system identified in the previously approved plan to track the initiation, status and completion of mitigation activities?
	D. B. Does the new or updated plan identify a system for reviewing progress on implementing activities and projects of the Mitigation Strategy?
	E. Does the updated plan discuss if mitigation actions were implemented as planned?

A. How Mitigation Measures and Closeouts will be Monitored

PDM, HMGP and FMA grant project activities have been monitored according to Section 8, Project Management of the State's Hazard Mitigation Administrative Plan. This includes the administration, roles and responsibilities and financial administration of the projects. Again, according to standard business and accounting practices, it is a monthly process. MEMA has developed spreadsheets for tracking the status of plans and projects. The state Admin Plan has been updated after every declaration for the last two decades. After the February 2013 blizzard declaration (DR-4108) it was decided that, going forward, the cover of the plan and footers will be named by the declaration number instead of a "version number" which will be more specific and meaningful.

Due to resource limitations, and the previously described distances across the state, site visits will usually be limited to pre-application and final inspection. 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 acquisition/demolition, will receive much more frequent monitoring based on circumstances.

Specifically, the close out process includes the following steps:

- Monthly or quarterly reports (depending on size and scope of project)
- Matching of invoices to expenses
- Final site inspection (dual inspection by MEMA and FEMA whenever possible)
- Final documents signed by sub-grantee
- Written request to MEMA business office to pay final amount
- Written notification to sub-grantee that payment has been processed
- Written notification to FEMA that the project has been closed

B. 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 the

Mitigation Planner and/or as part of the agenda at one of the above referenced monthly meetings. Progress of state mitigation activities will be coordinated on an annual basis or after a Disaster Declaration by TELCOMs between the Mitigation Planner and the agencies identified in the State Capability Assessment table.

C. Modifications to Track Initiation, Status and Completion of Mitigation Activities

The current system used to track the initiation, status and completion of mitigation activities appears to be working well. No modifications are proposed, other than the timeframes noted above. If any deficiencies are identified, they will be addressed in the new HMA Plan.

D. System for Reviewing Progress on Implementing Activities and Projects

The "Goals/Objectives and Strategic Measures (Actions)" table on pages 4-20 through 4-36 of the Mitigation Strategy contains a column entitled Status Report. As each action is completed, the status report column is updated.

E. Implementation of Mitigation Actions from Previous Plan

See Status Report column contained in Section 4, pages 4-19 to 4-32 of this 2013 Plan, with regard to how implementation was or was not achieved, as well as the summary of how hazard mitigation capabilities of the State have changed since 2010 (pages 4-13 to 4-14).

Schedule: Day 1 *(April 23rd, 2013)*

7:00-8:00	***Registration and Continental Breakfast*** *– Lobby & Exhibit Area*					
8:00-8:25	***Introduction*** *~ Conference Host* & ***National Anthem*** *~* ***Cony High School Madrigal Singers*** *~ Banquet Area*					
	Welcoming Remarks *~* ***Director Robert McAleer*** *~ Banquet Area*					
Break-out Sessions	***Home & Family***	***Communities***	***Schools***	***Emergency Management***		***Hazmat***
8:30-9:40	1. Preparedness for Hurricanes and Tropical Storms *John Jensenius*	2. Floodplain Management and Flood Mapping *Sue Baker*	3. Safe Schools _An Oxymoron? *Mark Bridgham*	4. Family Assistance in Mass Casualty *Gretchen Wilson, RN* *Jan Frost, MSW*	5. A Pictorial Tour of Historical Flooding in Maine Gregory Stewart	6. Is there something out there? Effectively using sniffers like PID, FID and MOS and sensors. **Part I** *Chris Wrenn*
Room	*Washington*	*Andro-Aroostook*	*Cumberland*	*Penobscot*	*Lincoln-Oxford*	*Kennebec*
9:40-10:00	***Networking Break*** *– Banquet & Exhibit Area*					
10:00-11:10	7. Modern Fuels & Fire: Considerations for Citizens & Town Officials *Vicki Schmidt*	8. Community Resiliency Efforts in Coastal Maine *Pete Slovinsky*	9. The Effective Use of Behavioral Assessment and Risk Mitigation Teams to Manage Concerning Behaviors in Schools *Cornel Plebani*	10. Leverage Donated Services to Maximize the Amount of FEMA Public Assistance Funds *Michael Ashmore* *Pamela Zutenhorst*	11. What Can information Technology Do for Me, and How do I Choose, Apply and Use it for my Organization? *Paul Weiss*	12. Is there something out there? Effectively using sniffers like PID, FID and MOS) sensors. **Part II** *Chris Wrenn*
Room	*Washington*	*Andro-Aroostook*	*Cumberland*	*Penobscot*	*Lincoln-Oxford*	*Kennebec*
11:20-12:15	***Keynote Presentation:*** ***The Sandy Hook Elementary School Tragedy: An Emergency Response Retrospective***					
12:15-1:15	***Lunch –*** *Emergency Manager of the Year, County EMA Council Award & Door Prizes – Banquet Area*					
1:15-2:20	13. Maine's Fire Burden: Losses and the Cost of Fire *Richard Taylor*	14. Balancing Safety, Security and Emergency Management: Understanding the Active Shooter Threat and how to address it in schools and the workplace *Larry Fitzgerald & Simon Vanleeuwen*	15. All Hazards Assessment for Schools *Richard Bishop*	16. The Day After: Conducting a Local Damage Assessment of Residences and Businesses *Richard Higgins*	17. National Weather Service Decision Support Services *Noelle Runyan*	18. CAMEO-MARPLOT *Stefan Coutoulakis* *Len Wallace*
Room	*Washington*	*Andro-Aroostook*	*Cumberland*	*Penobscot*	*Lincoln-Oxford*	*Kennebec*
2:30-2:45	**Networking Break ~** Exhibit Area					
2:45-4:00	19. Responding to Violence in the Workplace & the Community *Mark Hyland* *Tennie Shardlow*	20. Responding to Sandy Hook's School Assistance Center *Jan Frost* *Anthony Ng*	21. Planning an Active Shooter Exercise for Your School *Jeremy Damren* *Matthew Scott*	22. FEMA – IPAWS *Lynette Miller*	23. On-Line Collaboration for Maine Emergency Managers *Dale Rowley*	**24.** School Chemicals *Dwight Peavey*
Room	*Washington*	*Andro-Aroostook*	*Cumberland*	*Penobscot*	*Lincoln-Oxford*	*Kennebec*

Schedule: Day 2 *(April 24th, 2013)*

7:00-8:00	***Registration and Continental Breakfast*** *~ Lobby & Exhibit Area*						
8:00-8:20	***Introduction*** *~ Conference Host ~ Banquet Area*						
	Welcoming Remarks *~ Director Robert McAleer ~ Banquet Area*						
Break-out Sessions	***Home & Family***	***Schools***	***Communities***	***Emergency Management***		***Hazmat***	
8:30-9:40	25. Home & family Preparedness for Emergencies and Disasters *Tennie M. Shardlow*	26. Securing a COPS Grant *Judy Paolucci*	27. Need an Antidote? Maine's Pharmaceutical Caches *Karen Simone* *Tamas Peredy*	28. Communication Unit Leader (COML) *Steve Mallory* *Rick Andreano*	29. USDA Emergency Response Programs and Partnering Opportunities for Rural & Community Federal Assistance through USDA *Ken Gustin*	30. General Duty Clause *Jim Gaffey*	31. Radiation – How do you find it? *Al Nygren*
Room	*Hancock*	*Penobscot*	*Washington*	*Sagadahoc*	*Andro-Aroostook*	*Lincoln/Oxford*	*Kennebec*
9:40-10:00	***Networking Break ~*** *Banquet & Exhibit Area*						
10:00-11:10	32. Disaster Behavioral Health in the Aftermath of Violence *Pamela Holland*	33. The Big Yellow *Cheryl Brackett*	34. Point of Dispensing Demo: Come walk through before you have to! *Joe Legee* *Caity Hager*	35. Interoperability with the State's NEW Public Safety Radio Communications Network (MSCommNet) *Craig Hitchings, et al*	36. Boy Scouts and Emergency Management: An Untapped Resource *Paul Conley*	37. Dangerous drug trends in Maine *John Richards*	38. "Permit Required": Confined Space Entrant and Attendant Training *Sue Roy*
Room	*Hancock*	*Penobscot*	*Washington*	*Sagadahoc*	*Andro-Aroostook*	*Lincoln/Oxford*	*Kennebec*
11:20-12:15	***Keynote Presentation: EMAC Deployment : Response to Hurricane Sandy (panel presentation)***						
12:15-1:15	***Lunch ~*** *Team Challenge Awards & Door Prizes – Banquet Area*						
1:15-2:30	39. Generators: Demystifying Emergency Power *Steve Belcher*	40. School Security Options *Brad Norris*	41. Humane Society of the US Response to Hurricane Sandy in Shelters, On Hotlines & in the Field *Katie Hansberry, et al. (panel discussion)*	42. Emergency Communications Made Simple *Richard Beausoleil*	43. Managing Expectations After a Disaster *Robert Bohlmann*	44. DEP – Lessons Learned *Darian Higgins* *Andrea Lassalle*	45. Firefighter Response to Common Haz-Mat Emergencies *Scott Luciano*
Room	*Washington*	*Penobscot*	*Cumberland*	*Sagadahoc*	*Andro-Aroostook*	*Lincoln/Oxford*	*Kennebec*
2:30-4:00	**MALEM Meeting Hancock**						

Note: *The* ***Hazmat Team Challenge*** *will be conducted from 9:00-11:00 am, April 24th outside in the south parking lot, adjacent to the cargo entrance. Both HAZMAT technician and operations teams will be competing. Best of luck, HAZMAT teams!*