STATE OF MAINE
HAZARD MITIGATION PLAN

Photo by John Cannon, National Weather Service

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HAZARD MITIGATION PLAN
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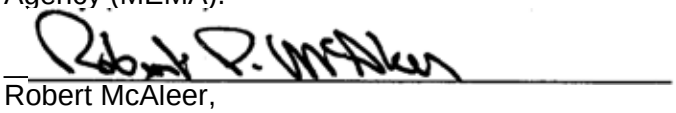
SECTION 1 – PREREQUISITES AND INTRODUCTION

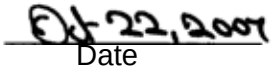
PREREQUISITES

§201.4(c)(6):	*The plan **must** be formally adopted by the State prior to submittal [FEMA] for final review and approval*

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 Hazard Mitigation Plan 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



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§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 period for which it receives grant funding, in compliance with 44 CFR 13.11(c). The State will amend its plan when ever necessary to reflect changes in State of Federal laws and statutes as required in 44 CFR 13.11(d).*

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, have required federal assistance. *The Maine 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 and 2004. In accordance with new Federal Emergency Management (FEMA) guidelines, this 2007 version reflects the most recent research, analysis and mitigation planning.

Authority. The 2007 *Maine Hazard Mitigation Plan* (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 Maine Hazard Mitigation 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 blight/infestation 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 Departments of Agriculture and Conservation, the Fire Marshall's Office and the State Planning Office.

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 run off, 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 2000 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 41.3 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**	**2000 USA**
Population		
Total Population	1,274,923	281.421,906
% White	96.9	62.6
% Black	0.5	12.3
% American Indian	0.6	0.9
% Asia	0.7	3.6
% Hispanic Origin	0.7	12.5
Households		
Total Households	518,200	105,480,101
Household Units	651,901	115,904,641
Average Household Size	2.39	2.6
Income		
Median Household Income ($)	**37,240**	**41,994**
Persons below poverty, %1997	10.9	12.4
Children below poverty, %1997	13.0	16.1
Sex and Age		
Median Age, Total Population	38.6	35.3
% Female	51.3	50.9
% Male	48.7	49.1
% Under 5 Years	5.5	6.8
% 18 Years and over	76.4	74.3
% 65 Years and over	14.4	12.4
Population Density (sq. mi.)	**41.3**	**79.6**

Source: 2000 Census website

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	**1,274,923 (3)**	**35,387 (1)**	**$37,240 (6)**
Connecticut	3,405,565 (2)	5,018 (5)	$53,935 (1)
Massachusetts	6,349,097 (1)	10,555 (2)	$50,502 (2)
New Hampshire	1,235,786 (4)	9,304 (4)	$49,467 (3)
Rhode Island	1,048,319 (5)	1,545 (6)	$42,090 (4)
Vermont	608,827 (6)	9,600 (3)	$40,856 (5)

Source: 2000 Census website

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 was updated in 1989, 1991, 1993, 1995, 1996, 1997, 1998, 2000, and 2004.

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.*

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

How the Plan was Prepared

Between 2003 and 2005, the planning staff of MEMA focused its energies on the preparation of a State Hazard Mitigation Plan and the provision of technical and planning assistance to the State's 16 counties as they developed their plans. The work involved numerous meetings with state, county and local officials, as well as the general public. As shown in the table on the next page, the State Hazard Mitigation Plan was approved by FEMA on October 26, 2004. All of the 16 county plans, as well as six local plans and one covering the University of Maine System, were approved by FEMA between November 4, 2004, and February 22, 2007.

With the State and all of the counties covered by approved plans, the State's efforts shifted from plan preparation to public education, mapping, and partnering with other agencies to implement key strategies contained in the 2004 Plan and to begin the process of preparing changes for the 2007 State Hazard Mitigation Plan revision.

The 2007 State Hazard Mitigation Plan revision was developed utilizing input from:

- Review of the 2004 Plan;
- A Hazard Mitigation Team that met on a periodic basis;
- Information obtained during preparation of the county plans; and
- One-on-one meetings with State officials.

Maine Hazard Mitigation Plans: 2007 Status						
	Approval Month	**Approval Year**	**# of Total Communities**	**Status**	**Revision Due**	**Comments**
State Hazard Mitigation Plan	Oct. 26	2004	490 of 490 Statewide	**FEMA APPROVED**	Oct 07	In revision
County (Multi-jurisdictional Hazard Mitigation Plans						
Androscoggin	Apr 29	2005	14 of 14	**FEMA APPROVED**	2010	
Aroostook	May 19	2005	47 of 67 plus UTs	**FEMA APPROVED**	2010	Includes Jan 07 – "Plan 2"
Cumberland	Dec 23	2005	27 of 27	**FEMA APPROVED**	2010	
Franklin	Feb28	2005	20 of 21 plus UTs	**FEMA APPROVED**	2010	
Hancock	Jul 25	2005	37 of 37	**FEMA APPROVED**	2010	
Kennebec	Apr 29	2005	29 of 29	**FEMA APPROVED**	2010	
Knox	Jan 18	2005	18 of 18	**FEMA APPROVED**	2010	
Lincoln	Aug 04	2005	19 of 19	**FEMA APPROVED**	2010	
Oxford	Apr 15	2005	36 of 36	**FEMA APPROVED**	2010	
Penobscot	Mar 14	2006	55 of 60 plus Uts	**FEMA APPROVED**	2011	
Piscataquis	Nov 30	2006	19 of 19 plus 100 Uts	**FEMA APPROVED**	2011	
Sagadahoc	Oct 10	2006	10 of 10 plus 1 UT	**FEMA APPROVED**	2011	
Somerset	Sep 12	2006	32 of 32 plus 83 Uts	**FEMA APPROVED**	2011	
Waldo	Nov 04	2004	26 of 26	**FEMA APPROVED**	2009	Preliminary revision budget drafted
Washington	Feb 22	2007	42 of 46 plus UTs	**FEMA APPROVED**	2012	
York	Oct 20	2005	29 of 29	**FEMA APPROVED**	2010	
Town Hazard Mitigation Plans						
Bradley	Dec 17	2004	1	**FEMA APPROVED**	2009	
Farmington	Jan 06	2005	1	**FEMA APPROVED**	2010	
Fort Fairfield	Sep 20	2005	1	**FEMA APPROVED**	2010	
Greenbush	Mar 21	2006	1	**FEMA APPROVED**	2011	
Holden	Mar 25	2005	1	**FEMA APPROVED**	2010	
Howland	Sep 28	2005	1	**FEMA APPROVED**	2010	
			Total: 435 of 490			
University Plans						
UMaine System Plan			7 of 7 campuses	**FEMA APPROVED**	2012	

Who was Involved in the Current Planning Process and How Other Agencies Participated

All pertinent persons (including their titles and organizations) involved in the planning processes are listed in the "Summary" of meetings contained in the Appendix. Unless otherwise noted in captions or footnotes, their specific contributions are detailed in the type of meeting or TELCOM described there.

All the agencies listed in the "Summary of Meetings" were involved and assisted in preparing the Plan by:

- Providing natural hazard information specific to their organizations
- Reviewing draft sections of the Plan and commenting
- Identifying goals and actions for the new Plan

Additionally, the MEMA website profiles both natural and human-caused hazards in the State. While there is no tally of the number of "hits" the website receives, frequent calls and emails from the public indicate that it is known and well used. To date, there have been many requests for grant monies, but no comments on the planning efforts. 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 county plan appendices.

How the Planning Team Reviewed Each Section of the Plan

The Planning Team met on several occasions to review the Plan. At its meeting of May 14, 2007, most members of the Team expressed concern that, given their workloads and other commitments, as well as understaffing, the State's hiring freeze and requested cuts, they would not have time to meet on a regular basis. They agreed that MEMA would draft Sections 1, 2, and 5 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 officials to draft sections of the risk assessment (Section 3) and mitigation strategies (Section 4) related to their areas of expertise. Team members would then be given a copy of the final drafts of Sections 3 and 4 for their review and comment.

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.*

How Federal and State Agencies Were Involved

As indicated in the previous discussion under Documentation of the Planning Process, State 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 with three disasters declared in the first half of 2007, there was a great deal of coordination on mitigation issues between state and federal officials. The operation of FEMA's Joint Field Office (JFO) in Scarborough in 2007 provided an excellent venue for this cooperation. The results of this coordination work included:

- **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;
- **New initiative:** The establishment of a series of workshops by the Maine Department of Transportation for local officials on the use of geosynthetics in road and ditch work; and
- **GIS Information:** A greater awareness of the need for more 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 workshops on hazard mitigation and disaster assistance.

How Interested Groups Were Involved

Interested groups were involved in the preparation of county and local plans and through participation in MEMA workshops.

In the future, as resources become available, outreach to businesses and non-profit organizations will be done through their professional associations as coordination efforts continue. Again, more detailed maps showing vulnerable areas would be very useful documentation in this outreach. Additionally, it would be invaluable to have "case studies" which showcase mitigation projects that have actually helped local businesses to thrive after hazard effects have been reduced.

How Coordination Has Changed Since Approval of Last Plan

Since approval of the 2004 State Hazard Mitigation Plan, coordination between State and Federal agencies has improved. Coordination has taken place at various workshops, through Federal/State participation in the plan review process, and through close working relationships established as a result of the State's three 2007 disaster declarations.

Between 2003 and 2005, MEMA was heavily involved in the preparation of the State Hazard Mitigation Plan and the 16 county plans. Following completion of these plans, MEMA shifted its attention to outreach to the general public as well as 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.*

Integration with Other State Planning Efforts

Since flooding is the State's primary hazard, most mitigation planning efforts have been integrated with those of the State Planning Office (SPO). It is the SPO that oversees the State's Growth Management Program, Map Modernization (flood mapping) projects, the Coastal Zone Management Program, the National Flood Insurance Program (NFIP), and the Community Rating System communities.

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 has now 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.

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 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 explore greater use of the 406 program to implement more mitigation projects, and to target mitigation assistance to the areas of greatest need. MEMA, the State Planning Office, and other State agencies will also continue to work with and support FEMA's map modernization 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 the Joint Field Office, and assisting counties and municipalities with the preparation of hazard mitigation plans.

1. **Mitigation needs far exceed available funding.** The approved mitigation plans listed on page 2 include roughly 1,500 mitigation projects. Assuming an average of about $100,000 per project (some are much more) the total need is about $150 million. Over the past five years, Maine received about $1.5 million annually in HMGP funding. Assuming that no new future projects came to light, it would take about 100 years to address all of the previously identified needs! Therefore, especially in light of the three disasters declared in 2007, 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. **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).

4. **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.

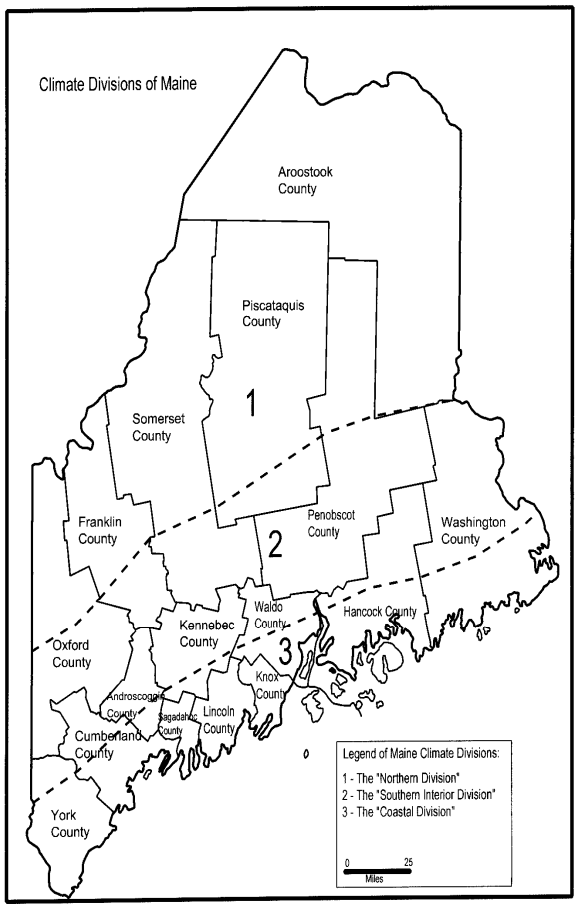
SECTION 3 – RISK ASSESSMENT

INTRODUCTION

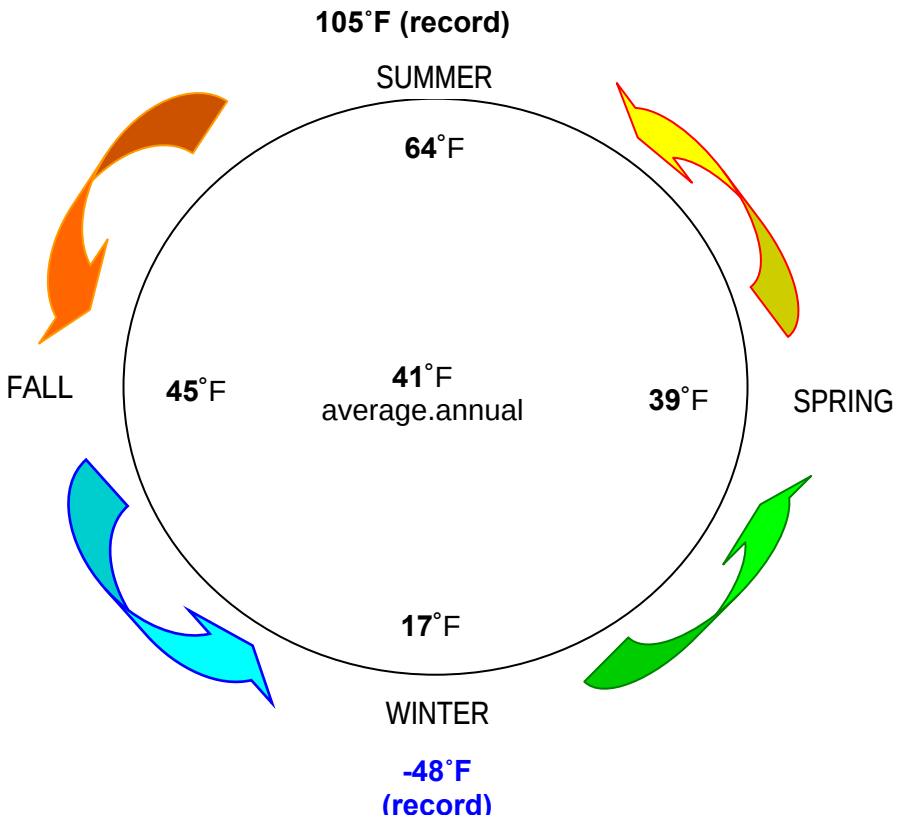
In compliance with *Requirement §201.4(c)(2)* the following section identifies, profiles and assesses the vulnerability of the State to natural hazards. No risk assessment of Maine's natural hazards can be done, however, without first considering its climate and geography. Factors such as variable seasonal 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.



Temperature. To date, the highest temperature ever recorded in the State was 105˚F, and the lowest was –48˚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: Gregory Zielinkski, State Climatologist, University of Maine, Department of Conservation Maine Geological Survey website and State Planning Office.

Sea Level Rise. Maine's coast has been and will continue to be profoundly affected by an increase in sea level. The Maine Geological Survey estimates that the ocean has risen about six (6) inches since 1900, and is currently rising at a rate of about 1/10 inch per year. The result 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.

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, 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 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 floods on a more frequent basis.

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.

The graph on the following page, taken from "A report of Working Group 1 of the Intergovernmental Panel on Climate Change, Summary for Policymakers," shows how global average temperature, global average sea level, and Northern Hemisphere snow cover have changed over the years.

Changes in Temperature, Sea Level and Northern Hemisphere Snow Cover

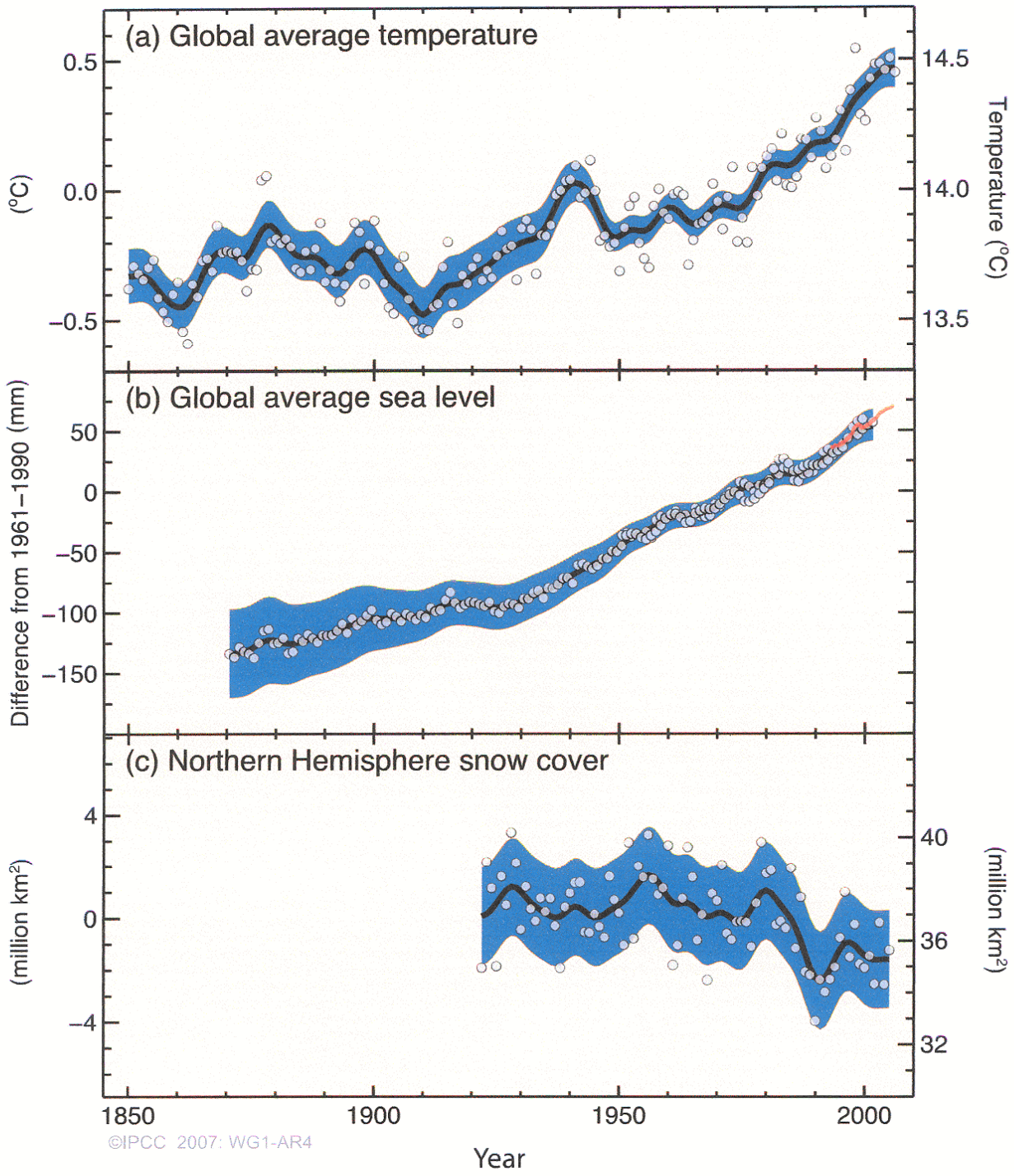


Figure SPM.3. *Observed changes in (a) global average surface temperature, (b) global average sea level from tide gauge (blue) and satellite (red) data and (c) Northern Hemisphere snow cover for March-April. All changes are relative to corresponding averages for the period 1961–1990. Smoothed curves represent decadal average values while circles show yearly values. The shaded areas are the uncertainty intervals estimated from a comprehensive analysis of known uncertainties (a and b) and from the time series (c). {FAQ 3.1, Figure 1, Figure 4.2, Figure 5.13}*

IDENTIFYING HAZARDS

§201.4(c)(2)(i) **Identifying Hazards**	[The State risk assessment shall include an] overview of the type … of all natural hazards that can affect the State …

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. After months of discussions and meetings, it was decided that because so many of the State's natural hazards tend to occur in seasonal groups, the summary table and hazard "titles" should be revised to reflect that. Therefore, 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. Accordingly, 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. Tsunamis, which are possible, but unlikely, and avalanches for which there are no records of occurrences will not be profiled or further assessed. Thus the identification process narrowed the scope of hazards to nine: flood, winter storms, hurricane, erosion/landslides, wildfire, blight/infestation, summer storms, drought and earthquake. (See next page for Maine Natural Hazard ID – Summary Table.)

Maine Natural Hazard ID – Summary

Hazard Type	Sources of Information (in addition to general Internet research)	Location in Plan: Section 3 – Risk Assessment
Blight/Infestation	Meetings with Departments of Agriculture and Forestry; department websites	Blight/Infestation
Dam Failure	MEMA, Dam Safety Program FEMA Disaster Reports Association of Dam Safety Officials	Flood
Drought	Department of Agriculture Drought Advisory Committee	Drought
Earthquake (5.0 magnitude)	Maine Geological Survey Historical records	Earthquake
Erosion/Landslides (a) beach erosion (b) bluff erosion (c landslides	State Planning Office, Flood Plain Management State Marine Geologist, ME Geological Survey FEMA Disaster Reports News paper articles	Erosion/Landslide
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 run off, ice jams, heavy rains)	MEMA records State Planning Office, Flood Plain Management 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 News paper articles	Winter Storms
Other: Avalanche Subsidence Tsunami	FEMA hazards MEMA and FEMA reports	Not included Not included Not included

Prepared by Maine Emergency Management Agency - 2007

PROFILING HAZARDS

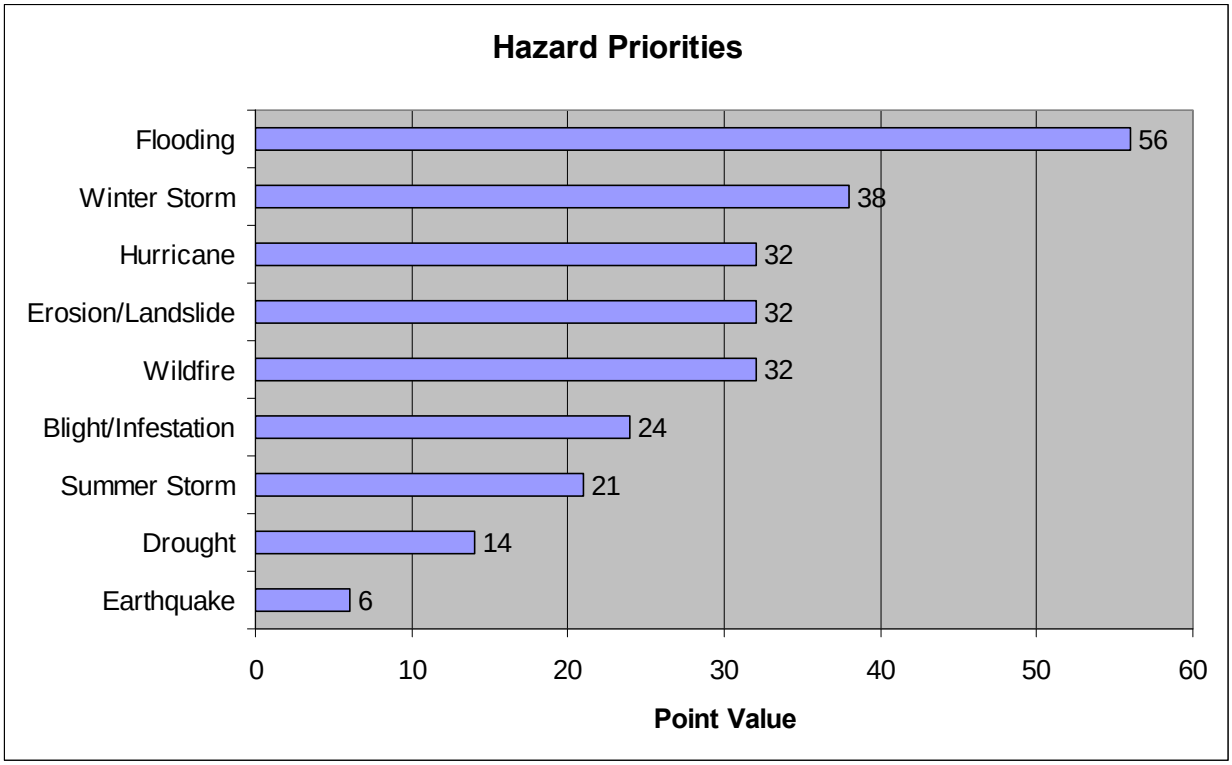
§201.4(c)(2)(i) **Profiling Hazards**	[The State risk assessment shall include an overview of the] location of all natural hazards that can affect the State, including information on previous occurrences of hazard events, as well as the probability of future hazard events using maps where appropriate …

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, county (jurisdiction) and the overall damage caused. In order to provide a "worst case scenario" for each hazard, storms of record were used.

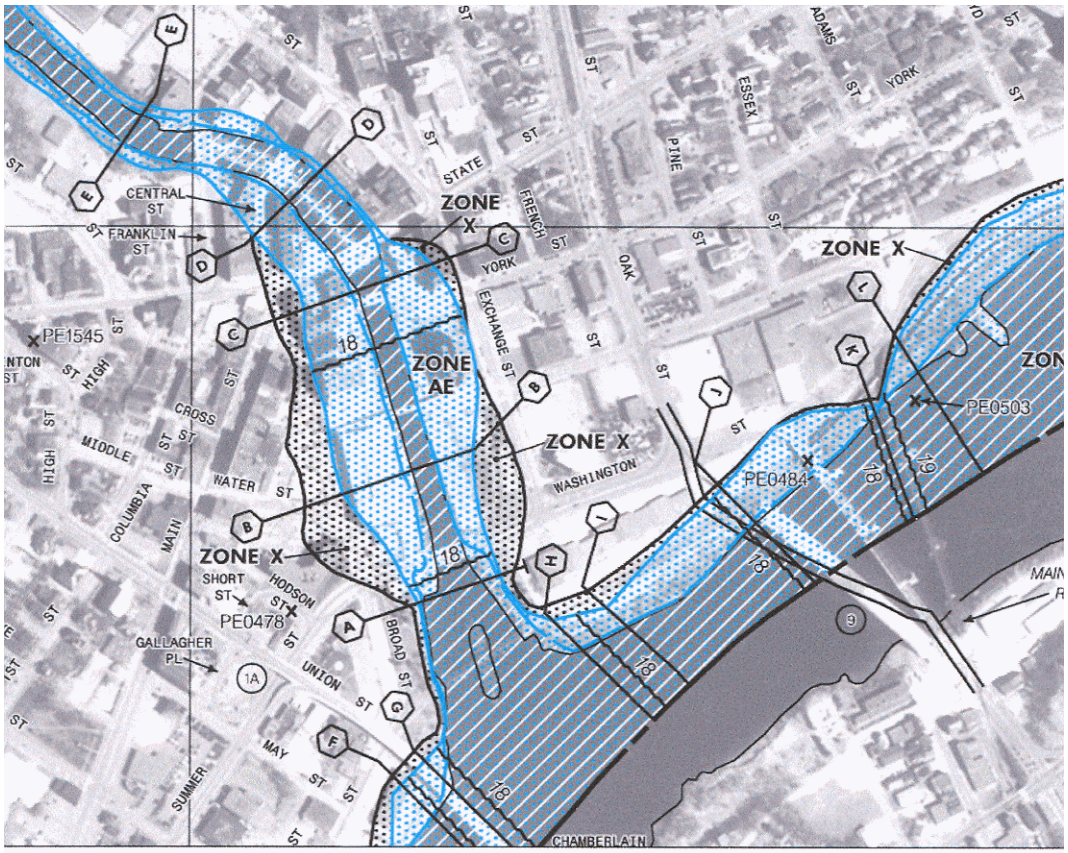
Due to a lack of data regarding probability, MEMA staff used the matrix found at the end of the Risk Assessment section of the Plan to score each of the nine hazards according to its likelihood and severity of occurrence. Likelihood of occurrence ranged from "Frequent" (annual) to "Improbable (> century) and the scores ranged from 4 to 0 (zero) points respectively.

Severity of occurrence took four factors into consideration: number of deaths or injuries, type of destruction, economic impact and sheltering needs. The more severe the impact, the higher the score it received. For example, "Hundreds of deaths" scored 10 points, but at the end of the range, "No Injuries" scored zero. Type of destruction ranged from "Destruction of structures" which could result from major floods or wildfires to "Loss of personal property" with scores from 6 to 1 respectively.

For the rest of the Plan, the hazards will be addressed in order of priority as summarized in the following chart which is linked to the matrix.



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 profile of erosion/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. 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 flood 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.

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.

NOTE: At this time, only half the 16 counties in Maine have been mapped with Q3 data. The Q3 mapping that has been done is primarily for the southern part of the State. Q3 mapping is essentially the process of scanning into a digital overlay the current floodplain boundaries. Q3 is not the same as a digital FIRM that is the end product associated with FEMA's Map Modernization Program. The State Planning Office has taken on the responsibility for Map Modernization in the State. SPO's Floodplain Management Program has developed a multi-year business plan that outlines the sequencing and metrics for Maine's communities based upon funding and resources. The Plan has been revised twice since its inception in 2004.

When additional resources are available to access the data, it will be included in future revisions to the Plan. In the interim, graphics, tables, charts and graphs will be used to convey the information about each hazard. At this time, residents or businesses can go to the local town office to view the FIRM Maps.

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, fire fighting 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 44 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 partnered with the Local Road Center of the Maine Department of Transportation in 2007 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 are now taking place throughout the State 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 State Planning Office'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, 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 profile on erosion/landslides contained in this Assessment).

A major issue that emerged from preparation of the State of Maine's 2004 Hazard Mitigation Plan was the lack of detailed, accurate mapping of flood hazards along the coast. Since then, there have been several major mapping initiatives:

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

- **FEMA Multi-Hazard Flood Map Modernization.** In the past, FEMA's National Flood Insurance Program (NFIP) remapping efforts have been limited by technology and funding. In recognition, Congress has committed to a Five-Year Flood Map Modernization Program (FMMP), also known as Map Modernization. Starting in FY 2003, the goal of Map Modernization is to upgrade flood hazard data and mapping to create a more accurate digital product that will improve floodplain management across the country. By 2009, it is envisioned that digital flood hazard data will be available for most of the nation. This is being undertaken with priority given to areas of greater population, need and ability to leverage resources.

- **LIDAR Mapping.** Detailed topographic maps are being prepared for coastal York and Cumberland Counties, as well as portions of Oxford County in Western Maine, by a consortium of agencies including NOAA and the Army Corps of Engineers. These maps should be available in 2008 and will be used by FEMA to generate far more accurate flood insurance rate maps for these two coastal 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

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 Merry Meeting 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. Those laws were enacted at the State Capitol, cited strategically high above its banks and away from the floodplain. 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 the vast 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. Coastal rivers, however, like the Presumpscot in Southern Maine, do not drain extensive areas. 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.

The ***Saco*** 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.

The ***St. Croix*** 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 within the past decade experienced increasing pressures for development. Much of Hancock and Washington Counties are covered with blueberry barrens. Most flood damages in this basin are infrastructure in nature.

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 2 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 and previous versions of the 409 plan, 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.)

NOTE: 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.

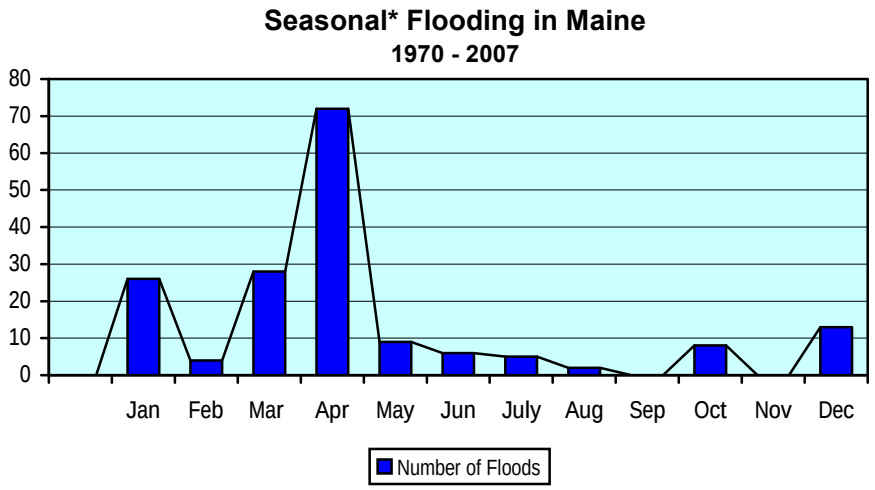
Location of Dams. MEMA maintains a database of 1,079 dam sites, including dams in New Hampshire that share rivers with Maine. This database was updated in 2004 as a Phase 1 Project and a preliminary mapping feature was added (See sample below). The quality will be improved in Phase 2, but for now, the red, yellow and green dots indicate the locations of High (H), Significant (S) and Low (L) hazard dams respectively. The hazard classification is based on severity of effect from failure: H dams could cause loss of life; S could cause significant loss of property and L would probably only damage the owner's property.

Map sample from MEMA
Dam Safety Program
Database - 2004

Maine law requires that H, S and L hazard dams be inspected every 2, 4 and 6 years respectively and that H and S dams have Emergency Action Plans (EAPs) to mitigate the effects of a failure. The Federal Energy Regulatory Commission (FERC) regulates 34 H hazard and 12 S hazard dams in Maine and has 5 engineers to do the inspections. The State regulates 26 H hazard and 79 S hazard dams and employs 1 engineer.

In its most basic form, the EAP 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% H and 60% S 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 37 year record of major seasonal flooding occurrence and the counties most susceptible to this natural hazard. Though the 70's and 90's were flood prone decades, note that the spring seasons of 1987, 1992 and 1993 (highlighted with bold **X's**) were the years where 63% - 88% 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
CD = 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
May 1973		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**
May 1989	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 2003				X		X			X		X		X	X			6
Apr 2005	**X**	**X**		**X**	**X**	**X**	**X**	**X**	**X**		**X**		**X**	**X**	**X**		**12**
May 2006																X	1
April 20 2007					X		X	X						X			4
April 25 2007	**X**		**X**	**X**	**X**	**X**		**X**				**X**	**X**	**X**	**X**	**X**	**11**
Aug 2007									X								1
TOTALS	12	14	12	16	5	13	7	6	19	11	8	5	13	11	6	14	

Flooding* Occurrence by County

19 - OD
16 - FN
14 - AK
14 - YK
13 - KC
13 - ST
12 - CD
12 - AN
11 - PT
11 - WO
8 - PS
7 - KX
6 - LN
6 - WN
5 - SC
5 - HK

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

The susceptibility of the major river basins to flooding, and the counties within them, is assessed by three factors: a) the extent of the drainage area, b) the fall of the river and, c) the 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 yeas 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]

[1] "Flood of April 1987 in Maine," US Geological Survey Water Supply Paper 2424, p.37

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.

Figure 3
History of Flood Occurrence

Month	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	*Presidential*
Feb 12	1972	Cumberland York		n/a

[2] Ibid, p.27
[3] Interagency Hazard Mitigation Report, FEMA-788-DR-Maine, April 1987, p.2.

Month	Year	County (ies)	Damages	Declaration
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 Req – denied*
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	*Presidential*
Apr 30	1979	Aroostook Kennebec Penobscot Piscataquis	$648,500	SBA
June	1984	Androscoggin Cumberland Kennebec Penobscot Sagadahoc Somerset		n/a

Month	Year	County (ies)	Damages	Declaration
Jan	1986	Androscoggin Cumberland Franklin Kennebec Lincoln Oxford Sagadahoc Somerset York	Roads, bridges, dams, clean up	n/a
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 Oxford Franklin	$1,396,120	*Presidential*
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

[4] Maine State Hazard Mitigation Plan 1993

Month	Year	County (ies)	Damages	Declaration
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
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 Lili. 1,000 structures were inundated, several dams breached, and roads, bridges and culverts were destroyed	*Presidential* FEMA-1143-DR-ME

[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	Year	County (ies)	Damages	Declaration
Jun 12-21	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
Mar-Apr	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 17 – Jun 1	2003	Androscoggin Aroostook Cumberland Franklin Hancock Kennebec Lincoln Oxford Penobscot Piscataquis Washington	$XXXXXX Extreme winter weather; severe cold and frost	*Presidential* FEMA-1468-DR-ME
Dec 11-31	2004	Franklin Kennebec Oxford Piscataquis 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	TBA Severe storms, flooding, snow melt and ice jams	*Presidential* FEMA-1591-DR-ME

Month	Year	County (ies)	Damages	Declaration
		Piscataquis Somerset Waldo Washington York		
May 25 (The "Mother's Day Storm")	2006	York	$7,400,000 (est.) Severe storms and flooding	*Presidential* FEMA-1644-DR-ME
April 20	2007	Lincoln, Knox, Waldo, Hancock	TBA Flooding	*Presidential* FEMA-1691-DR-ME
April 25 (The "Patriot's Day Storm")	2007	Androscoggin Cumberland Franklin Hancock Kennebec Knox Lincoln Sagadahoc Somerset Waldo Washington York	TBA Severe storms and inland and coastal flooding	*Presidential* FEMA-1693-DR-ME
Aug 8	2007	Oxford	TBA Severe storms and flooding	*Presidential* FEMA-1716-DR-ME

Sources: FEMA website and MEMA records

History of Dam Failure/Breach. Known dam failures/breaches include the following:

- 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 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.

Probability of Occurrence

Floods are described in terms of their extent (including the horizontal area affected and the vertical depth of floodwaters) and the related probability of occurrence. Flood studies use historical records to determine the probability of occurrence for different flood recurrence intervals. The probability of occurrence is expressed in percentages as the chance of a flood

of a specific recurrence interval in any given year. The most widely adopted design and regulatory standard for floods in the Untied States is the 1-percent annual chance flood and this is the standard formally adopted by FEMA. The 1-percent annual flood, also known as the base flood, or regulatory flood, has a 1 percent chance of happening in any particular year. It is also often referred to as the "100-year flood." This expression is, however, merely a simple and general way to express the statistical likelihood of a flood. Actual recurrence periods are variable from place to place.

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

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

Source: FEMA 386-2, August 2001

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

Probability of Dam Failure/Breach: Because most of Maine's dams were constructed 100 years ago and have thus outlived their anticipated life span, there is obviously a probability for failure. Acknowledging this, the Maine Dam Safety Law requires regular inspections, maintenance and current EAPs. Maine's current approach to dam management recognizes that dam failure probability studies are prohibitively expensive, and that establishing a definitive risk of failure for specific dams is virtually impossible. Rather than insisting on the preparation of expensive dam failure studies, Maine has chosen to require that EAPs be prepared for the possibility of dam failure. If funds were available, it would be desirable to prepare well-engineered inundation maps showing the exact areas that could be a affected by a breach.

Issues and Challenges

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

1. **Flood mitigation needs exceed available resources**. As noted previously in this Plan, the completion of FEMA-approved hazard mitigation plans for 16 counties, six municipalities and the University of Maine System has resulted in the identification of about 1,500 hazard mitigation projects amounting to about $150 million (assuming an average of about $100,000 per project). At least 90 - 95% of these projects are flood mitigation projects. Over the past five years, Maine has received about $1.5 million annually in Hazard Mitigation Grant Program funding to address these identified needs. At the current rate of funding, it will take about 100 years to address all of the identified needs.

2. **The lack of detailed mapping is still a major issue.** Since completion of Maine's 2004 Hazard Mitigation Program, there have been a 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 (most recently in 2004), but this needs to be repeated every five years to keep up with the dynamic shoreline changes.

- The rest of the coast and large rivers need to be flown and mapped by LIDAR so flood and surge levels can be effectively mapped and hazards to specific areas identified.

- Many communities are still struggling with older, less detailed Flood Insurance Rate Maps. 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.

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 <u>every</u> 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.

Severe Winter Storm History

Month	**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	***Presidential***
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***		***Presidential***
Jan 5-25 "Great Ice Storm of 98"	**1998**	***Statewide***	**$47,748,466 Power outages [Loss of heat, refrigeration, sanitation services] Forestry damage**	***Presidential***
Mar 5-31	2001		$4,483,918 Snow removal costs	***Presidential*** FEMA-1371-DR-ME
Jan-March	2003	Androscoggin Aroostook Cumberland Franklin Hancock Kennebec Lincoln Oxford Penobscot Piscataquis Washington	$2,144,457 Severe winter conditions: frozen pipes	***Presidential***
Dec 25-27 "Christmas Storm"	2005	Aroostook	$ TBD Federal disaster funds available to supplement emergency response to the record snow storm	***Emergency Snow Aid*** 24 Feb 2006 announced

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.

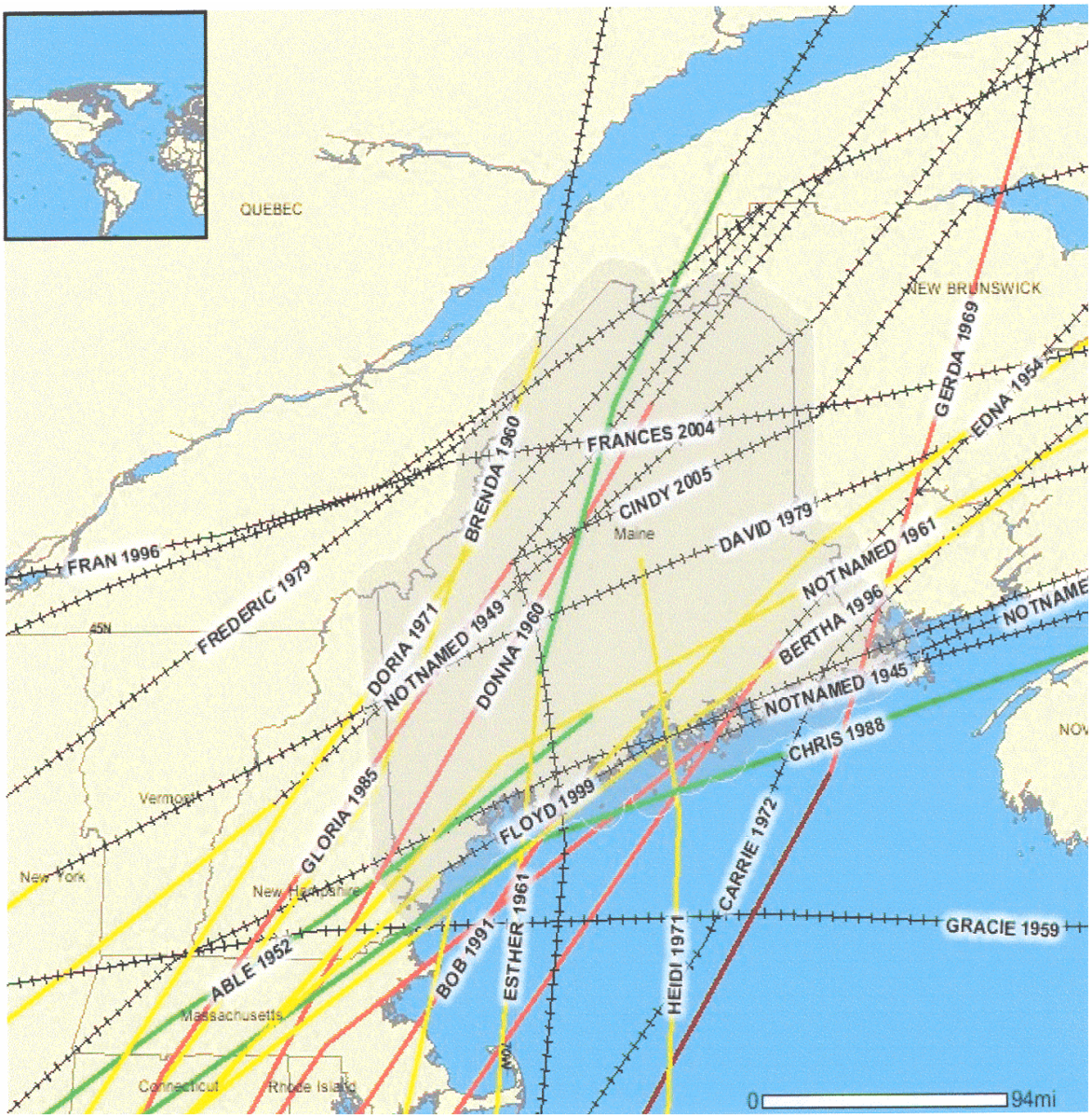
Frequency of Occurrence

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

No probability studies have been done, but Maine's location in the Northeast, and its long experience with winter storms indicate that <u>every</u> year, between November and April there is a high probability that such storms will occur.

HURRICANE



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.

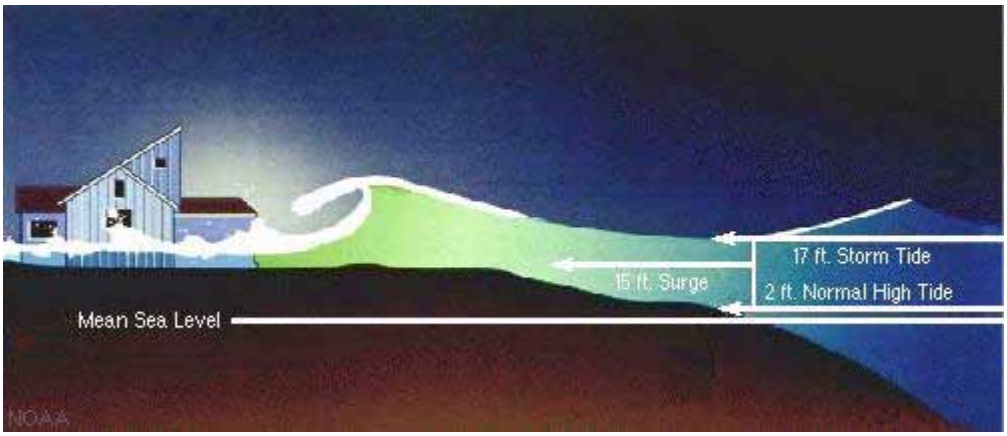
Nature of Hazard

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

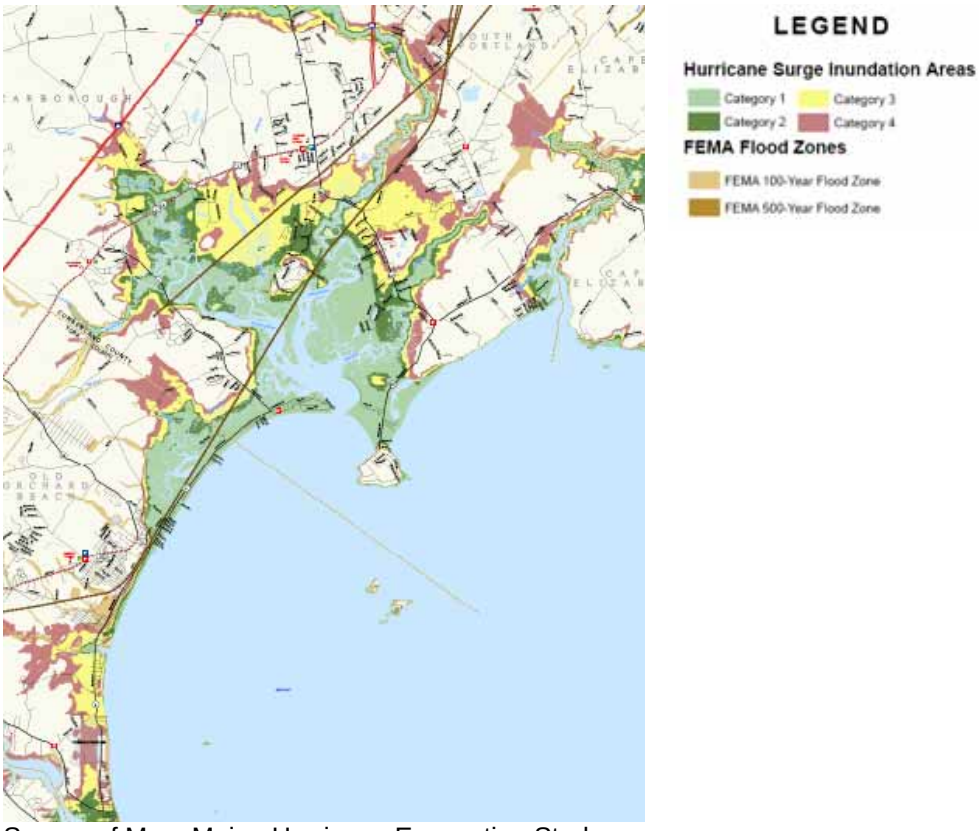
In general, the more intense the storm, and the closer a community is to the right-front quadrant, the larger the area for potential evacuation. The problem is always the uncertainty about how intense the storm will be when it finally makes landfall. Wave and current action associated with the tide also 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	Year	County (ies)	Estimated Damage	Declaration
Sept. 21	1938	Androscoggin Cumberland York	$135,000	
Sept. 14	1944	Cumberland		
Aug. 31 "Carol"	1954	Cumberland Knox Lincoln Sagadahoc Waldo & York	$5,000,000 3 Deaths Power outages, Downed trees	SBA
Sept. 11 "Edna"	1954	***STATEWIDE*** (flooding)	$7,000,000 8 Deaths, Power outages	***Presidential #24***
Sept. 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
Sept. 6 "David"	1979	Coastal	Minor Damage	
Sept. "Diana"	1984	Coastal Counties Threatened		

Month	Year	County (ies)	Estimated Damage	Declaration
Sept. 17 "Gloria"	1985	Androscoggin Cumberland Franklin Kennebec Somerset York	3 Injuries Downed trees Power failures (up to 14 days, 250,000 people affected)	
Sept. 10 "Bob"	1991	Androscoggin Cumberland Franklin Kennebec Sagadahoc York	$5,523,665 3 Deaths Power outages	***Presidential FEMA-915-DR-ME***
Sept. 16-19 "Floyd"	1999	Androscoggin Cumberland Kennebec Oxford Somerset	$1,210,205	***Presidential FEMA-1308-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 harms way. Consequentially, it is expected that damage today from the likes of an Edna would be many times greater.

Fishing, commercial and pleasure boating losses would probably be significant due to loss of boats and gear. The lack of any strong hurricanes for the last four decades will affect the common knowledge of how to prepare, and the willingness to make 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

The probability of hurricanes occurring in Maine varies by hurricane category and by location within the State, as shown in the following table. The table does not include probabilities for Category 4 and Category 5 hurricanes because there is no known history of Category 4 or 5 hurricanes hitting Maine.

Hurricane Frequency (Center within 75 miles)		
Category	**Southwestern Maine**	**Mid and Downeast Maine**
1	30 years	30 years
2	150 years	100 years
3	400 years	200 years

Source: Maine Emergency Management Agency

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.

EROSION/LANDSLIDES

Source: Maine Geological Survey Landslide Maps

General Definition

Erosion. 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).

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

Note: Sea level rise is driving erosion and landslides. If the level of the sea were falling, erosion and landslides would not be an issue.

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)

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).

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. In general, landslide-prone bluffs have the following characteristics:

- A high, steep face;
- Clay sediment;
- Erosion near the high-tide line; and
- A high ground water table.

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, which cover about 75% of the Maine coast, 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 is completing landslide susceptibility maps for the four above-mentioned communities. Future mapping of the towns in York County that are underlain by the marine clay of the Presumpscot Formation will commence in October of 2007. If future funding becomes available, towns in Cumberland and Penobscot Counties will be mapped in future years.

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. Coastal landslides are occurring on landslide-prone bluffs in excess of 20 feet in height throughout the coast.

Landlsides 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

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. 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.

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.

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.

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

No probability studies have been done, and predictive models don't exist, but Maine's experience with erosion and landslides, coupled with the continual rise in the level of the sea, indicate that there is a high probability that erosion and 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 erosion and landslide 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 and landslides.** Erosion and 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.

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

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

WILDFIRE

Wildland Urban Interface Fire in Addison, Maine 2001– 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.

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

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

In 2001, 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.

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.

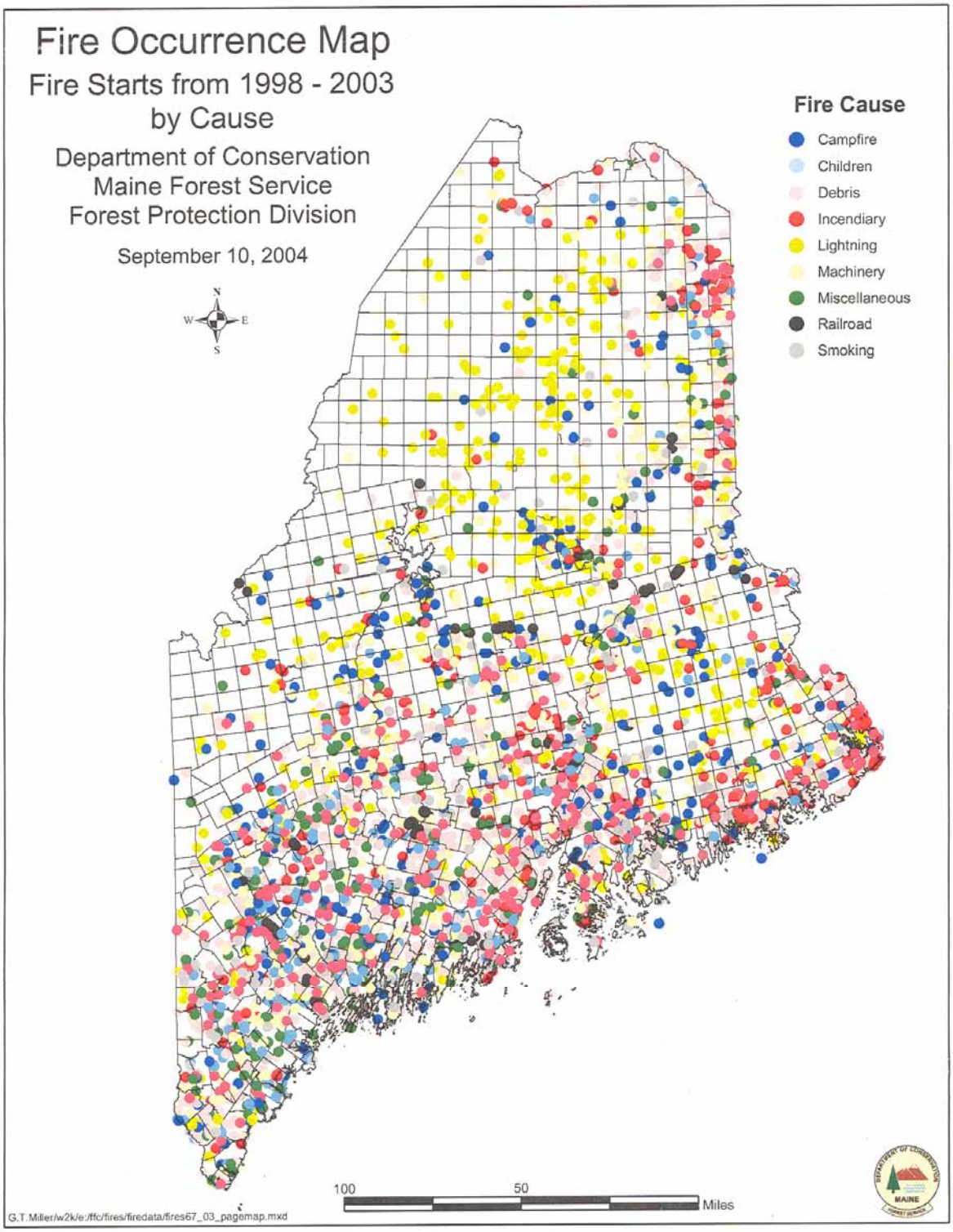

Fire Occurrence Map
Fire Starts from 1998 - 2003
by Cause
Department of Conservation
Maine Forest Service
Forest Protection Division
September 10, 2004
N
W
E
S
Fire Cause
Campfire
Children
Debris
Incendiary
Lightning
Machinery
Miscellaneous
Railroad
Smoking
100
50
Miles
G.T.Miller/w2k/e:/ffc/fires/firedata/fires67_03_pagemap.mxd

Table 1
Number of Fire by Cause by County
2002-2006

County	Camp	Child	Debris	Arson	Light	Machin	Misc	RR	Smoke	5 Yr Av	5 Yr Total
Androscoggin	6	5	36	2	4	8	13	12	5	18.2	91
Aroostook	15	13	93	67	56	68	19	13	12	71.2	356
Cumberland	5	31	48	12	6	31	27	13	30	40.6	203
Franklin	9	9	39	6	13	19	13	0	6	22.8	114
Hancock	24	9	109	9	11	24	12	0	17	43.0	215
Kennebec	7	17	84	3	3	17	27	65	8	46.2	231
Knox	7	11	40	3	0	6	6	6	7	17.2	86
Lincoln	2	6	29	3	0	14	8	5	4	14.2	71
Oxford	13	23	72	12	14	34	22	14	16	44.0	220
Penobscot	15	23	99	38	40	48	23	16	25	65.4	327
Piscataquis	25	5	28	3	82	37	6	5	10	40.2	201
Sagadahoc	6	12	14	1	2	11	12	0	5	12.6	63
Somerset	16	9	52	8	24	44	22	19	16	42.0	210
Waldo	1	3	46	4	1	11	8	18	6	19.6	98
Washington	8	3	102	94	12	29	11	0	11	54.0	270
York	17	24	71	17	7	39	32	1	23	46.2	231
Total	**176**	**203**	**962**	**282**	**275**	**440**	**261**	**187**	**210**	**597.4**	**2,987**

Source: Maine Forest Service, 2007

Table 2 HISTORY- MAJOR FOREST FIRES					
Month	**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	

Information courtesy of Mary Casey, Maine Forest Service, who used a benchmark acreage of 500 acres for a fire to be included as "major." 1 March 2004. There have been no major forest fires since 2001.

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

While probability studies have not been done, based on historical record 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 500 acres). However, using the last three decades of fire record, the probability of a major wildfire is once a decade.

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.

BLIGHT/INFESTATION (Plant Pest and Environmental Problems)

Hemlock Wooly Adelgid Infestation – Photo courtesy of Maine Forest Service website

General Definition

Any disease or injury of plants resulting in withering, cessation of growth and death caused by: disease organisms (fungi, bacteria or virus), insects, invasive species or unfavorable environmental conditions.

Nature of Hazard

Beyond the loss of a crop's market value, vegetation that has been seriously affected by plant pests or unfavorable growing conditions becomes more susceptible to fires, whether ignited by people or lightning (see also Wildfire section). As root systems die, topsoil becomes more vulnerable to erosion, thus valuable farm and forest land may be impacted and streams may be contaminated by the runoff. Re-vegetation efforts may be compromised by inadequate nutrients left in the soils. During the processes of infestation, wildlife habitat may be lost or changed. Invasive species, such as wooly adelgid and milfoil, can impact the State by displacing native, or preferred species.

Location of Hazard

Maine has 17.7 million acres of forested land (90% of Maine's total forested area) and 1.25 million acres of farmland which are susceptible to plant pest infestations and environmental damage. Historically, there have been instances where large areas have been impacted by plant pests and environmental problems, including: spruce budworm, Dutch elm disease, white pine blister rust, brown tail moth, potato late blight, gypsy moth and severe drought. Invasive

species, such as milfoil, can impact the State's water bodies, displacing native, or preferred species.

A current example of infestation is the hemlock woolly adelgid (HWA) which has been detected in Maine in controllable occurrences since 1999. The adelgids feed on the sap of hemlock trees, a forest product on which Maine depends for 10% of its pulp wood and which homeowners use for landscaping. A fully infested tree can die within five years, leaving "standing fuel." This could become a problem in heavily populated York County. HWA was detected in Maine forests in 2003, and has since been found in the six southernmost towns in York County (Eliot, Kittery, Ogunquit, South Berwick, Wells and York). What also concerns Maine officials is a low-level infestation in a natural hemlock stand discovered in neighboring New Hampshire.

Originally from Asia, the HWA was likely brought into the U.S. on a nursery stock tree. Unfortunately, it had no natural predators in North America, allowing it to develop substantial populations. Severe winter weather can prove beneficial, since the HWA can not survive bitter cold. Rather than wait and see, however, the Maine Forest Service (MFS) is taking a "pre-inoculation" approach. In selected areas of the State, the MFS has introduced *Pseudoscymnus tsugae*, a small beetle that feeds exclusively on adelgids, and especially on the HWA. MFS research has shown that *Pseudoscymnus tsugae will survive* Maine winters. In addition, the beetle will feed on two other non-native adelgids in the State.

The insect began spreading northward decades ago, causing forest cover to disappear where the infestation grew out of control. Foresters thought it was only a matter of time before it showed up in Maine. To prevent or at least limit infestation, the State has been under quarantine since 2000, banning the importation of infected nursery hemlocks. Today, about 3,500 acres of spot infestation is occurring in York County.

Previous Occurrences

Historically, there have been instances where large areas have been impacted by plant pests and environmental problems, including: spruce budworm, brown tail moth, potato late blight, gypsy moth, Dutch elm disease, and severe drought. To date, spruce budworm has been the biggest native forest insect problem in Maine.

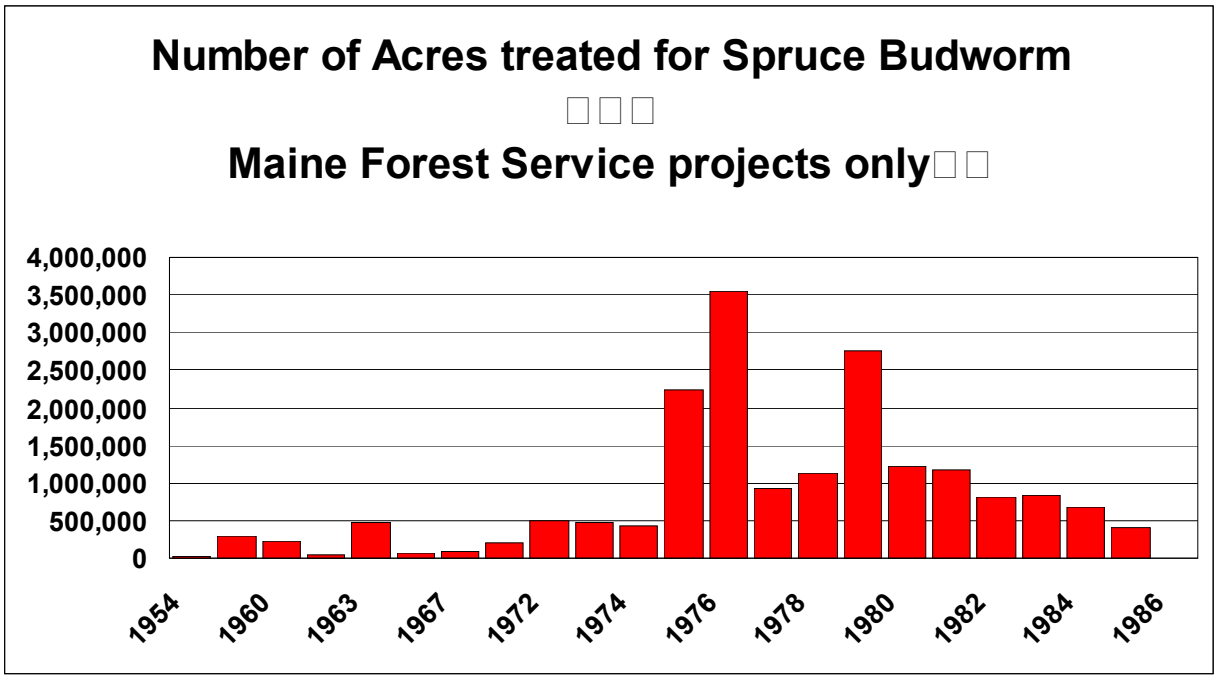


Chart provided by Dave Struble, Maine Department of Conservation - 2004

Gypsy Moth. This exotic pest invaded Maine in the early 1900's. It has not yet expanded to all its potential range in the State, but probably has infiltrated most of the most susceptible forest types. There is now a disease organism, *Entomophaga maimaiga*, established in Maine which currently appears to be successfully ameliorating outbreaks. However, there continue to be periodic population spikes in the gypsy moth population.

If these spikes were to coincide with dry summers and associated reduced disease effectiveness, gypsy moth's reproductive capacity could result in renewed outbreak status. This scenario, in concert with drought stress on the host trees could cause significant tree decline and mortality.

As with browntail moth, the State provides technical advice and assistance for risk assessment and treatment, and works with impacted municipalities in conducting targeted spray projects to address this forest pest. State/municipal cooperative spray treatments have been conducted in four of the last 25 years, for a total of 2600 acres treated. Private treatments greatly exceed the municipally sanctioned projects.

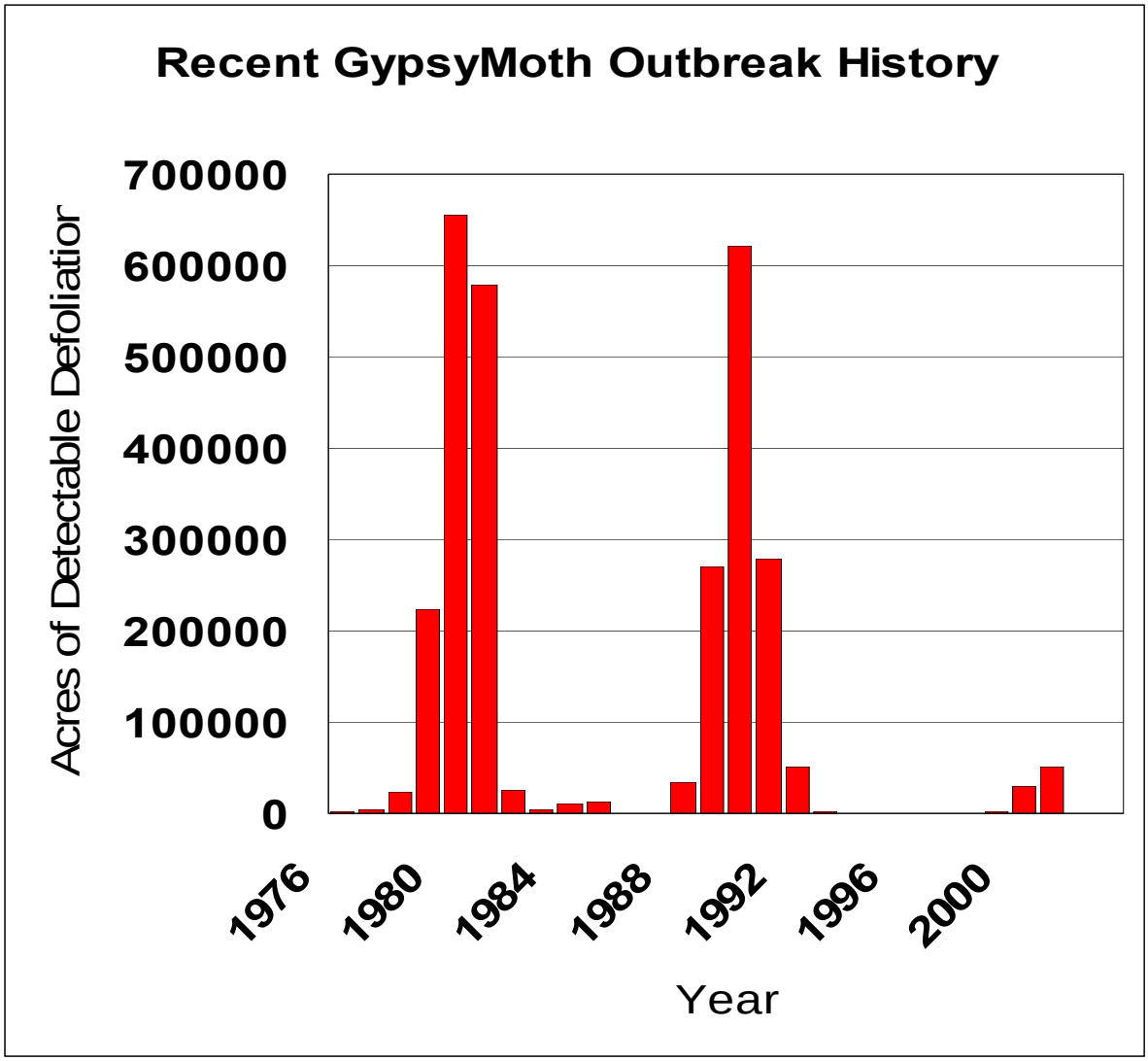


Chart provided by Dave Struble, Maine Department of Conservation - 2004

Browntail Moth. Although this exotic insect has been in the State since the early part of the last century and has become "naturalized", this has not equated to abatement of pest impacts. Towns in Maine are still dealing with this issue. The most recent outbreak started in the late 1980's and is still on-going. With the state providing technical advice and assistance for risk assessment and treatment, municipalities in the Casco Bay region have conducted targeted spray projects to address this public health pest. Spray treatments have been conducted in 11 of the last 13 years. A total of 15,000 acres have been treated by municipalities. The extent of private treatments unknown but appreciable. Since 1992, towns have sprayed 11 times, the most recent treatment being 2000 acres in Freeport and Brunswick in 2002.

Frequency of Occurrence

Many pests have 7-8 year life cycles and run their course while being contained.

Probability of Occurrence

While probability studies have not been done, based on historic record and the facts that the state is 90% forested, has two agricultural counties and is part of the global circulation of goods, the probability of pest infestations is high.

Sources: Department of Conservation, Dave Struble; Division of Plant Industry, Maine Department of Agriculture, Terry Bourgoin, Director; Ann Gibbs, State Horticulturist and Maine Forest Service press releases and website [www.state.me.us/doc/mfs/idmhwa.htm]

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 S tate. 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.

Frequency of Occurrence

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 worse, F2s, are captured there. When the history of occurrences in Maine is considered, there have been seventeen F2 tornados over a 45 year period, which averages 0.377 per year and is therefore consistent with the NOAA map on the next page. There have been no F2 tornados in Maine since the year 2000.

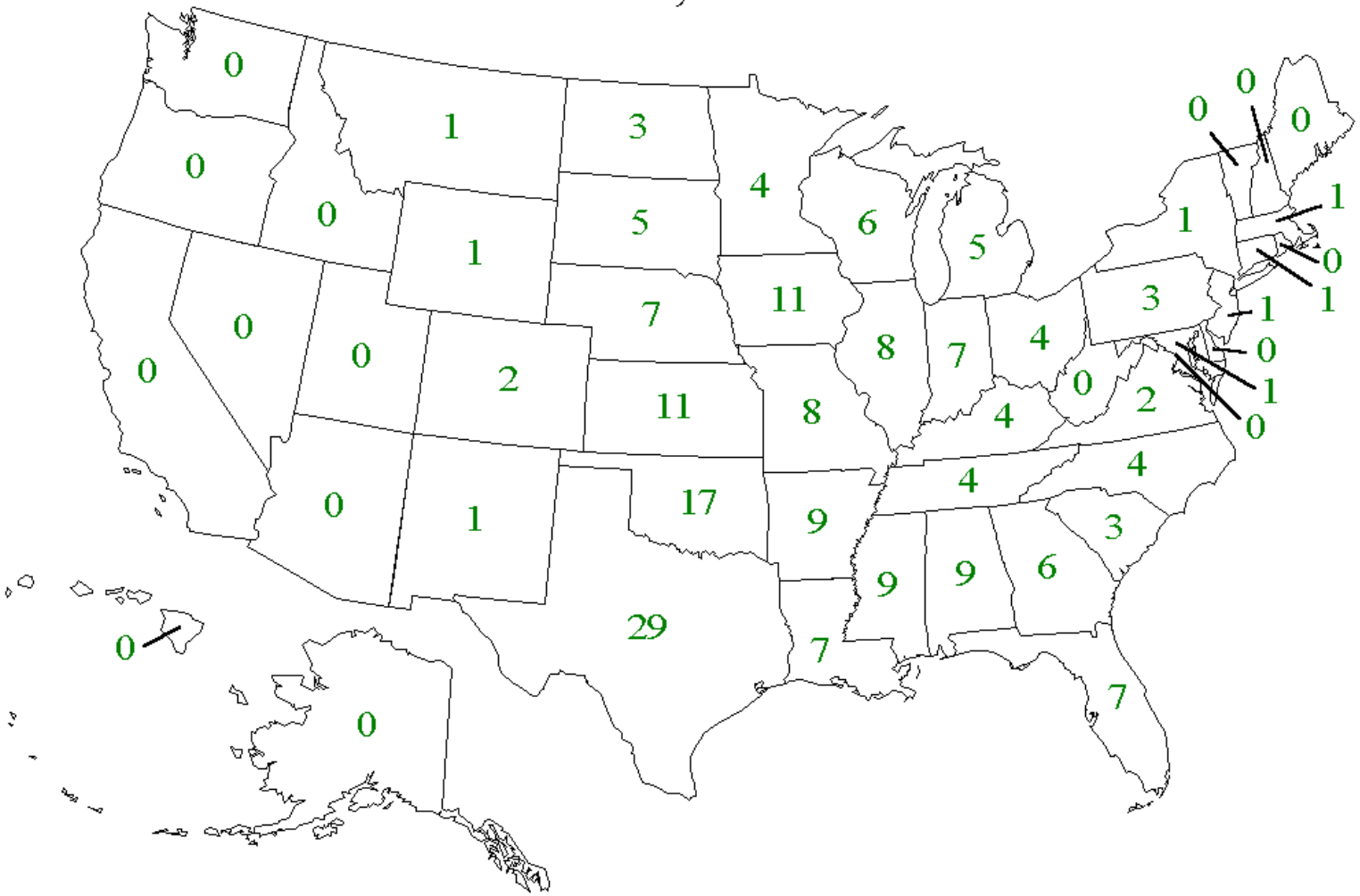
F2 Tornados in Maine
1950 – 2007

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
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 – September, 2007

F2 or greater tornado occurrences per County resulting from heavy thunderstorms
1953 – 2007
- 4 – PT, ST
- 3 - AK
- 2 – AN, KC, YK
- 1 – WO, WS
- 0 - CD
- 0 - FN
- 0 - HK
- 0 - KX
- 0 - LN
- 0 - OD
- 0 - PS
- 0 - SC

Annual Average Number of Strong-Violent (F2-F5) Tornadoes, 1950-1995



Source: NOAA website, “www.ncdc.noaa.gov/img/climate/severeweather/avgf2.gif”

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. There are no probability studies available. However, based on past experiences, the state can expect thunder and lightning every year, especially in the summer months.

F2-5 Tornado. As seen on the previous NOAA map, Maine has had, on average, 0.34 “strong-violent” F2-5 tornados annually between 1950-1995. 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	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

There are no probability studies available. However, based on past experience, and the cyclical nature of drought, 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

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, 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.

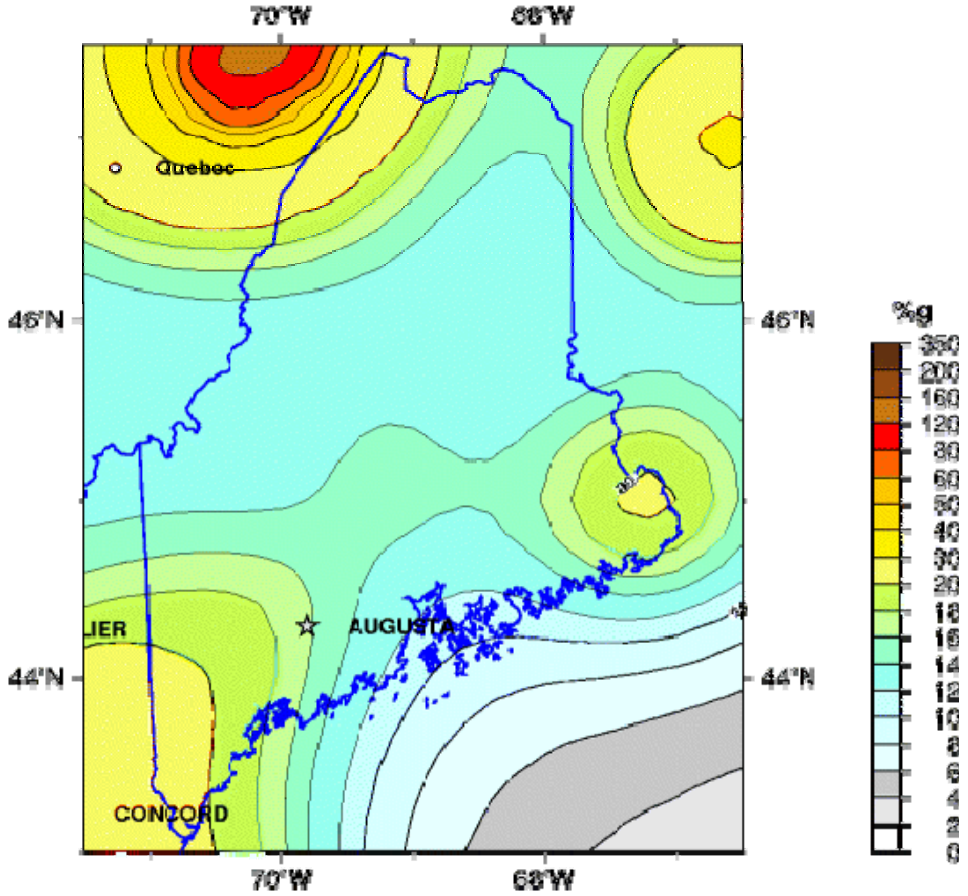
With increased development, the likelihood of marked destruction escalates. Metropolitan areas encounter far more structural damage because of the density and design of urban buildings, especially multi-story structures.

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, profiled this hazard in their local Plan.

SEISMIC Hazard Map of Maine

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



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

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 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 in Quebec near Oxford County. 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

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

Earthquake of Record. To date the worst earthquake in Maine history occurred in 1904 in Eastport (Washington County).

Probability of Occurrence

Based on 116 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, 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. 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….*

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.

Jurisdictions Most Threatened and Vulnerable to Damages from Hazards

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.

County	Flood	Winter Storm	Hurricane	Wild Fire	Blight	Summer Storm	Drought	Earth quake
Androscoggin	X	X					X	X
Aroostook	X	X		X		X		
Cumberland	X	X		X				
Franklin	X	X		X				
Hancock	X	X		X		X		
Kennebec	X	X		X				
Knox	X	X		X		X		
Lincoln	X	X	X	X				
Oxford	X	X		X			X	X
Penobscot	X	X						
Piscataquis	X	X		X				
Sagadahoc	X	X		X				
Somerset	X	X		X				
Waldo	X	X		X				
Washington	X	X		X				
York	X	X	X	X		X		X

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.

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/Landlsides. 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.

Blight and infestation. Blight and infestation come in several different manifestations in Maine. Infestations of lakes cause severe damage to the ecology of these waterbodies and can occur in any county in the State. Crop blight can affect agricultural production in any county, but predominantly in the agricultural counties of Aroostook, Hancock, Penobscot, Somerset and Washington.

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.

Changes in Development for Jurisdictions in Hazard Prone Areas

Most of the county plans used 2000 Census data in the preparation of their risk assessments. The latest Census estimates (July 1, 2006), show that Maine as a whole grew by 3.7% between 2000 and 2006. However, the growth was not evenly distributed throughout the State. The State's second largest county, York County, accounted for about a third of the State's overall population gain, growing by 8.3%. Together, York and Cumberland County (the State's largest county, population-wise, grew by a total of 24,476, or 52% 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 costal 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 - 2006

County	2000 Population*	July 1, 2006 Population (Estimated)*	Change 2000-06	
			#	%
Androscoggin	103,793	107,552	3,759	3.6
Aroostook	73,938	73,008	- 930	- 1.3
Cumberland	265,612	274,598	8,986	3.4
Franklin	29,467	30,017	550	1.9
Hancock	51,791	53,797	2,006	3.9
Kennebec	117,114	121,068	3,954	3.4
Knox	39,618	41,096	1,478	3.7
Lincoln	33,616	35,234	1,618	4.8
Oxford	54,755	57,118	2,363	4.3
Penobscot	144,919	147,180	2,261	1.6
Piscataquis	17,235	17,585	350	2.0
Sagadahoc	35,214	36,837	1,623	4.6
Somerset	50,888	52,249	1,361	2.7
Waldo	36,280	38,715	2,435	6.7
Washington	33,941	33,288	- 653	- 1.9
York	186,742	202,232	15,490	8.3
Maine - Total	**1,274,923**	**1,321,574**	**46,651**	**3.7**

*Source: U.S. Census

ASSESSING VULNERABILITY OF STATE FACILITIES

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 …the State risk assessment... State owned critical or operated facilities located in the identified hazard areas shall also be addressed…*

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 is 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.

ESTIMATING POTENTIAL LOSSES BY JURISDICTION (COUNTY)

Requirement §201.4(c)(2)(ii)	*[The risk assessment shall include] an overview and analysis of potential losses to identified vulnerable structures, based on estimates provided in the 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*

Overview and Analysis of Potential Losses to Identified Vulnerable Structures

This section will incorporate the findings of the county hazard mitigation plans that have been submitted to date 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 hazard mitigation plans and are added to provide an estimated total State loss for each infrastructure item. Each county determined potential losses using the procedures explained in the FEMA document, *Understanding Your Risks: Identifying Hazards and Estimating Losses*.

Potential Losses Identified in Local Risk Assessments

Flood Losses

County	Estimated Losses to Critical Facilities	Estimated Losses to Roads	Estimated Losses to Bridges	Estimated Losses to Utilities	Estimated Losses to Homes
Cumberland	$0	$9,039,678	$0	$0	$0
Hancock	$14,764,283	$73,097,822	$13,000,000	$3,628,750	$48,487,125
Kennebec	$7,584,700	$16,788,644	$0	$1,400,000	$87,018,300
Knox	$5,286,000	$2,893,000	$0	$0	$0
Lincoln	$208,818,800	$2,346,600	$45,665,000	$605,000	$63,316,300
Oxford	$9,202,000	$1,406,000	Included in Roads	Included in Roads	Included in Facilities
Penobscot	$0	$21,206,395	$0	$0	$0
Piscataquis	$19,000	$3,747,585	$0	$0	$0
Sagadahoc	$0	$7,284,000	$0	$0	$0
Somerset	$0	$14,174,858	$29,815,000	$0	$20,116,800
Waldo	$114,095,080	$6,945,000	$3,000,000	$150,000	$55,531,000
Washington	$23,675	$12,423.825	$0	$0	$0
York	$45,255,000	$6,826,300	$0	$0	$189,600,000

Due to a lack of standardization in earlier plans, data in the form needed for this table is not available for Androscoggin, Aroostook and Franklin counties. Revisions to county plans will include newly developed, standardized forms.

Losses from Floods were determined using FIRM maps, the locations of critical facilities and the NFIP Biennial Reports. Road lengths were measured in the 100 year flood areas and damages were calculated from the cost of construction for road washouts. It was assumed that bridges would be destroyed and would need to be replaced. The number of houses located in flood areas was taken from the Biennial reports and the housing values from the US Census 2000. Critical facilities were determined by GPS-ing their locations and determining their location in the 100 year flood areas and calculating by their assessed municipal values.

Winter Storm Losses

County	Estimated Losses to Critical Facilities	Estimated Losses to Roads	Estimated Losses to Bridges	Estimated Losses to Utilities	Estimated Losses to Homes
Cumberland*	$0	$1,213,016	$0	$74,928,120	$0
Hancock	$0	$666,225	$0	$118,168,780	$0
Kennebec*		$749,210		$1,885,980	
Knox	$0	$363,920	$0	$25,058,040	$0
Lincoln	$0	$404,245	$0	$26,891,780	$0
Oxford	$0	$676,150	$0	$2,900,000	$0
Penobscot*	$0	$863,939	$0	$544,322,635	$0
Piscataquis*	$0	$400,650	$0	$50,481,520	$0
Sagadahoc*	$0	$424,195	$0	$28,845,260	$0
Somerset*	$0	$312,378,770	$0	$1,073,417,960	$0
Waldo	$0	$562,155	$0	$137,534,660	$0
Washington	$0	$770,386	$0	$20,428,407	$0
York	$172,513,000	$3,181,000	$0	$0	Included in Critical Facilities

Due to a lack of standardization in earlier plans, data in the form needed for this table is not available for Androscoggin, Aroostook and Franklin counties. Revisions to county plans will include newly developed, standardized forms.

*Includes severe storm losses, winter and summer

Losses from Winter Storms were determined by identifying the road and utility mileages and assuming that the damages will be total. Damages costs for roads were assumed to be road debris (trees and vegetation) and snow and ice which would need to be cleared. Damage costs for utilities were assumed to be the replacement costs for downed poles and lines.

Hurricane Losses

County	Estimated Losses to Critical Facilities	Estimated Losses to Roads	Estimated Losses to Bridges	Estimated Losses to Utilities	Estimated Losses to Homes
Lincoln	$0	$404,245	$0	$26,891,780	$0
York	$350,362,000	$0	$0	$0	Included in Critical Facilities

Losses from Hurricanes were determined by identifying the road and utility mileages and assuming that the damages will be total. Damages costs for roads were assumed to be road debris (trees and vegetation) which would need to be cleared. Damage costs for utilities were assumed to be the replacement costs for downed poles and lines. In York County, a damage figure was calculated from the assessed values of public and private facilities. Each community was given a percentage value (1-10%) depending on its proximity to the coast, with which to multiply the assessed values.

Wildfire Losses

County	Estimated Losses to Critical Facilities	Estimated Losses to Roads	Estimated Losses to Bridges	Estimated Losses to Utilities	Estimated Losses to Homes
Cumberland	$0	$0	$0	$0	$3,960,863,305
Hancock	$139,828,000	$0	$0	$2,800,000	$819,312,000
Kennebec	$0	$0	$0	$0	$1,340,402,000
Knox	$6,600,000	$0	$0	$0	$446,806,000
Lincoln	$0	$0	$0	$0	$871,908,500
Oxford	$360,000,000	$0	$0	Included in Facilities	Included in Facilities
Penobscot*	$0	$0	$0	$0	$0
Piscataquis*	$111,967,830	$0	$0	$2,666,400	$234,587,000
Sagadahoc*	$0	$0	$0	$0	$573,811,400
Somerset*	$0	$0	$0	$0	$1,098,596,200
Waldo	$0	$0	$0	$0	$478,897,700
Washington	$0	$0	$0	$0	$377,615,000
York	$373,700,000	$0	$0	$0	$1,339,600,000

Due to a lack of standardization in earlier plans, data in the form needed for this table is not available for Androscoggin, Aroostook and Franklin counties. Revisions to county plans will include newly developed, standardized forms.

Losses from Wildfire were determined by assuming an estimated number of homes and critical facilities and utilities located in the wildland urban interface and that there would be a total loss of these structures in these areas. The estimated numbers were then multiplied by the assessed values.

Blight & Infestation Losses (Not profiled by any counties)

None of the counties profiled this hazard because blight and infestation do not cause any damages to facilities or infrastructure.

Summer Storm Losses

County	Estimated Losses to Critical Facilities	Estimated Losses to Roads	Estimated Losses to Bridges	Estimated Losses to Utilities	Estimated Losses to Homes
Hancock	$0	$666,225	$0	$118,168,780	$0
Knox	$0	$363,920	$0	$25,058,040	$0

Losses from Summer Storms were determined by identifying the road and utility mileages and assuming that the damages will be total. Damages costs for roads were assumed to be road debris (trees and vegetation) which would need to be cleared. Damage costs for utilities were assumed to be the replacement costs for downed poles and lines. Many counties lumped summer storm and winter storm damages together; these are reported under the winter storm heading and identified as including both kinds of losses.

Drought Losses

Oxford County profiled drought but was unable to calculate an actual dollar figure.

Earthquake Losses

County	Estimated Losses to Critical Facilities	Estimated Losses to Roads	Estimated Losses to Bridges	Estimated Losses to Utilities	Estimated Losses to Homes
York	$66,374,000	$27,287,000	Included in Roads	Included in Roads	Included in Critical Facilities

The County of Oxford profiled Earthquake but was unable to calculate an actual dollar figure.

In York County, losses from earthquakes were estimated using HAZUS software. The HAZUS program was designed to measure all of the loss types listed above resulting from earthquakes. As described in the Hazard Event Profiles, York County is considered to be at a moderate risk for earthquakes, but no significant earthquakes have affected the county since 1957.

Since the new HAZUS Multi Hazard (HAZUS-MH) product was not available at the time, HAZUS99 Release 2 was used instead. This computer application measures all types of damage resulting from earthquake events based on a series of assumptions regarding the magnitude and location of the event, unit loss values for different types of buildings, the ability of the infrastructure network to withstand earthquakes, et cetera.

For the purposes of estimating earthquake damage, the earthquake scenario inputted into HAZUS was that of an event measuring 5.8 on the Richter Scale with its epicenter in the middle of York County (in the Town of Alfred).

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 2007 as it had in 2004. However, there may be increases in flood losses to homes in the counties that experienced the most growth.

Adjusted Flood Losses

County	Estimated Losses to Homes*	Growth Rate 2000-2006	Adjustment to Flood Loss Data Based on Population Growth
Cumberland	$0	3.4	n.a.
Hancock	$48,487,125	3.9	$50,378,122
Kennebec	$87,018,300	3.4	$89,976,922
Knox	$0	3.7	n.a.
Lincoln	$63,316,300	4.8	$66,355,482
Oxford	Included in Facilities	4.3	n.a.
Penobscot	$0	1.6	n.a.
Piscataquis	$0	2.0	n.a.
Sagadahoc	$0	4.6	n.a.
Somerset	$20,116,800	2.7	$20,659,953
Waldo	$55,531,000	6.7	$59,251,577
Washington	$0	- 1.9	n.a.
York	$189,600,000	8.3	$205,336,800

*In county plans

ESTIMATING POTENTIAL LOSSES OF STATE FACILITIES

Requirement §201.4(c)(2)(ii)	*[The risk assessment shall include the following:] an overview and analysis of potential losses to identified vulnerable structures, based on estimates provided in … 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.*

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 floodzone. The following chart identifies those State owned or operated facilities that are potentially located in a floodzone. 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.

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

PROPERTY NAME	STREET ADDRESS	TOWN	CONTENT VALUE	BLDG VALUE	TOTAL VALUE
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
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)

Damages to State-owned or operated buildings or infrastructure are not likely from winter storm events. 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.

Hurricanes (CAT 1)

Damages to State owned or operated buildings or infrastructure are not likely from hurricane storm events. 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.

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.

Blight & Infestation

Damages to State-owned or operated buildings or infrastructure are not likely from blight and infestation events. Costs typically come from the overtime use of State of Maine employees (such as entomologists) and equipment to attack the infestation.

Summer Storms (1-3 Years)

Damages to state owned or operated buildings or infrastructure are not likely from summer storm events, such as thunderstorms and F0-F2 tornadoes. General damage can be caused by flooding or wildfires, but these are covered in their own sections.

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)

Damages to state owned or operated buildings or infrastructure are not likely from earthquakes because Maine does not earthquakes that cause structural damages.

Hazard Profile Work Sheet

The hazard profile worksheet on the next page was used to rate the severity of hazards profile in this Assessment. The results are included in the “Hazard Priorities” chart on page 3-8.

CATEGORY	LIKELIHOOD OF OCCURRENCE					SEVERITY OF OCCURANCE															
HAZARD EVENT	Frequent (Annual)	Probable (1-3 Year Cycle)	Occasional (Every Decade)	Remote (>Decade <Century)	Improbable (>Century)	Hundreds of Deaths	Tens of Deaths	1-9 Deaths	Mass Injuries	1-5 Injuries	No Injuries	Destruction of Structures	Major Damages	Minor Damages	Loss of Real Estate	Loss of Personal Property	Economic Impact to State	Economic Impact to County	Economic Impact to Community	Economic Impact to Individual	Eva
POINT VALUE	4	3	2	1	0	10	8	6	4	2	0	6	5	4	3	1	5	4	3	1	
NATURAL																					
Blight/Infestation	4										0				3				3		
Drought			2								0				3			4			
Earthquake (5.0 mag)				1							0			4						1	
Flooding	4									2		6					5				
Hurricane (Cat 1)			2					6					5					4			
Summer Storms		3								2					3					1	
Wildfire (major)			2							2		6					5				
Erosion/ Landslides	4										0	6								1	
Winter Storm			2					6				6					5				

NOTES:

1. Since the “Summer Storms” hazard includes tornados which are less frequent than an annual event, and thunderstorms which are annual events, averaging put the overall hazard in the 1-3 year cycle.
2. Wildfires occur annually in Maine and burn low acreage, but major wildfires that burn much larger acreages occur about every decade.

SECTION 4 – MITIGATION STRATEGY

Requirement §201.4(c)(3)	*[The State 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:

- State Capability Assessment (page 4-1)
- Local Capability Assessment (page 4-13)
- Funding Sources (page 4-17)
- Goals, Objectives and Strategic Measures (page 4-18)

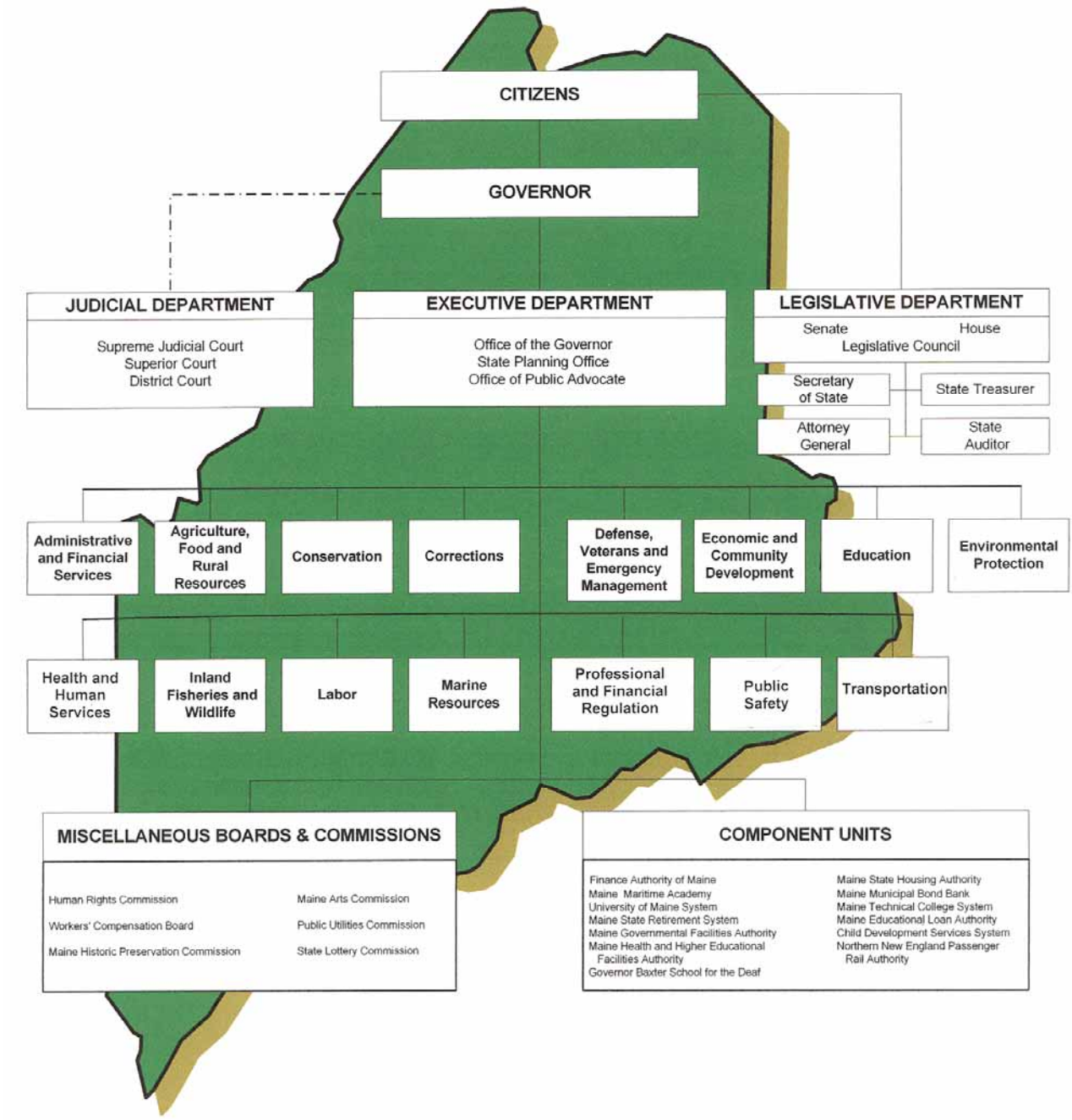
STATE CAPABILITY ASSESSMENT

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.*

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

The chart on page 4-2 illustrates the organizational format of the government of the State of Maine. It is provided to give the reader a broad concept of the various departments and their reporting structures. Pages 4-3 through 4-12 include a summary and evaluation of the State's pre-disaster and post-disaster hazard mitigation policies, programs and capabilities.

ORGANIZATION CHART OF MAINE STATE GOVERNMENT
AS OF JUNE 30, 2007



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	State Planning Office	Maine Floodplain Management Program Community Assistance Program Map Modernization 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
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
Blight & Infestation	Crops	Agricultural, Natural, and Rural Resources Office	Pesticide Control Program	Pre-disaster
Blight & Infestation	Crops	Agriculture, Food and Rural Resources	Authority to quarantine plant pests Enforcement of Permit Regulations	Post-disaster
Blight & Infestation	Environment	Bureau of Geology and Natural Areas	Invasive Species Awareness and Prevention Plan	Pre-disaster
Blight & Infestation	Environment	Dept of Environmental Protection	Spread of Invasive Aquatic Plants Grants Watershed Protection Grants	Pre-disaster
Blight & Infestation	Environment	Inland Fisheries & Wildlife	Invasive Aquatic Plant Prevention Program	Pre-disaster
Blight & Infestation	Environment	Dept of Marine Resources	Public Health Program	Pre-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

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, wildland fires and blight & infestation. Additionally, hurricane pre-disaster mitigation is 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 and landslides, 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 (MDOT) is responsible for the repair, maintenance and upgrade work to State-owned highways. When funds are available, the MDOT upgrades and/or elevates road surfaces to reduce the possibility of flood damage to roads. The MDOT 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 since completion of the 2004 State Hazard Mitigation Plan 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.

2. **Floodplain Management Program.** The State Planning Office'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 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 22 communities currently enrolled in the CRS Program. The 22 communities represent more than one third of the state's flood insurance policy base.

The 2004 State Hazard Mitigation Plan recognized that Maine's flood hazard mitigation efforts were somewhat limited by the aging Flood Insurance Rate Maps. Since that time, 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 Map Modernization Program has produced a number of new, digital flood plain maps that are much more detailed and easier to use than the earlier FIRMS.

- The Map Modernization Program is being implemented by county wide mapping and Southern Maine was the first area of the State to be digitally mapped. Over the next several years the mapping will be advanced as the program moves north through the state.

- LIDAR-based topographical mapping is being undertaken by NOAA and the Army Corps of Engineers along Maine's southern coast (York and Cumberland Counties). This information is expected to become available in 2008. The LIDAR mapping is a great tool for updating the FIRMs and could be a valuable tool for determining erosion rates.

On the downside, LIDAR based mapping is limited to a few costal areas, primarily Maine's beaches, and selected riverine areas, and many communities are still struggling with aging FIRMS. There is a concern at the State level that FEMA may not be on target to complete its Map Modernization Program for Maine within the initial timeframe envisioned by Congress (2009).

3. **MEMA Mitigation grants program.** The third state program is the planning and hazard mitigation grant programs managed by the Maine Emergency Management Agency (MEMA). 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 and respond to natural disaster hazard events. MEMA also manages the State portion of FEMA's Hazard Mitigation Grant Program and the Pre-Disaster Mitigation Program. 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, six local 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 roughly $150 million in hazard mitigation needs. At the current level of funding ($1.5 million annually), it will take about 100 years to address these needs, assuming no additional needs are identified during that time period.

4. **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 waterbody retention. The Stormwater Management Law does not apply to small projects, including the construction of single family dwellings.

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

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. Since completion of the 2004 State Hazard Mitigation Plan, 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.

Blight & Infestation. Blight and infestation are present in the State of Maine in many areas and there are several state agencies and programs that are working to mitigate the losses from these sources. The Department of Agriculture, Food and Natural Resources manages pesticide programs to reduce the loss to agricultural products. The Bureau of Geology and

Natural Areas, Department of Environmental Protection, Department of Inland Fisheries and Wildlife, and the Department of Marine Resources are all working to prevent the spread of invasive species.

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 storm, 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. And 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.

Summary

Because the State of Maine has a small population (2006 estimate of 1,321,574), 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 are multiple agencies that deal with blight and infestation mitigation, however they are scattered and many times are part-time positions. 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.

Of significant importance to furthering hazard mitigation, the Governor and Legislature signed two bills into law in the spring of 2004. The first law establishes a single, statewide model building code for all cities and towns which presently have no adopted code. The other law tasks the State Planning Office with providing model downtown rehabilitation code assistance to Maine's 494 cities and towns. Both of these laws represent a significant opportunity for Maine to address, in a coordinated fashion, six out of the nine major hazard risks to the State: flooding, winter storms, hurricanes, summer storms, wildfires and earthquakes. Maine has worked for 20 years to reach the point of having model codes for new construction and rehabilitation. Successfully designing these model codes and administering training and

technical assistance for their adoption and administration will be the next challenge for Maine in implementing this important hazard mitigation tool.

In addition, there is a Governor's Executive Order dating back to March 4, 1968, that essentially prohibits most new State facilities from being located in a floodplain area. Exceptions would include boat landings, ferry terminals, piers and wharfs, parks, preserves and similar facilities. The Governor's Executive Order is patterned after federal Executive Order 11988 in stating that if the proposed action can be undertaken outside the floodplain it should be so located, and if it must be located in the floodplain it must comply with the standards of the National Flood Insurance Program.

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.

Hazard Management Capabilities of the State that have Changed Since 2004

The table does not reflect a number of improvements in the State's hazard management capabilities since publication of the 2004 Plan:

- County Emergency Management officials are far more knowledgeable about hazard mitigation than they were just a few years ago, and are committed to helping their counties deal with mitigation issues;
- Some county directors have been heavily involved in post disaster assistance work;
- The Maine Forest Service is now placing a far greater emphasis on prevention of fires in the wildland/urban interface, rather than just responding to fires in those areas;
- There have been a number of important mapping initiatives that have resulted in local officials being more aware of hazards, and using the various maps to better manage development in those areas. Updated maps include the preparation of updated Flood Insurance Rate Maps, current LIDAR mapping efforts along beaches, and the preparation of coastal bluffs maps and coastal landslide maps for most of the coast and mapping of inland landslides in the towns of Wells, Cumberland, Bangor and Greenbush.
- The number of approved full-time equivalent positions for the Maine Floodplain Management Program now stands at four, up one-half person since 2004.

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			General Description 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.
American Red Cross Disaster Services	- Disaster Shelter Management Program		X		Maintains statewide database of 535 disaster relief shelters. Provides for safety and pre-event identification of mass care facilities including feeding, family and volunteer reception centers.
Administrative and Financial Services Bureau of General Services Risk Management Division	- Insurance on State-owned property		X		Provides insurance advice to the State government and administers all State insurance and self-funded plans and programs. Helps to reduce the cost of loss to State-owned property.
Administrative and Financial Services Bureau of General Services Professional Services Div.	- Inventories all State-owned property - Maintains construction plans and costs		X		Provides technical and fiscal oversight/approval to construction and repair of buildings and public works. Ensures that State facilities are built to code.
Administrative and Financial Services Chief Information Officer	- Sets standards for the use of information technology in State government		X		Guides the use of information technology, such as the State Internet system. Supports mitigation efforts through better distribution of information.
Agriculture, Food and Rural Resources Animal Health & Industry Div	- Enforcement of Permit Regulations - Prompt diagnosis of disease - Surveillance testing programs - Accreditation of Veterinarians		X		Controls animal disease through regulation, education and enforcement. Reduces the impact and severity of animal-borne diseases.
Agriculture, Food and Rural Resources Plant Industry Division	- Authority to quarantine plant pests. - Enforcement of permit regulations		X		Controls plant disease through regulation, education and enforcement. Reduces the impact and severity of plant infestations.
Agriculture, Food and Rural Resources Agricultural, Natural, and Rural Resources Office	- Pesticide Control Program - Animal Welfare Program - Integrated Pest Management		X		Oversees the use of pesticides and the health and safety of agricultural animals in the prevention of blight, infestation and disease.

State Department, Agency, Authority, Board, Commission, Division	Mitigation-related Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) State Mitigation Initiatives			General Description of Effect on Mitigation Initiatives
		Provides Funding	Supports Implementation	Conflicts with	
Conservation 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.
Conservation Land Use Regulation Commission	- Serves as the planning and zoning authority for unorganized areas of State, encompassing 10.4 million acres		X		By regulating development in the unorganized areas, the program ensures that development is directed away from hazard areas.
Conservation Maine Forest Service	- Forest Protection Division		X		Oversees the pre-suppression, suppression and investigation of Maine forest fires. Provides trained and equipped Forest Rangers.
Conservation Maine Forest Service	- Forest Health and Monitoring		X		Pest management and damage prevention for Maine's forest resources.
Conservation 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.
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.
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.
Defense, Veterans and Emergency Management Maine Emergency Management Agency	- Hazard Mitigation Grant Program - Pre-Disaster Mitigation Grants	X			Oversees and manages federal funding of hazard mitigation, local and state plans and local mitigation programs and construction projects.
Defense, Veterans and Emergency Management Maine National Guard	- Disaster Recovery manpower pool		X		Provides a quick manpower and equipment resource for the Governor to reduce the severity and duration of disaster events.
Economic & Community Development Department Office of Community Development	- Economic Development Infrastructure Grant Program - Public Facilities Grant Program	X			Includes public projects for flood and drainage improvements and for the construction of fire stations, homeless shelters, piers and dams. Projects must meet flood protection standards.

State Department, Agency, Authority, Board, Commission, Division	Mitigation-related Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) State Mitigation Initiatives			General Description of Effect on Mitigation Initiatives
		Provides Funding	Supports Implementation	Conflicts with	
Environmental Protection State Statutes	- Erosion & Sedimentation Control - Hydropower & Dams - Natural Resources Protection Act - Shoreland Zoning - Stormwater Program		X		Enforces standards on damages from Erosion. Licensing of hydropower projects for flood control. Regulates development in wetland areas. Regulates development in the shoreland zone. Regulates development that affects stormwater.
Environmental Protection Dept of Water Quality	- Prevent Spread of Invasive Aquatic Plants Grant. - Watershed Protection Grants	X			Provides education, inspection and hand removal grants for preventing aquatic plant infestations. Provides education grants to local schools for educating students about watershed protection.
Inland Fisheries & Wildlife Resource Management	- Invasive Aquatic Plant Prevention Program		X		Provides an education, permit and enforcement program to reduce the introduction of invasive aquatic plant infestation into Maine waters.
Marine Resources Bureau of Resource Management	- Public Health Program		X		Identifies pollution sources that may be corrected in order to increase the amount of shellfish producing areas open to harvesting. Biotoxin sampling is conducted to monitor the occurrence of PSP or "red tide" and close shellfish harvest areas as necessary to protect public health.
Public Safety Emergency Services Communication Bureau	- Enhanced 911		X		Saves lives by giving the public the ability to dial for immediate help for all emergencies. Provides for automatic caller location information, critical to speeding up the dispatch of emergency services.
Public Safety Fire Marshal's Office	- Licensing and Inspections Program		X		Enforces fire safety- related building codes to reduce loss of life due to fires.
State Planning Office 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.

State Department, Agency, Authority, Board, Commission, Division	Mitigation-related Programs, Plans, Policies, Regulations, Funding or Practices	Effect on Loss Reduction (X) State Mitigation Initiatives			General Description of Effect on Mitigation Initiatives
		Provides Funding	Supports Implementation	Conflicts with	
State Planning Office 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.
State Planning Office 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.
State Planning Office 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.
Transportation Environmental Office	- Natural Resources Mitigation Program		X		Directs and coordinates compensatory mitigation for impacts to wetland resources caused by State transportation projects.

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.*

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

Between 2003 and 2005, the Maine Emergency Management Agency 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.

In many of Maine's 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 a number of very positive trends:

- There has been huge increase in the use of modern technology; many of Maine's smallest towns now have computers and digital cameras, and are conversant with technologies such as email, the use of web sites 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.

The following paragraphs contain an analysis by hazard category.

Flooding. Some Maine communities have taken advantage of the Maine Department of Transportation's (MDOT) 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%) have received technical assistance and guidance from the State Planning Office's Floodplain Management Program, have floodplain ordinances and are members of the National Flood Insurance Program (NFIP). In addition, the 22 communities in the CRS Program represents more than one third of the flood insurance policy base. 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 Map Modernization Program will allow more municipalities to better manage their floodplains,

especially where local flood insurance rate maps are based on LIDAR topographic mapping. There is a concern, however, that many Maine communities will 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 LURC's jurisdiction is not mapped but they participate by virtue of LURC'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. Unfortunately, the mitigation needs documented in the 16 County plans, six local plans, and one University of Maine System Plan, far outweigh available funding. The approved mitigation plans listed on page 2-2 of this Plan include roughly 1,500 mitigation projects. Assuming an average of about $100,000 per project (some are less, but some are a lot more), the total need is about $150 million. Over the past five years, Maine received about $1.5 million annually in HMGP funding. Even if no new projects were added to the list, it would take about 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 NFIP'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. As of this writing, MEMA has sent a digital copy of the hurricane surge inundation maps to every affected community along Maine's coast.

Erosion/Landslides. The Maine Geological Survey (MGS) has completed coastal bluff erosion maps for about 75% of Maine's coast. The covered area extends from York County in Southern Maine to a portion of 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.

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. In 2008 additional mapping of landslide hazards will continue at MGS. 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 and the general lack of pre-disaster mitigation efforts. Moreover, 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 do not deal at all with the wildland-urban interface issues. Mitigation efforts at the local level are limited to the forest firefighting efforts of the local volunteer or municipal fire department. Since publication of the 2004 State Hazard Mitigation Plan, 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.

Blight and Infestation. Blight and infestation are present in the State of Maine in the coastal and inland waters, the Maine forests and on the many local farms. Since the coastal and inland waters are either owned or managed by the State government, the municipal governments are typically not involved. Maine forests may encompass many communities and unorganized townships and also are typically managed by the State. Because crop damages from blight could also be a widespread hazard, it is typically State and Federal agencies that are involved in the pre- and post-disaster mitigation activities.

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.

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. And 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 Capabilities by Hazard Matrix

HAZARD	TYPICAL DAMAGES or LOSSES	ACTIVITY TASKED	PROGRAMS	PRE- OR POST-DISASTER
Flooding	All Structures	Code Enforcement Officer or Municipal Planning Board	Floodplain Ordinance	Pre-disaster
Flooding	Local Roads	Road Commissioner or Public Works Director	Maine Local Roads Center Municipal Capital Improvement Projects	Pre-disaster 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 and 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

FUNDING SOURCES

Requirement §201.4(c)(3)(iv)	*[The State mitigation strategy shall include] identification of current and potential sources of Federal, State, local, or private funding to implement mitigation activities.*

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.

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	Implement long-term mitigation strategies	All-Hazards	Post	15% of Disaster
Pre Disaster Mitigation Grant	Provide planning and projects to lessen impacts of disasters	All-Hazards	Pre	$0-3 million
Flood Mitigation Assistance Program	Planning, Project & Technical Assistance Grants	Flooding	Pre	$160,000
Community Development Block Grant	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	$11,000,000
US DOA National Conservation Resources Service	Provide funds to farmers to incorporate erosion control and stormwater management into their farming practices	Flooding	Pre	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
STATE				
Maine Highway Fund	Provide funding for highway road maintenance and capital improvements	Winter Storm	Post	Varies
Environmental Protection Permits	Enforce compliance with stormwater management and erosion control	Flooding	Pre	Varies
MUNICIPAL				
Municipal Capital Improvement Projects	Construct long-term upgrades to local roads and bridges	Flooding	Pre	Varies by community
Land Use Impact Fees	Fund activities that will deal with land use development impacts	All-Hazards	Pre- or Post	Need to be created

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.

GOALS, OBJECTIVES AND STRATEGIC MEASURES (ACTIONS)

The 2007 Maine Hazard Mitigation goals, objectives and actions are set forth on the following pages, 4-19 through 4-29. There are a number of significant differences from the 2004 version of the Plan:

1. **Revised Format.** The format has been completely changed to a tabular presentation, so that the reader can easily see the linkages between each of the goals, objectives and actions. In the 2004 Plan, it was very difficult to see any of the linkages.

2. **Better Organization.** Goals, objectives and actions are now arranged by topic, beginning with administration and proceeding in order through each of the hazards profiled in this Plan. In the 2004 Plan, there was no such breakdown.

3. **Revised Goals**. In the 2004 Plan, most of the goals were not goals. Some were actually objectives, and some were actions. A concerted effort has been made to provide at least one broad-based goal for each of the major headings (Administration, Flooding, etc). Under each heading, more specific objectives have been added, followed by even more specific, measurable actions.

4. **More Realistic Actions.** The 2004 Plan contained a number of actions that are not realistic. For example, the 2004 Plan called for hiring more State staff. This is not realistic, given Maine's ongoing budget problems and the current State of Maine limits on additional hiring.

   The actions set forth on the following pages more closely 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
DOC	Maine Department of Conservation
FEMA	Federal Emergency Management Agency
MEMA	Maine Emergency Management Agency
MFS	Maine Forest Service
MGS	Maine Geological Survey
SPO	Maine State Planning Office

GOALS/OBJECTIVES AND STRATEGIC MEASURES (ACTIONS)

ADMINISTRATION

Goals: Enhance the State's hazard mitigation capabilities.

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
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	Short Range	Education of local officials on opportunities for implementation of mitigation projects
	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	Short Range	Maximum completion of hazard mitigation projects
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	Short Range	Integration of multi-jurisdictional plans
	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	Long Range	More effective county-wide, multi-jurisdictional plan updates
	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	Long Range	More effective county-wide, multi-jurisdictional plan updates
	D. State plan. Maintain and update a State Hazard Mitigation Plan.	Existing Staff $ F, S	MEMA	Long Range	Better protection of Maine residents

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
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	Long Range	Provision of mitigation information to local officials and the general public
	B. Community outreach. Continue to revise, update, and make available materials aimed at educating local officials and the public about hazard mitigation.	Existing Staff $ F, S	MEMA	Short range	Provision of mitigation to local officials and the general public
	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	Long Range	Provision of mitigation information where it is most needed
	D. Open houses. Continue to sponsor and participate in open houses, workshops and similar events aimed at increasing public awareness of hazard mitigation.	Existing Staff $ S	MEMA	Long Range	Greater awareness of mitigation issues
	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	Long Range	More time and data for emergency managers for effective decision-making
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	Short Range	More effective hazard mitigation program
	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	Short Range	Targeting of mitigation technical assistance to public officials for effective mitigation decision-making
5. Better coordination. Better coordinate the mitigation and data collection efforts of State agencies.	A. Mitigation Committee. Meet periodically with the Mitigation Review Committee 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	Long Range	Cost-effective hazard mitigation with every public dollar

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
	B. Hazard additions to State GIS system. Add hazard occurrence information to the State's GIS system.	Existing Staff $ S	MEMA, Maine OGIS	Long Range	Greater availability of hazard occurrence data
	C. 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	Long Range	Better data for hazard mitigation assessment and decision making
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	Long Range	Provision of ideas and technical know-how to public officials and the private sector on methods to incorporate hazard mitigation into their projects
	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	Long Range	Simplification of the process for choosing Hazard Mitigation Projects

FLOODING:

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

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
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	Ongoing	Better approaches to mitigating flood damages
2. Improved mapping. Support efforts to improve flood plain mapping. (see also summer storms/hurricanes)	A. Map Modernization. Support FEMA's Map Modernization Program including: • Preparation of a flood insurance rate map for every community in Maine; • Preparation of LIDAR-based mapping to the maximum extent possible	Existing Staff $ F	SPO, State Agencies	Ongoing	Better floodplain management
	B. Coastal LIDAR maps. As time and resources permit, use LIDAR-based maps to prepare detailed maps of potential storm flooding and extreme tidal flooding events for coastal communities.	$ F, S	DOC/ MGS	Ongoing	Better prediction of infrastructure and evacuation routes subject to frequent coastal flooding
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	DOC/ MGS	Ongoing	Improved geographic information on flooding vulnerability created by rising floodplains and tides
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	Long Range	Development of information on how the dynamics of watershed development adversely impact downstream properties

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
	B. Watershed recommendations. Where upstream patterns of development may be contributing to the potential for increased, downstream flood flows, recommend an action plan for addressing the problem.	Existing Staff $ S, L	DEP	Long Range	Development of workable, cost-effective strategies for protecting downstream properties
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	Long Range	Assessment of downriver flooding vulnerabilities from dam failures (breaches) for better land use and emergency planning
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: • Developing early warning systems • Monitoring ice and river flow conditions, where applicable • 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 lists of people with disabilities who would be adversely impacted by flooding • Developing and circulating lists of emergency shelters • Participating in hazard mitigation grant programs, particularly the 406 program, where applicable • Developing plans to upgrade roads, culverts, ditches and drainage systems to make roads and structures safe from flooding	Existing Staff $ F, S, C, L	MEMA	Medium Range	Development of more effective county plans

WINTER STORMS

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

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
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: • Developing early warning systems • Developing public education service announcements • Encouraging homeowners to keep driveways open for emergency vehicles • Maintaining lists of people with disabilities who would be adversely impacted by winter storms • Developing and circulating lists of emergency shelters • Developing plans for alternative transportation • Participating in hazard mitigation grant programs, particularly the 406 program, where applicable • Installing back-up power at all emergency facilities	Existing Staff $ F, S, C, L	MEMA And Counties	Medium Range	Development of more effective county plans

SUMMER STORMS/HURRICANES

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

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
1. Coastal storm surge flooding/hurricane surge inundation. Provide for better management of 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	SPO/ MEMA	Long Range	Better regulation of development in all flood zones
	B. DEP Project Review. Consider developing regulations for development in areas subject to hurricane surge inundation.	Existing Staff $ S	DEP	Long Range	Better management of areas subject to hurricane inundation
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: • Developing early warning systems • Developing public education service announcements • Maintaining lists of people with disabilities who would be adversely impacted by summer storms/hurricanes • Developing and circulating lists of emergency shelters • Developing plans for alternative transportation • Participating in hazard mitigation grant programs, particularly the 406 program, where applicable • Installing back-up power at all emergency facilities • Developing plans to upgrade roads, culverts, ditches and drainage systems to make roads safe from hurricanes	Existing Staff $F, S, C, L	MEMA	Medium Range	Development of more effective county plans

EROSION/LANDSLIDES

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

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
1. Coastal bluff and landslide areas. Develop information on vulnerable coastal bluffs and landslide areas.	A. Coastal Bluff and Landslide Mapping. Complete mapping of bluff and landslide areas along the remainder of the Maine coast for a uniform and state-wide GIS coverage.	MEMA $ S	DOC/ MGS	Short Range	Use of maps for setbacks for new development in shoreland areas in coastal municipalities
2. 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	Medium Range	Better management of high hazard landslide areas
	B. Policy Development. Write model language for avoiding unsound development in landslide-prone areas.	State Rules	DEP	Medium Range	Reduced exposure of development and infrastructure to future landslides
3. 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	Short Range	Increased community resiliency, Enhanced storm protection through natural dunes, Expedited permitting
	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	Short Range	Increased community resiliency, Enhanced storm protection through natural dunes, Expedited permitting
	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	Ongoing	Documentation of erosion trends for beach management and planning

WILDFIRES

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

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
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	Long Range	Reduction of the possibility of residential losses due to wild fires
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: • Developing public education service announcements • Maintaining access to gated roads • Maintaining lists of special needs people who would be adversely impacted by wildfires • Developing and circulating lists of emergency shelters • Participating in hazard mitigation grant programs, particularly the 406 program, where applicable • Installating back-up power at all emergency facilities	Existing Staff $ F, S, C, L	MEMA	Medium Range	Development of more effective county plans

BLIGHT/INFESTATION

Goals: Reduce loss of life, injury and property damage in Maine caused by blight/infestation

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
1. Management. Continue to provide for management of blight and infestation.	A. Monitoring. Continue to monitor blight and infestation throughout the State.	Existing Staff $ S, C, L	MFS	Ongoing	Reduction of the possibility of losses due blight and infestation
	B. Action Plan. Work with officials of other State agencies, groups and organizations to develop and implement an action plan when warranted by particular outbreaks of blight and infestation.	Existing Staff $ S	MFS	Ongoing	Reduction of the possibility of losses due blight and infestation

DROUGHT

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

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
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 Advisory Comm.	As needed	Guidance to Governor and State on what to do in the event of another drought
	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 Advisory Comm.	As needed	Guidance to Governor and State on what to do in the event of another drought

EARTHQUAKE

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

Objectives	Actions	Resources	Agency	Time Frame	Results of Action
1. Management. Continue to provide for management of earthquakes.	A. Monitoring. Continue instrumental monitoring of earthquake occurrences and collection of intensity reports.	Existing Staff $ F, S, L	MGS	Ongoing	Compilation and analysis of data base on earthquake occurrences and effects
	B. Emergency response. In the event of a large earthquake, mobilize the State's emergency response system.	Existing Staff $ F, S, C, L	MEMA	As needed	Emergency response, including assistance to most severely affected populations
	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	Ongoing	Guidance to private and public decision-makers

Priorities

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. The Benefit to Cost Ratio category used in the 2004 Plan was dropped because many of the actions are not project-specific and cannot be analyzed using traditional benefit/cost techniques. Conversely, the category relating to better information for hazard mitigation has been added because it is highly relevant to the action matrix.

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
Information for Better Management	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.	Better Info.	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
3D Open houses, public info	0	2	4	4	4	4	18
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 Hazard additions to GIS system	4	4	3	3	4	4	22
5C 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.	Better Info.	Cost Effect.	Total Points
Erosion/Landslides							
1A Coastal bluff and landslide mapping	2	3	3	3	4	4	19
2A Inland landslide mapping	2	3	1	3	4	4	17
2B Policy development	1	3	4	3	3	4	18
3A Coastal beach mapping	1	2	4	3	4	4	18
3B Analysis	1	2	4	3	4	4	18
3C 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
Blight/Infestation							
1A Continue monitoring	4	2	3	3	4	4	20
1B Action plan when needed	4	0	2	3	0	3	12
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 Emergency response	4	0	2	3	0	3	12
1C Communication	4	2	4	4	4	4	22

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

This Plan reflects the priorities and thinking that went into the preparation of 16 county plans and the University of Maine System plan, in large part because of MEMA's extensive involvement with the planning processes of these various jurisdictions. Inclusion 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.

SECTION 5 – COORDINATION OF LOCAL MITIGATION PLANNING

LOCAL FUNDING AND TECHNICAL ASSISTANCE

§201.4(c)(4)(i) **Local Funding and Technical Assistance**	[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.

Description of State Process to Support Development of Local Plans

Through the FEMA PDM-C grants, administered through MEMA, Maine's counties and towns received funding for researching and developing their Hazard Mitigation Plans. While not *direct* funding, the State's 800 number, EOC space for meetings, and staff travel time all made it easier and less expensive for the local municipalities to get information and technical assistance.

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 the Summary of Meetings table in the Appendix, 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 approved FEMA plans contained in Section 2.

Additional face-to-face meetings occurred monthly when the County Directors met in the EOC at MEMA. Time on the agenda was often used to update information relevant to both the local and state plans. On other occasions, individual County Directors or town representatives came to the MEMA offices, often for several hours at a time, to review the requirements, get contact information, or revise their work-in-progress.

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 FEMA Website calendar notices are used to inform the 489 towns 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.

Description of Funding and Technical Assistance, Last Three Years

Appendix A documents not only the planning efforts since 2004, but also the exhaustive technical assistance that was provided to communities and counties during the development of sixteen county plans, a University of Maine System (7 campuses) Plan and a few town plans.

If not provided by phone, teleconference or email, technical assistance in Maine must cover considerable distances. Technical assistance in the form of site visits, workshops or planning meetings in Aroostook and Washington Counties for example usually involved a minimum roundtrip of 6 hours driving and the time and expense of overnight stays. During the winter

months of 2006, an 800 number was provided so Aroostook County participants could safety stay home but still participate in the planning process.

With the exception of Kennebec County, the county seats of all other counties are at least an hour's distance from the MEMA offices in Augusta. As gas prices continue to rise, it is anticipated that more and more meetings will be conducted through the use of conference calls and, where available, video conferences. On a number of occasions, selectmen or town managers from small towns were setup with a computer at MEMA in order to have both the equipment and the 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 per year. In 2007, when the State received multiple declarations, a number of the hardest hit counties received multiple workshops.

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, such as the workshops on geo-synthetics.

Funding Provided to Local Jurisdictions for Mitigation Plans Since 2004

County	**Approval Date**	**Cost** (Federal Share 75%)
Standard State Plan	10-26-04	$50,000
Androscoggin	4-29-05	$20,000
Aroostook	5-19-05, 3-07	$30,093
Cumberland	12-23-05	$30,283
Franklin	2-28-05	$20,000
Hancock	7-25-05	$19,029
Kennebec	4-29-05	$20,000
Knox	1-18-05	$20,000
Lincoln	8-04-05	$18,400
Oxford	4-15-05	$21,000
Penobscot	3-14-06	$34,973
Piscataquis	11-30-06	$15,386
Sagadahoc	10-10-06	$15,000
Somerset	9-12-06	$20,760
Waldo	11-04-04	$18,708
Washington	2-23-07	$24,998
York	10-20-05	$20,739
University of Maine System	12-26-06	$35,000
Maine - Total		**$434,369**

LOCAL PLAN INTEGRATION

§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.

Description of Process and Timeframe to Review Local Plans

Because the State and counties were writing their plans concurrently, the processes for review were truncated. The State had no criteria other than FEMA's crosswalk for reviewing the local plans. Wherever possible and to optimize time, the State reviews were combined with the "technical assistance" meetings and phone calls as described in the previous paragraphs, so local plans could go directly to FEMA upon completion.

For the five year review of local plans, MEMA has not established any further review processes, pending future guidelines from FEMA.

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

The November 1, 2004 approval deadline of all the Plans overshadowed the highly desirable goal, and logic, of linking them to one another. To meet the deadline, and to maximize resources, the State focused its attention on two key efforts: first, to revise the State Plan for approval before deadline and second, to provide technical assistance as requested by the towns and counties to also attain approval.

As part of the planning process used to prepare this Plan, MEMA reviewed each county plan by hazard priority in order to link (connect) them to the State Plan, that is, to reconfirm that the goals and objectives of these local plans (previously reviewed by MEMA) closely track those of the State's Plan. Furthermore, because MEMA was closely involved in the preparation of the county plans there was consistency in the manner in which the risk assessments were done. Information in local plans that supplements and/or improves the accuracy and common knowledge base will be added to the State plan.

PRIORITIZING LOCAL ASSISTANCE

§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.

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

Since it was a federal requirement (DMA 2000) to have hazard mitigation plans, all 16 Maine counties were notified of the funding that was available in federal fiscal years 2002 and 2003 for developing their plans. Over the planning period, a benchmark cost for writing the plans was established and the funds were fairly evenly distributed among the counties.

The criteria for project grants are much more specific and are spelled out in the Administrative Plan that is at the end of this section. Approved in February 2004, and revised for inclusion in this Plan, 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

Note: While originally written with HMGP grants in mind, the criteria in the Administrative Plan will apply to PDM-C projects as well.

Consideration of Cost Benefit Analysis

Since the Administrative Plan was written for the management of HMGP grants and was approved prior to the new FEMA guidelines for PDM-C projects, it does not emphasize the new weighting of a cost benefit analysis for mitigation projects. The cost benefit criteria has been addressed, however, in several 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 emphasized in FEMA "Grant Development Workshops"
- It's on MEMA's web site

Consideration of Communities with Highest Risk

See Section VII.A.7, page 5-10

Consideration for Communities with Repetitive Loss Properties

Not applicable

Consideration for Communities with Most Intense Development Pressure

Not applicable

HAZARD MITIGATION ADMINISTRATIVE PLAN

I. Introduction

A. Purpose

The purpose of the State Hazard Mitigation Plan is to outline the management procedures that the State of Maine will use to administer the Hazard Mitigation Grant Program.

B. Authorities and References

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, 44 CFR, 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 initial requests 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 government 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.

6. "Hazard Mitigation Survey Team (HMST)" means the team that is established as the method of identifying mitigation issues in an immediate post disaster setting. The HMST is also integral to early identification of measures to be funded under some Hazard Mitigation Grant programs.

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

8. "Project" means any mitigation measure, project, or action proposed to reduce risk of future damage, hardship, loss or suffering from disasters. The term "project" is used interchangeably with the term "measure" in regulations, and the term "measure" is used interchangeably with the term "project."

9. "Projects" means hazard mitigation projects proposed by eligible applicants for implementation "State Hazard Mitigation Officer (SHMO)" means the individual designated by the Governor as the responsible individual for all matters related to the Section 404 Hazard Mitigation Grant Program, the Section 322 Hazard Mitigation Planning Program and all other State of Maine FEMA- funded hazard mitigation programs.

10. "State Hazard Mitigation Program" is an ongoing program involving a coordinated effort of State agencies to reduce the threat to people and property from natural and technological hazards.

11. “State Hazard Mitigation Review Board” means the State Hazard Mitigation Officer and his appointed panel members representing appropriate State agencies and other representatives serving to assist the SHMO to identify and rank potential projects.

12. "Subgrant" means an award of financial assistance under a grant to an eligible SubGrantee.

13. "SubGrantee" means the government or other legal entity to which a Subgrant is awarded and which is accountable to the Grantee for the use of the funds provided. SubGrantees may be a State agency, local government, private nonprofit organization, or Native American Nation.

14. Other definitions applicable to the hazard mitigation program found in Section 206.431 and 206,433 44 CFR.

II. Responsibilities

A. State Government

1. The Maine Emergency Management Agency located 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.

2. The State Hazard Mitigation Officer, within the Maine Emergency Management Agency (MEMA) in the Department of Defense, Veterans and Emergency Management (DVEM), is designated to coordinate activities of the State Hazard Mitigation Team and to serve as the responsible individual for project management.

3. 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 Government

The jurisdiction's First Select Person or City/Town Manager or the Chief Executive Officer of the private nonprofit organization will be required to designate an individual, in the application for a grant, who will serve as the point of contact on all matters related to the application.

III. Funding

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 7.5% of the Federal share of the FEMA estimate of all Damage Survey Reports under Section 406 (Public Assistance permanent restorative work), Individual Assistance, and administrative mission statements for each disaster. The Non-Federal 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.

IV. Eligibility Requirements

The State of Maine's eligibility requirements conform to 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. Located in communities that meet all federal requirements to allow participation in the National Flood Insurance program, meet all applicable federal, State and local permit requirements, and not contribute to or encourage development in the flood plain or other hazardous areas. *Only communities in good standing with the National Flood Insurance Program will be considered for 404 Grants in the State of Maine.*

B. Eligible Grant Projects must:

1. Seek to solve the problems they are intended to address.

2. Conform to the State's Hazard Mitigation Plan;

3. Address a problem that has been repetitive, or a problem that poses a significant risk to health and safety if left unsolved;

4. Be cost effective and cost no more than the anticipated value of the reduction in damage to the project area if a future disaster were to occur (benefits must exceed cost of the project proposal);

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 it is intended to address and avoid unintended consequences;

7. Consider long-term changes to the areas and entities it protects, and has manageable future maintenance and modification requirements;

8. Have a direct beneficial impact upon the designated disaster area, whether or not the project is located in the designated area (IAW 44 CFR 206.434[c][2]) and benefit the community rather than an individual;

9. Contribute to a long-term solution that integrates hazard mitigation principles with existing programs and overall community planning; and

10. Meet all applicable codes, standards, and regulations applicable to the locale including, but not limited to, 44 CFR Part 9, Flood Plain Management and Protection of Wetlands, and 44 CFR Part 10, Environmental Considerations.

V. Applicant Notification

A. Public Assistance Briefings

The State will coordinate the presentation of information, as needed, on the Hazard Mitigation Grant Program at Public Assistance Applicant's Briefings. The intent of Applicant Briefings is to create an early awareness of Mitigation Grant Programs.

B. Notice to Potential Applicants

When sufficient funding is determined to be 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 official of each municipality and all of the regional planners and County Emergency Management directors in Maine or in the designated disaster area. When funding is limited, the State will consider projects already on its list of priority projects developed and ranked by the State Mitigation Team and which fall within historical, repetitive loss areas. (See Section VI,D.)

C. Special Briefings

As necessary, detailed Hazard Mitigation Grant Program briefings for potential applicants will be scheduled. The briefings will describe eligible activities, funds and SubGrantee administrative requirements, application process and key deadlines.

VI. Project Identification

A. Dissemination

Information on the Hazard Mitigation Grant Program shall be widely disseminated through multiple sources to potential applicants.

B. Public Damage Assessment Teams

Information acquired during Preliminary Damage Assessments (PDA) for presidentially-declared disasters is an excellent opportunity for the identification of mitigation issues and potential projects. PDA teams should be briefed as to the availability of funds and requirements of the Hazard Mitigation Grant Program so potential projects can be identified for follow-up by the State Hazard Mitigation Officer. The PDA teams should suggest such projects to the State and not relate this information to potential applicants.

C. Public Assistance Briefings

Applicants for Public Assistance may be aware of potential mitigation projects that will not be funded through the Public Assistance Program. They will be briefed on the availability of the Hazard Mitigation Grant Program during the Applicant Briefings that are held for Public Assistance. The Public Assistance inspection teams consisting of Federal, State and local representatives will complete detailed inspections of damaged facilities and will be in a position to identify broad or comprehensive projects that may impact several sites. The PDA teams should suggest such projects to the State and not relate this information to potential applicants.

D. List of Projects

An ongoing list of potential Hazard Mitigation projects shall be identified and maintained by the State mitigation team for various types of mitigation grants.

VII. Application Procedures

A. Submission of Applications to the State

1. Application forms with instruction brochures will be provided for the applicant to provide information necessary to determine eligibility (Sec. IV) and ranking (Sec. VII B.2.)

2. Applications should be completed by the responsible governmental entity or private nonprofit organization, signed by the Chief Executive Officer of the jurisdiction or organization, and submitted to the State Hazard Mitigation Officer.

3. Applications for projects must indicate that work can be completed within one year of the date of FEMA approval of the grant. An exception may be granted to this requirement if circumstances warrant.

4. Applicants must submit information on their proposed projects by the announced due date to the State Hazard Mitigation Officer to be considered for 404 funding.

5. The State must notify FEMA of all proposed 404 funded projects after all state reviews and cost benefit analyses have been completed.

B. Review, Ranking and Selection of Projects

6. The function of The State Hazard Mitigation Grant Program Review Board is to review and recommend 404 grant projects to the State Hazard Mitigation Officer for funding. The Director of MEMA submits the approved funding recommendations to FEMA.

7. Ranking

   The State Hazard Mitigation Grant Program Review Board will review applications for eligibility and completeness, and will rank and assign priorities for funding to all eligible projects. This ranking will be in accordance with the criteria in Section IV B and 44 CFR Section 206.434 (c) as follows:

   a) Measures that, if not taken, will have an adverse impact on the area, such as potential loss of life, loss of essential services, damage to critical facilities, or economic hardship on the community;

   b) Measures that have the greatest potential impact for reducing future disaster losses;

   c) Indication that the proposed project is well-designed, well-organized, and demonstrates the technical capacity to undertake and implement proposed measures successfully;

   d) Degree of commitment and support by participants (e.g. active participation, including financial, by local beneficiaries, public and private) and likelihood that the project, as proposed, will succeed in attaining its objectives;

   e) Measures that are designed to accomplish multiple objectives or multi-purpose projects versus single purpose projects, including damage reduction, environmental enhancement, and economic recovery;

   f) Measures that best fit within State Hazard Mitigation Plan and an overall plan for development and/or hazard mitigation in the community, disaster area, or state;

   g) Extent to which regional or multi-agency cooperation is encouraged; and

   h) Extent to which the project will serve as a model for other communities and/or State agencies.

3. During the review and ranking process it is probable that the Panel will need additional information about the project. The State Hazard Mitigation Officer

is responsible for obtaining the needed information from the Applicant's point of contact.

C. Notification of Applicants

Following selection of projects to be submitted to FEMA for 404 funding, the Governor's Authorized Representative will notify each applicant of the decision.

D. Submission of Selected Projects to FEMA

1. The State Hazard Mitigation Officer will ensure that minimum program requirements are met by ensuring that each applicant is a member in good standing of the National Flood Insurance Program and that each application contains the items listed in Appendix A and below:

   a) A narrative describing the benefits of the project;

   b) A statement that the project meets all eligibility requirements as listed in Section IV;

   c) A preliminary environmental review that demonstrates that the application is submitted in conformance with appropriate regulations such as 44 CFR, Part 9 (Floodplain Management and Protection of Wetlands), and CFR Part 10 (Environmental Considerations).

2. The State Hazard Mitigation Officer is responsible for preparing and sending to FEMA a complete package for each project. The State Hazard Mitigation Officer is also responsible for sending to FEMA a SF 424 (Application for Federal Assistance) and a SF 424D (Assurance for Construction Programs) for each disaster. The package must contain any pertinent project management information not contained in the State Administrative Plan and identify the specific mitigation measures for which funding is requested. 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.

VIII. Project Management

A. Administration

1. All 404 mitigation funding approval for the Grantee and SubGrantee will be 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. SubGrantee applicants for 404 funding must provide written description of its cost share agreement. Obligation of Federal funds will not take place until approval has been received for the project from FEMA.

2. Based on the approved application and work schedule of the project(s), a record keeping and financial system will be implemented for the duration of the project. The SubGrantee will submit quarterly progress reports to the State Hazard Mitigation Officer, beginning the first full quarter after receipt of the funding. These reports should indicate 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 State Hazard Mitigation Officer will submit reports to FEMA as required. The final report will be a complete assessment of project accomplishment.

3. Roles and responsibilities

a) SubGrantee (applicant):

(1) Implements monitoring procedures and submits quarterly progress reports to the State Hazard Mitigation Officer as directed at the time grant is awarded.

(2) Maintains financial records and receipts necessary to document all expenditures connected with the project.

(3) Insures that any repair or construction is in accordance with applicable standards of safety, decency, and sanitation, and in conformity with applicable codes, specifications, and standards.

b) Grantee (State Hazard Mitigation Officer):

(1) Provides overall staff support necessary to manage the State Hazard Mitigation Grant Program and funded programs.

(2) Receives quarterly progress reports from SubGrantee, and reviews and submits to FEMA as required.

(3) Reviews certification of costs, cost overruns, audits and appeals, and forwards to GAR.

(4) Monitors and evaluates project accomplishment, and adherence to work schedule.

(5) Maintains necessary financial documentation and progress reports to support funds distributed to SubGrantee(s).

(6) Coordinates project actions with the GAR and provides assistance as required in administering the mitigation program.

(7) Provides technical assistance to SubGrantees as necessary.

(8) Assures necessary interagency coordination on all aspects of the Program.

c) Governor's Authorized Representative (GAR).

(1) Is responsible for overall grant administration.

(2) Notifies SubGrantees of actions taken in response to applications.

(3) 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.

(4) Coordinates all actions that pertain to the mitigation grant program with FEMA, as necessary, on matters pertaining to the Hazard Mitigation Grant Program.

B. Financial Administration

1. The Maine Emergency Management Agency will serve as Grantee for project financial administration in accordance with 44 CFR, Part 13. SubGrantee(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. Administrative costs must be shown as a separate line item and must be approved by the GAR.

3. Reimbursement

   The Grantee will pay SubGrantees on a reimbursement basis upon receipt of a reimbursement request. Only up to 90% of the award will be available until after the project is completed; the final share will be paid after the SHMO and MEMA accounting team chief do a final project review and all relevant parties have signed off on the project completion certificate. Where financial need and the ability to provide local match are demonstrated, the Grantee may pay up to 30% of the grant amount upfront. The Grantee and SubGrantees will establish reasonable procedures to ensure that the time lapse between the receipt of funds from the U.S. treasury and their disbursement is minimized.

4. Audit Requirements

   a) State Audit

      (1) The Grantee, and each SubGrantee, that receives $25,000 or more in federal financial assistance, shall have audits made in accordance with 44 CFR Part 14.

      (2) The GAR shall assure that these audits are performed on a timely basis.

      (3) The GAR shall review audits completed for the Grantee and SubGrantees. If adverse findings are reported, the GAR shall assure that appropriate action is taken and report that action to FEMA.

      (4) 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 subgrants.

C. Appeals

1. Applicant

a) The applicant may elect to appeal a decision, made by the Governor's Authorized Representative, on applications for mitigation grants.

b) The appeal will be submitted in writing and contain sufficient additional information, over that submitted with the original application, 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

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) Applicants must provide sufficient information to allow the GAR to determine the facts and validity of the request.

c) 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. The final cost of approved work may, in some instances, exceed approved cost estimates.

2. In cases of cost overrun, the applicant may request approval of additional costs providing justification (invoices, daily activity reports, progress reports, etc.) for evaluation by the State Hazard Mitigation Officer.

3. The GAR evaluates each cost overrun and, when justified, and funds are available, may approve an additional amount if it meets the cost/benefit criteria. The applicant should identify the overrun before the final inspection and in any applicable quarterly reports. Cost overruns will be approved only when funds are available in the grant program to support the amount required.

4. The SHMO will coordinate with the GAR on all cost overruns and make recommendations to the GAR on overruns exceeding 10% of project costs.

5. The GAR will forward cost overruns exceeding 10% of project cost to the FEMA Regional Director for appropriate action.

E. Project Closeout

1. When all payments of funds have been made, the GAR determines eligible administrative allowance and requests reimbursement from FEMA.

2. Files at MEMA will be documented to reflect that closeout has been accomplished and no further disbursements will be made.

IX. Plan Review

This plan will be reviewed annually to ensure compliance with law, implementing regulations and state policies. It will be updated as needed to reflect regulatory or policy changes or to improve program administration.

APPENDIX A: HMPG APPLICATION PROCEDURES

Application for a Hazard Mitigation Program Grant should be come from the responsible governmental entity (city, town or Indian Reservation), signed by the Chief Executive Officer or the designated representative of the jurisdiction and submitted to the State Hazard Mitigation Officer. The address for submitting applications is:

State Hazard Mitigation Officer
Department of Defense, Veterans and Emergency Management
Maine Emergency Management Agency
State House Station #72
Augusta, Maine 04333-0072

Each application must contain the following information:

- Identification number of disaster;
- Name of the applicant/organization;
- Point of contact for the proposed measure or project;
- Location of the proposed mitigation measure or project;
- Description of the proposed mitigation measure or project;
- Analysis of the project's cost effectiveness and substantive risk reduction;
- Project work schedule;
- Justification for selection of the project;
- Alternate considerations;
- Environmental information consistent with Federal and State Regulations;
- Cost breakdown of preferred alternative;
- List of damages indicating repetitive losses at sight.

Potential applicants should submit three copies of complete, signed applications by the announced deadline. Applications postmarked later than the deadline will not be considered.

APPENDIX B: STATE HAZARD MITIGATION TEAM

The following State Agencies will be considered and enlisted, when appropriate, to serve on the State Hazard Mitigation Team whenever necessary to accomplish the purposes of this Plan and the State's Hazard Mitigation Grant Program.

Department of Environmental Protection
Department of Economic and Community Development
DVEM/Maine Emergency Management Agency
Department of Transportation
Department of Agriculture
Department of Conservation
Maine State Planning Office
Finance Authority of Maine
Maine State Housing Authority
Department of Marine Resources
Department of Inland Fisheries and Wildlife

The following Federal Agencies may also be requested to cooperate:

Federal Emergency Management Agency
U.S. Army Corps of Engineers
U.S. Geological Survey
Natural Resources Conservation Service (NRCS)
National Weather Service
Small Business Administration
U.S. Department of Agriculture

APPENDIX C: HMGP ENVIRONMENTAL CONSIDERATIONS

Projects funded under the Hazard Mitigation Grant Program must comply with certain environmental requirements. It is FEMA's responsibility to prepare the environmental document, although the State and/or local proponent of the project should provide much of the basic information. Coordination with all appropriate agencies and individuals is very important. The first step is to determine if the individual project is categorically excluded from the need to prepare an environmental document. The types of projects that do not need the environmental analysis are those that will not result in any physical change to the environment. Such projects include:

1. Training activities,
2. Public education programs,
3. Studies that involve no commitment of resources other than manpower and funding, and
4. Technical assistance activities.

If it is determined that a project meets the categorical exclusion criteria, the applicant shall provide a brief explanation, describing the project and why there will be no impact to the environment. All other projects should include an environmental analysis to aid in the compliance with environmental requirements. This analysis should describe the:

1. Need for the proposed action, i.e., the problem/issue that is being addressed,
2. Proposed action, including location (if applicable), all actions associated with implementing the mitigation project, and timing of project implementation,

3. Alternatives considered, including the no action alternative, and
4. Analysis of the environmental effects of the proposed project and alternatives. Answer the following questions with a yes (with explanation), no, or not applicable.

Land Use and Socioeconomic Issues

a) Is the proposed project inconsistent with land use in the area?
b) Does the project conflict with local zoning ordinances?
c) Will the project result in the relocation of any structures?
d) Will the project have a significant effect on the economic activities of the area?
e) Will the project have a significant effect on any parks or recreation areas?
f) Does the proposed activity or project require a Coastal Zone Consistency Determination?

Air Quality and Water Quality

a) Will the project have significant effect on air quality?
b) Will the project require any dredging and/or disposal of any material (including construction) in any wetlands or waterways? If so, the project may require a Corps of Engineers Section 404 permit.
c) Will there be any modification of a streambed or banks of a waterway?

Natural Resources

a) Will the project require the significant removal of any marine, aquatic, or terrestrial vegetation?
b) Will the project involve construction in marshlands or wetland areas?
c) Are there any known rare or endangered species within range of the project area?
d) Is the project located inside or near a wildlife refuge or wildlife conservation area?

Archeological and Historic Resources

a) Is the project site located in any area of archeological, cultural, or historical significance? Contact the State Historical Preservation Officer (SHPO) for determination.

Coordination

The application should also identify who was contacted in the development of the project and in the preparation of this environmental analysis. Appropriate agencies for coordination might include:

The State Department of Environmental Protection
The Maine Department of Inland Fisheries and Wildlife
The Maine Historic Preservation Commission
The State Department of Agriculture
The Regional Office of the Environmental Protection Agency
The Corps of Engineers
The Natural Resources Conservation Service

References

References may be required, if appropriate.

The information provided in the environmental document will be analyzed at the FEMA Regional Office to determine if there will be significant environmental impacts as a result of the proposed project. If not, then a Finding of no Significant Impact (FONSI) will be prepared, attached to the environmental analysis, now an Environmental Assessment, and forwarded to the Hazard Mitigation Branch, FEMA Headquarters for approval. If significant impacts are anticipated, then the project will be reviewed and revised or an Environmental Impact Statement (EIS) will be prepared.

SECTION 6 – PLAN MAINTENANCE AND MONITORING

PLAN MAINTENANCE PROCESS

§201.4(c)(5)(i) Monitoring, Evaluating, and Updating **the Plan**	[The Standard State Plan Maintenance Process **must** include an] established method and schedule for monitoring, evaluating, and updating the Plan.

Method and Schedule for Monitoring, Evaluating and Updating the Plan

Monitoring. Since mitigation actions are now tied to the goals in the Plan, Section 4 of the Plan will be monitored annually or after a Disaster Declaration as described in the next section on "Activities." As previously noted, the County Directors meet monthly at the MEMA EOC 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.

Evaluation. As before, the Plan will also be monitored relevant to any disasters (and new lessons learned) 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.

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 Hazard Mitigation Planner. This review will occur in June, which would allow enough time after the winter and usual spring flooding months to properly assess any storm damages 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.

Evaluation of whether Previous Plan's Methods and Schedules Worked

The previous Plan's methods and schedules have not worked, and need to be adjusted. The major challenges are:

- The Hazard Mitigation Officer does not have sufficient time to Plan. The job requires multi-tasking: sponsoring workshops, participating in post-disaster assistance activities, reviewing applications, and attending to other emergency management duties. Additional staff is needed.
- A monthly review and evaluation is unrealistic and unnecessary. There are not that many changes taking place on a month-to-month basis. Quarterly or annual reviews and evaluations, and/or reviews after a Disaster Declaration, should be sufficient.
- The Hazard Mitigation Officer's involvement in the preparation of county plans certainly helped the counties, but it also created a lot of extra work that took away time that could have been spent on the State Plan.
- The local (county) planning process raised awareness of hazard mitigation issues, but it also increased expectations that FEMA assistance would be available to fund locally identified projects. In reality, as previously noted, the planning process identified about 100 years worth of projects (assuming all would be funded through the HMGP program).

MONITORING PROGRESS OF MITIGATION ACTIVITIES

§201.4(c)(5)(ii) Monitoring Progress of Mitigation Activities	[The Standard State Plan Maintenance Process must include a] system for monitoring implementation of mitigation measures (actions) and project closeouts.

§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.

How Mitigation Measures and Closeouts will be Monitored

For PDM, HMGP and FMA grant project activities, these will be monitored according to Section VIII - 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 a spreadsheet for tracking the status of plans and projects.

Due to resource limitations, and the previously described distances across the state, site visits will usually be grant pre-application and final inspection events. 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.

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 accountant to pay final amount
- Written notification to sub-grantee that payment has been processed
- Written notification to FEMA that the project has been closed

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.

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.

System for Reviewing Progress on Implementing Activities and Projects

Using the "Goals/Objectives and Strategic Measures (Actions)" table on pages 4-19 through 4-29 of the Mitigation Strategy, a spreadsheet has been created with an eighth column entitled

"Date of Completion." As each action is completed, a percentage of goal accomplishment can then be quantified.

Implementation of Mitigation Actions from Previous Plan

See Status report contained in the table on the next page.

Pri. #	Action	Cost	Funding Source	Time Frame	Agency	Status
1A	Create and maintain a State Enhanced Hazard Mitigation Plan	$50,000	EMPG/MEMA	Nov 07	MEMA	Not feasible – lack of staff capacity
1B	Advertise Hazard Mitigation concepts in media	$100,000	PDM	Jun 06	MEMA	Ongoing (e.g. newspaper inserts)
2	Establish & staff a Hazard Mitigation Technical Assistance Office	$100,000/yr	EMPG/MEMA	Jun 06	MEMA	Not feasible. Lack of staff capacity
3	Review the remaining county hazard mitigation plans to determine communities that are the most vulnerable to damage losses associated with hazard events.	Completed by existing staff	EMPG/MEMA	Jul 05	MEMA	To be done 2008-10
4	Modify the Floodplain Management program to use storm surge/SLOSH maps and requirements	$50,000	PDM	Jun 06	SPO	No modification, but MEMA distributed copies to towns
5A	Staff MEMA with a GIS Technician	$50,000/yr	EMPG/MEMA	Jun 06	MEMA	Not feasible. Lack of staff capacity. MEMA uses Maine Office of GIS Services as needed
5B	Create a Hazard Mitigation Best Management Practices (BMP) Manual	$75,000	PDM	Dec 06	MEMA	To be done 2008-10
6	Budget a "Winter Day" Road Assistance Program	$1,000,000/yr	US & Maine Highway Funds	Jun 07	MDOT	Not feasible – lack of sufficient State highwat budget
7A	Create a Hazard Mitigation Awareness Outreach Program	$50,000/yr	EMPG/MEMA	Jun 06	MEMA	Ongoing
7B	Encourage all communities to enact a basic Urban-Wildland Interface building code	$100,000	Land Use Impact Fees	Nov 07	SPO	Not feasible. MFS is taking a voluntary approach to mitigation through its community assessment program
7C	Budget for Flood Area Road Capital Improvements Program	$1,000,000/yr	US & Maine Highway Funds	Jun 07	MDOT	Not feasibe. No budget for this outside disaster assistance and mitigation programs
7D	Use Website to advertise mitigation concepts	$4,000/yr	PDM	Jun 05	MEMA	Ongoing. 100% implementation
8	Provide Hurricane Storm Surge Inundation maps to every community participating in the NFIP and encourage inclusion in their floodplain ordinances.	$200,000	Land Use Impact Fees	Jun 07	SPO	MEMA distributed copies to towns. No guidance on how to implement
9	Improve the State's disaster early warning capabilities, such as river gauges and NOAA alerting systems	$25,000	Bonding	Jun 07	MEMA	MEMA partnered with National Weather Service
10A	Require that every municipality have a Floodplain ordinance and be a member of the NFIP	$5,000	SPO Budget	Jun 06	SPO	Not done. Non-participation is not an issue. Some towns do not have FIRMS.
10B	Establish a state hazard mitigation database that is secure web-based and tied to GIS in order to keep the state mitigation plan up to date.	$50,000	EMPG/MEMA	Jun 06	MEMA	Action modified in current Plan. To be done 2008-10.
10C	Complete Q3 Flood Maps for those counties which do not have Q3 data and estimate probability for coastal erosion.	$200,000	PDM	Nov 07	SPO	FEMA is updating maps through its map modernization program. Not a State activity
11A	Establish the Annual Mitigation Review Committee	$20,000/yr	EMPG/MEMA	Jun 06	MEMA	Done – 2004

Pri. #	Action	Cost	Funding Source	Time Frame	Agency	Status
11B	Revise Hazard Mitigation Prioritization Criteria in Admin Plan to include communities at highest risk, with consideration for repetitive loss and most intense development pressures.	Completed by existing staff	EMPG/MEMA	Jul 06	MEMA	In Plan being reviewed by FEMA
12	Support farmers with Irrigation projects and technical assistance	$500,000/yr	US DOA Grants/Loans	Jun 07	DOA	Not feasible
13A	Increase DEP Land & Water Quality Stormwater and Shoreland Zoning Enforcement Staffing.	$200,000/yr	DEP Permit Fees	Jun 07	DEP	Not feasible. Lack of funds for additional staff.
13B	Collect vulnerability and potential loss data to estimate losses for State owned and operated buildings, infrastructure and critical facilities associated with the most likely hazards events.	$50,000	PDM	Sep 07	MEMA	No information on losses to State facilities other than those currently in the Plan
13C	Complete GIS mapping of all dam locations.	Completed by Item #5 GIS Tech	EMPG/MEMA	Sep 07	MEMA	Not feasible. Lack of adequate staff capacity. Some GIS being done on a case by case basis as dams are inspected by MEMA staff
14	Establish and fund a Public Facility Generator Grant	$50,000/yr	Maine Budget	Jun 07	MEMA	Establishment of State program not feasible, but some funds available through Homeland Security
15	Convert MGS dune maps to a GIS coverage so the spatial extent in each municipality or county could be known and integrated.	$25,000	PDM	Jun 06	DOC	Not done
15A	Determine dune cross-section areas for 100 year storms.	$25,000	PDM	Jun 06	DOC	There has been a dune profiling program
16B	Complete mapping of bluff and landslide hazards along the entire GIS coverage.	$25,000	PDM	Jun 06	DOC	75% complete