

# Sagadahoc County, Maine



## 2016 Hazard Mitigation Plan



Sagadahoc County Emergency Management Agency  
752 High Street  
Bath, Maine 04530

**2016 Sagadahoc County Hazard Mitigation Plan  
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**How the Planning Team Reviewed and Analyzed Each Section of the Plan Whether Each Section Was Revised**

1. Cover/Table of Contents: This section was revised with repagination.
2. Overview: This section was reviewed for accuracy, additions as indicated.
3. Adoptions: This section simplified and revised in 2016 to reflect changes in Sagadahoc County EMA Office personnel.
4. Planning Process: This section revised to reflect new Hazard Mitigation Planning Team members, team meetings and public involvement opportunities.
5. Risk Assessment: Major revisions as indicated; new text in red; deletions shown by strike- outs
6. Mitigation Strategies: Major revisions as indicated; new text in red; deletions shown by strike-outs
7. Plan Maintenance Process: This section updated with access to newer forms of media for review and maintenance of the plan in the future.

This plan update was developed with input from:

- Information obtained from municipal comprehensive plans, municipal land use ordinances, and municipal capital improvement plans completed since the 2006 plan
- Disasters declarations since the completion of the 2006 and 2011 plans
- Discussions in the planning meetings
- The Sagadahoc County 2006 and 2011 Hazard Mitigation Plan
- Discussions with surrounding counties
- The State of Maine 2010 Hazard Mitigation Plan
- Sagadahoc County Hazard Mitigation

**Plan Sections All Sections**

For consistency within the required sections and for the ease of review against the, FEMA checklist, Maine Emergency Management Agency required in 2009 that all county plans use the same format: (As a result this latest update still follows this format.)

- Section 1 – Introduction
- Section 2 – Adoptions
- Section 3 – Planning Process
- Section 4 – Risk Assessment
- Section 5 – Strategy
- Section 6 – Maintenance

## SECTION 1. INTRODUCTION

### OVERVIEW

Sagadahoc County is located in the Midcoast region of Maine. As Maine's smallest county, it is made up of ten municipalities totaling 250 square miles, with a population of 33,525. The County is home to Maine's largest employer, Bath Iron Works, Inc. and is a close neighbor to the former Brunswick Naval Air Station facility and Bowdoin College. It is a popular area for tourists, offering a phenomenal coastline, a rich maritime heritage, quaint towns, antique shops and more. The County sits in the lower regions of the Androscoggin and Kennebec Rivers. Its weather, landscape, and climate are dominated by maritime influences.

Originally part of Lincoln County, Sagadahoc became a separate county in 1854. It was the site of one of the first attempted permanent colonies in the New World, Popham's Colony, established and then abandoned in 1608. However, even after the failure of Popham's Colony, the English continued voyages to the region for fur-trade and fishing.

Sagadahoc County has a long tradition of maritime industries, as evidenced by the presence of Bath Iron Works, first established as an iron foundry in 1826. The company was incorporated as Bath Iron Works in 1884, and expanded into shipbuilding with the acquisition of the Goss Marine Iron Works in 1888. The first BIW-built vessel was a coastal passenger ship named Cottage City built for the Maine Steamship Company in 1890. Since that time, BIW has been awarded more than 425 shipbuilding contracts, including 245 military ships (mostly destroyers and frigates for the US Navy) and over 160 private yachts and commercial vessels. BIW became a wholly owned subsidiary of General Dynamics in September 1995. While maritime industries continue to play a strong role within the County's economy, tourism has also become a major force.

The county's topography is typified by a remarkable number of streams, bays, coves, and tidal features. The surface of the county, though considerably broken, has no high hills, and the general altitude is such that the fresh-water streams and salt inlets are not productive of deep ravines.

Sagadahoc County's political and cultural environment can best be described as "small-town". The most populous municipality, the City of Bath, has a population of just under 9,000, while Arrowsic, its smallest incorporated town, has a population of 445. While Bath, Topsham, and Richmond maintain full time police departments, the rest of the county is served by the Sagadahoc County Sheriff's Department. Only Bath maintains a paid municipal fire department with full-time paid shift firefighters while Topsham maintains a fire department with a full-time fire chief and on-call firefighters. The remaining municipalities rely on either paid on-call volunteers or unpaid volunteers.

The County has a strong tradition of self-sufficiency and independence, typified by strong local governments. However, there is also a sense of shared interdependence, which is exhibited, in the regional approach to this multi-jurisdictional plan. This hazard mitigation plan is recognized by the municipalities as a starting point for collaborative efforts, to be built upon in successive years through monitoring and review of the plan implementation.

### Municipal Population

According to the 2010 census, Sagadahoc County had a population of 35,293, which is less than a small city (the city of Lewiston, Maine has 36,592 people). Between 2000 and 2010, the County's population

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increased by just 79 people, or 0.2%. Between 2010 and 2013, the population declined by 99 persons and is anticipated to remain relatively stable. The following table, which contains population totals from the 2010 Census, and the 2013 Census Estimate shows that Sagadahoc County is composed of 10 small municipalities, the largest of which, Topsham, contains just 8,750 people. Approximately 10% of the homes in Sagadahoc County are for seasonal or recreational use.

Population of Sagadahoc County Municipalities								
Town/City	2010 Year Round Population	2000 Year Round Population	2010 Median Age	2010 Square Miles	2010 Density/ Square Mile	2010 Total Homes	2010 Year Round Homes	2010 Average Household Size
Arrowsic	427	477	55.0	8.9	48	251	213	2.09
Bath	8,514	9,266	41.0	9.8	869	4,437	4,352	2.14
Bowdoin	3,061	2,727	40.4	39.2	78	1,202	1,193	2.67
Bowdoinham	2,889	2,612	43.7	36.9	78	1,279	1,237	2.45
Georgetown	1,042	1,020	49.6	19.0	55	1,044	518	2.22
Phippsburg	2,216	2,106	49.8	31.0	71	1,748	1,062	2.30
Richmond	3,411	3,298	42.1	30.8	111	1,629	1,546	2.39
Topsham	8,784	9,100	45.2	33.2	265	4,167	4,106	2.32
West Bath	1,877	1,798	47.7	12.3	153	1,116	898	2.29
Woolwich	3,072	2,810	44.6	37.6	82	1,415	1,334	2.48
<b>Sagadahoc Co.</b>	<b>35,293</b>	<b>35,214</b>	<b>44.1</b>	<b>254</b>	<b>139</b>	<b>18,288</b>	<b>16,459</b>	<b>2.32</b>

Source: U.S. Census

Population of Sagadahoc County Municipalities: American Factfinder 2013					
Town/City	2013 Year Round Population	2013 Median Age	2013 Total Homes	2013 Year Round Homes	2013 Average Household Size
Arrowsic	445	55.2	242	216	2.09
Bath	8,324	41	4,498	4,002	2.14
Bowdoin	3,066	40.8	1,204	1,151	2.67
Bowdoinham	2,880	40	1,207	1,140	2.45
Georgetown	998	50.8	1,025	435	2.22
Phippsburg	2,153	53	1,744	961	2.30
Richmond	3,393	43.4	1,777	1,436	2.39
Topsham	8,750	45.3	4,206	3,681	2.32
West Bath	1,978	46.3	1,062	781	2.29
Woolwich	3,065	45.3	1,336	1,219	2.48
<b>Sagadahoc Co.</b>	<b>35,194</b>	<b>44.5</b>	<b>18,303</b>	<b>15,022</b>	<b>2.32</b>

Sagadahoc County is structured the same as county governments in other parts of the state. There are three county commissioners who oversee the operations of the county government including the courts, sheriff, corrections, registry of deeds and emergency management.

There are several different kinds of government in Sagadahoc County. The following summary is based in part on the Maine Municipal Association's report "Local Government in Maine."

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

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

**Townships/Unorganized Territory:** Maine is unique among eastern states in having half its land mass, or more than 10 million acres, in an Unorganized Territory. Most of it is in the northern and easternmost counties. There is no local, incorporated municipal government. Collectively, the Unorganized Territory has a population of 9,000 residents, which is 0.68 percent of the State's population.

Provision of services and property tax administration for the Unorganized Territory is shared among various State, County and local agencies. Law enforcement and public road maintenance is the County's responsibility. Taxes are paid to the State Property Tax division. The State's Land Use Regulation Commission (LURC) establishes basic rules. Perkins Township is the only township in Sagadahoc County's portion of the Unorganized Territory. In the year 2010, there were no year-round residents living in Perkins Township, and the same is true for year 2013.

The table below, from the U.S. Census, shows population fluctuations through the last century.

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Population of Sagadahoc County and Maine, 1900 - 2013		
Year	Sagadahoc County	Maine
1900	20,330	694,466
1910	18,574	742,371
1920	23,021	768,014
1930	16,927	797,423
1940	19,123	847,226
1950	20,911	914,950
1960	22,793	970,689
1970	23,452	992,048
1980	28,795	1,124,660
1990	33,535	1,227,928
2000	35,214	1,274,923
2010	35,293	1,328,361
2013	35,194	1,328,320
1970-80 change	23%	13%
1980-90 change	16.5%	9%
1990-00 change	5%	4%
2000-10 change	0.2%	4.2%
2000-13 change	(-0.28%)	(-.003%)

Source: U.S. Census and American Fact-Finder 2013

Seasonal Population of Sagadahoc Municipalities					
Town	Seasonal Housing	Estimated Seasonal Population	Town	Seasonal Housing	Estimated Seasonal Population
Arrowsic	38	106	Phippsburg	686	1,921
Bath	85	238	Topsham	61	171
Bowdoin	9	25	Richmond	83	232
Bowdoinham	42	118	Woolwich	81	227
Georgetown	526	1,473	West Bath	218	610

Source: 2010 U.S Census

Note: Estimated seasonal population is based upon an average household size of 2.8 persons.

Sagadahoc County contains 1,829 seasonal housing units with an estimated seasonal population of 5,121 based upon seasonal housing occupancy. Most of the seasonal housing is located in the towns of Phippsburg and Georgetown which are peninsula communities.

Other factors which affect seasonal population include:

- Traffic activity on Route One which is a major corridor along the coast and to other eastern tourist sites such as Bar Harbor and Acadia National Park.

- Occupancy at the numerous motels, bed & breakfast, inns and campgrounds

Considering all the factors which affect seasonal population during the summer months, the population can increase to over 10,000 persons at certain times during the summer season. This is an important factor affecting planning and dealing with a severe summer storm event.

DRAFT

## SECTION 2. ADOPTIONS

<b>1. Adoption by the Local Governing Body</b>	
<b>Requirement §201.6(c)(5):</b> (The local hazard mitigation plan shall include) documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g. City Council, County Commissioner, Tribal Council).	
<b>Elements</b>	<b>A.</b> Has the local governing body adopted (the) new or updated plan?
	<b>B.</b> Is supporting documentation, such as a resolution, included for each participating jurisdiction?

Not Applicable. This Plan is a multi-jurisdictional plan.

<b>2. Multi-Jurisdictional Plan Adoption</b>	
<b>Requirement §201.6(c)(5):</b> For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.	
<b>Elements</b>	<b>A.</b> Does the new or updated plan indicate the specific jurisdictions represented in the plan?
	<b>B.</b> For each jurisdiction, has the local governing body adopted (the) new or updated plan?
	<b>C.</b> Is supporting documentation, such as a resolution, included for each participating jurisdiction?

This plan is a multi-jurisdiction plan. Municipalities that participated in the preparation of this plan include:

- Arrowsic
- Bath
- Bowdoin
- Bowdoinham
- Georgetown
- Phippsburg
- Richmond
- Topsham
- Unorganized Territory (Perkins Township)
- West Bath
- Woolwich

Copies of the adoption resolution from each participating jurisdiction are shown on the following pages. Sagadahoc County Commissioners adopted the resolution on behalf of the Unorganized Territory (Perkins Township).

**RESOLUTION**

Whereas, natural and man-made disasters may occur at any time, we recognize that to lessen the impacts of these disasters we will save resources, property, and lives in Sagadahoc County;

And whereas the creation of a multi-jurisdictional Hazard Mitigation Plan is necessary for the development of a risk assessment and effective mitigation strategy;

And whereas, this multi-jurisdictional county of ten towns, and a portion of Maine’s Unorganized Territory is committed to the mitigation goals and measures as presented in this plan;

Therefore the City Councils, Boards of Selectmen, of the Incorporated Towns and a portion of Maine’s Unorganized Territory hereby adopt the Sagadahoc County Hazard Mitigation Plan – 2016 Update; and

Therefore, the Sagadahoc County Commissioners, acting on behalf of the county and its portion of the Unorganized Territory hereby adopt the Sagadahoc County Hazard Mitigation Plan – 2016 Update.

**Authorizing Signatures**

**Commissioners of: Sagadahoc County**

_____ Charles Crosby	_____ Commissioner	_____ Date
_____ Lawrence “Max” Dawson	_____ Commissioner	_____ Date
_____ Carol Grose	_____ Commissioner	_____ Date

### SECTION 3. PLANNING PROCESS

<b>3. Multi-Jurisdictional Planning Participation</b>	
<b>Requirement §201.6(a)(3):</b> Multi-jurisdictional plans (e.g. watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process. Statewide plans will not be accepted as multi-jurisdictional plans.	
<b>Elements</b>	<b>A.</b> Does the new or updated plan describe how each jurisdiction participated in the plan's development?
	<b>B.</b> Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?

#### A. Description of Local Participation

The jurisdictions in Sagadahoc County participated in the preparation of this Plan in a variety of ways. While meeting attendance provides a solid measure of local interest and support, not all local officials have the time and resources to attend them. Meeting participation is also hampered by the fact that many local officials have full-time jobs in addition to their municipal responsibilities. Accordingly, participation in the preparation of this Plan has been construed to include many venues including meeting attendance, town visits to meet with staff and officials, telephone conversations, email correspondence and inclusion of one or more projects in the Plan.

The table below documents how each jurisdiction participated in the preparation of this Plan, while the following acronyms indicate who verified the projects for each community:

**DPW** (Director of Public Works), **RC** (Road Commissioner), **S** (Board of Selectmen), **P** (Planner), **M** (Manager), **FC** (Fire Chief), **E** (Emergency Management Director)

<b>Summary of Local 2016 Participation</b>				
<b>Jurisdiction</b>	<b>Meeting Attendance</b>	<b>Telephone Conversations</b>	<b>E-mails</b>	<b>Project Verification</b>
Arrowsic	X	X	X	RC
Bath	X	X	X	FC, P, DPW, M,
Bowdoin	X	X	X	E
Bowdoinham	X	X	X	M, P
Georgetown	X	X	X	E, RC
Phippsburg	X	X	X	M, RC, S
Richmond	X	X	X	P DPW
Topsham	X	X	X	FC, P
Unorganized (Perkins Township)	X	X	X	E
West Bath	X	X	X	M, RC
Woolwich	X	X	X	RC, M

Note: See also the participation table on page 3-2

**B. Status of Local Participation**

The table on the next page documents the participation of jurisdictions in the preparation of the 2006, 2011 and 2016 plans.

<b>Summary of Local Plan Participation: 2006, 2011 and 2016</b>			
<b>Jurisdiction</b>	<b>2006 Participation</b>	<b>2011 Participation</b>	<b>2016 Participation</b>
Arrowsic	X	X	X
Bath	X	X	X
Bowdoin	X	X	X
Bowdoinham	X	X	X
Georgetown	X	X	X
Phippsburg	X	X	X
Richmond	X	X	X
Topsham	X	X	X
Unorganized (Perkins Township)	X	X	X
West Bath	X	X	X
Woolwich	X	X	X

<b>4. Documentation of the Planning Process</b>	
<p><b>Requirement §201.6(b):</b> In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:</p> <ol style="list-style-type: none"> <li>(1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;</li> <li>(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and</li> <li>(3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.</li> </ol>	
<p><b>Requirement §201.6(c)(1):</b> (The plan shall document) the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.</p>	
<b>Elements</b>	<p><b>A.</b> Does the plan provide a narrative description of the process followed to prepare the new or updated plan?</p> <p><b>B.</b> Does the new or updated plan indicate who was involved in the current planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated in the plan committee, provided information, reviewed drafts, etc.).</p> <p><b>C.</b> Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage prior to the plan approval)?</p> <p><b>D.</b> Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits and other interested parties to be involved in the process?</p>

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	E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?
	F. Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?

**A. Narrative Description**

The Sagadahoc County Hazard Mitigation Plan is a multi-jurisdictional plan and therefore participants were neighboring communities, businesses and other interested parties – **see list on page 4**. It was prepared in 2006, 2011 and 2016 by a Hazard Mitigation Planning Team hosted by the Sagadahoc County Emergency Management Agency with representatives from county and municipal governments, private, volunteer, and business sectors.

The Sagadahoc County EMA Director contracted with a hazard mitigation planner, William Najpauer from Midcoast Council of Governments, to assist in the development and execution of a regional solution to mitigation planning. The plan development used other Maine county plans as models and the State Mitigation Plan as a resource.

Steps taken in the preparation of this 2016 Hazard Mitigation Plan include:

**Meetings**

July 7, 2015: Kick-off Meeting with EMA Directors

July 2015: Surveys distributed to Local EMA Directors

August 20, 2015: Public meeting with EMA Directors, Fire Chiefs and interested persons to discuss Plan update and to solicit ideas and suggestions

Summary of Meetings with Municipalities to Discuss Projects and Plan Updates				
Town	Date	Meeting Type	Municipal Participants	Meeting Summary
Arrowsic		E-mail	EMA	
Bath		In Person	Planner, Fire Chief, Public Works	Update projects, discuss flooding
Bowdoin		E-mail	EMA	
Bowdoinham	12/21/15	E-mail/Phone	Town Manager	Update projects
Georgetown		In Person	EMA Directors	Update projects, discuss local plans
Phippsburg		In Person	Town Manager Road Commissioner	Update projects
Richmond		In Person	Planner	Update projects
Topsham		In Person	Fire Chief	Update projects
West Bath		In Person	Town Manager Road Commissioner	Update projects, identify deficient culverts
Woolwich		Phone/e-mail	Road Commissioner	Identify deficient culverts

**Website Outreach**

Postings on the Sagadahoc County website, EMA section, including:

- A press release describing the plan preparation process and seeking input (see appendix)
- A copy of the 2011 Plan
- Draft copies of sections of the 2016 Plan
- A public risk assessment ratings questionnaire/survey. Information provided in the surveys was included in the plan and also included municipal project updates and new projects, and recommendations for the following: to address improvements to cell phone service; to conduct wildfire pre-planning; to encourage adequate tree trimming; and to apply for the Maine Department of Environmental Protection’s culvert grant program.

**B. People Who Were Involved in the Planning Process**

**Staff Level and consultant service:** The County EMA Director led the development of this plan at the staff level, assisted by a consultant, William Najpauer, who helped draft the revisions.

**Hazard Mitigation Planning Team:** The Hazard Mitigation Planning Team consisted of representatives from state, county, health, local businesses, and municipal governments. Technical assistance was provided by structural engineers, directors of public works, fire chiefs, local contractors, public health consultants, cultural and historical organizations, and interested citizens. Team members are shown in the following table.

2016 Update – Municipal Hazard Mitigation Planning Participants		
Name	Municipal Position	Municipality or Entity
Brian Carlton	EMA Director	Town of Arrowsic
Andrew Deci	Town Planner	Town of Bath
Lawrence Renaud	Fire Chief / EMA Director	Town of Bath
Peter Owen	Director of Public Works	Town of Bath
Tom Garrepy	Fire Chief / EMA Director	Town of Bowdoin
William Post	Town Manager	Town of Bowdoinham
Nicole Briand	Planner	Town of Bowdoinham
Jerome Gamache	EMA Director	Town of Georgetown
Karin Gamache	EMS Director	Town of Georgetown
Mike Young	Town Administrator	Town of Phippsburg
Andrew Hart	Fire Chief	Town of Phippsburg
Curtis Doughty	Road Commissioner	Town of Phippsburg
Alan Moeller	Public Works Director	Town of Richmond
Scott McMaster	Police Chief / EMA Director	Town of Richmond
Victoria Boundy	Planner	Town of Richmond
Mike Labbe	EMA Director / EMS Deputy Chief	Town of Topsham
Dennis Cox	Public Works	Town of Topsham
Rod Melanson	Planner	Town of Topsham
Adam Garland	Town Administrator	Town of West Bath
Steve Reno	Road Commissioner	Town of West Bath
Jack Shaw	Road Commissioner	Town of Woolwich

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Dickey Brigance	EMA Director	Town of Woolwich
Eric Sawyer	County EMA Director	Sagadahoc County
Jason Shedlock	County EMA Deputy Director	Sagadahoc County
Joel Merry	County Sheriff	Sagadahoc County
Brodie Hinckley	County Communications Director	Sagadahoc County
Michael Clarke	Largest Employer	Bath Iron Works
Lloyd Hendrix	Electric Company	Central Maine Power
JoAnn Mooney	State Hazard Mitigation Officer	MEMA
Larry French	Red Cross Representative	American Red Cross
William Najpauer	Planning Director	MCOG

**C. How the Public was Given an Opportunity to be Heard**

The Sagadahoc County EMA Director used a variety of techniques for obtaining public input including one-on-one meetings with town officials, the use of a press release, a website survey, and presentations to various groups (see appendix sign-in sheets) to obtain public input.

**D. Opportunities for Additional Comments**

Additional comments could be made to the County EMA in person at the final public review and comment meeting **on XXX date**, by telephone, email, mail, or on the County EMA website. The Sagadahoc County Mitigation Plan involves participation by each of our municipalities and the most active players include, Fire Chiefs, Road Commissioners, Town Managers, Town Planners, Public Work Directors and EMA Directors.

**E. Review and Incorporation of Existing Plans and Studies**

The Sagadahoc County Hazard Mitigation Planning Team reviewed the 2006 and 2011 mitigation plan, the 2013 State of Maine Hazard Mitigation Plan, and other county and community plans and incorporated information as appropriate. This plan revision may be incorporated into other plans, municipal and county budgets, and emergency operation plans once the plan revision is approved by FEMA and adopted by the communities of Sagadahoc County.

The existing risk assessment contained in the 2011 plan was reviewed and was determined to be accurate. Suggestions based upon recent experiences concerning the following items were incorporated into the 2016 mitigation strategies: to improve cell service, undertake wildfire pre-planning, encourage tree trimming, and to take advantage of culvert grant funding.

All of our communities adopted the revised FIRM Flood maps in 2015 which now provide better flood data. The new FIRM maps and the ability to access this data online will greatly improve awareness of flooding hazards for development and planning purposes. The towns of Richmond and Bowdoinham undertook, at their own expense, new comprehensive plans which include new transportation sections which encourage the adoption of capital road plans.

**F. How the Planning Team Reviewed and Analyzed Each Section of the Plan Whether Each Section Was Revised**

1. Cover/Table of Contents: This section was revised with repagination.
2. Overview: This section was reviewed for accuracy, additions as indicated.
3. Adoptions: This section simplified and revised in 2016 to reflect changes in Sagadahoc County EMA Office personnel.

## Sagadahoc County Hazard Mitigation Plan – 2016 Update

4. Planning Process: This section revised to reflect new Hazard Mitigation Planning Team members, team meetings and public involvement opportunities.
5. Risk Assessment: Major revisions as indicated; new text in red; deletions shown by strike-outs
6. Mitigation Strategies: Major revisions as indicated; new text in red; deletions shown by strike-outs
7. Plan Maintenance Process: This section updated with access to newer forms of media for review and maintenance of the plan in the future.

This plan update was developed with input from:

- Information obtained from municipal comprehensive plans, municipal land use ordinances, and municipal capital improvement plans completed since the 2006 plan
- Disasters declarations since the completion of the 2006 and 2011 plans
- Discussions in the planning meetings
- The Sagadahoc County 2006 and 2011 Hazard Mitigation Plan
- Discussions with surrounding counties
- The State of Maine 2010 Hazard Mitigation Plan
- Sagadahoc County Hazard Mitigation

### **Plan Sections All Sections**

For consistency within the required sections and for the ease of review against the, FEMA checklist, Maine Emergency Management Agency required in 2009 that all county plans use the same format: (As a result this latest update still follows this format.)

- Section 1 – Introduction
- Section 2 – Adoptions
- Section 3 – Planning Process
- Section 4 – Risk Assessment
- Section 5 – Strategy
- Section 6 – Maintenance

## SECTION 4. RISK ASSESSMENT

In compliance with Code of Federal Regulations, Part 201.6(c)(2), this section of the Plan identifies, profiles and assesses the vulnerability of Sagadahoc County to natural hazards. Our local risk assessments provide sufficient information to enable Sagadahoc County to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards. This plan includes detailed descriptions of all the potential hazards that could affect Sagadahoc County, along with an analysis of Sagadahoc County's vulnerability to those identified hazards. Specific information about numbers and types of structures, potential dollar losses, and an overall description of land use trends are included in this analysis. Because this is a multi-jurisdictional plan, the risks that affect only certain regions of the County were assessed separately in the context of the affected region.

This section of the Plan contains eight subsections as follows (the numbering system begins with 5 to correspond to numbered sections of the Code of Federal Regulations):

5. Identifying Hazards (#5 below) **SH Note: add page # references to all in this section**
6. Profiling Hazards (#6 below)
7. Assessing Vulnerability: Identifying Assets (#7 below)
8. Assessing Vulnerability: Addressing repetitive loss properties (#8 below)
9. Assessing Vulnerability: Identifying Structures (#9 below)
10. Assessing Vulnerability: Estimating Potential Losses (#10 below)
11. Assessing Vulnerability: Analyzing Development Trends (#11 below)
12. Multi-jurisdictional Risk Assessment (#12 below)

### Maps

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

Sagadahoc County lies entirely within Maine's coastal division. Of the three climate zones within Maine, this climatic zone is most affected by the ocean, and because of the minimal elevation changes it is least affected by topography.

### Temperature

Average high/low temperatures (F), based on data from the nearest National Weather Service station in neighboring Brunswick are:

<u>January:</u>	30.1 to 10
<u>April:</u>	52.4 to 34.2
<u>July:</u>	77.9 to 59.3
<u>October:</u>	58.4 to 39.4

Temperature extremes can range from 20 below zero to the high 90's. These temperatures tend to be moderated in the coastal communities.

**Precipitation**

Sagadahoc County averages approximately 48 inches of precipitation annually, based on records from nearby Brunswick. 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 especially in the Coastal and Southern Interior Divisions. Statewide, average monthly precipitation is between three and four inches, with November being the wettest month, and February being the driest month. Coastal storms provide the abundant winter precipitation, especially in Sagadahoc County 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 interior parts of the county.

**Prevailing Winds**

As a mostly coastal county, Sagadahoc winds are often influenced by the wind patterns of the Gulf of Maine, which vary dramatically over the seasons. In summer, the gulf typically experiences weak winds from the southwest or southeast, which can bring warm, moist air resulting in fog formation. At times, coastal sections of the county may be in fog, while inland areas, such as Richmond, Bowdoin and Bowdoinham, are clear. Autumn winds tend to arise from the north- northwest. Winter and spring storms often are accompanied by strong winds. A familiar Gulf of Maine storm is the “nor’easter”, characterized by high winds that blow out of the northeast just ahead of the low pressure storm. Along with the rain or snow that “nor’easters” bring, high winds can produce strong waves that contribute to flooding and beach erosion.

<b>5. Identifying Hazards</b>	
<b>Requirement §201.6(c)(2)(i):</b> (The risk assessment shall include a) description of the type, location and extent of all natural hazards that can affect the jurisdiction.	
<b>Element</b>	<b>A.</b> Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?

**A. Description of All Natural Hazards Potentially Affecting Sagadahoc County**

The Sagadahoc County Hazard Mitigation Planning Team identified several natural hazards that are addressed in this Sagadahoc County Multi-jurisdictional Hazard Mitigation Plan. These hazards were identified through an extensive process that utilized input from members of the Hazard Mitigation Planning Team (comprised of representatives from state, county and municipal governments and educational, health and business representatives), public input, researching past disaster declarations in the County, and a review of current maps.

The following table identifies the natural hazards to be profiled as well as the hazards that were eliminated from further consideration in the plan, due to a lack of historical evidence, lack of overall county-wide severity or a low likelihood for the event to occur. However, although these disaster events were not profiled in the **hazard mitigation plan**, it does not certify that any of these events will not or could not occur and cause great damage.

Sagadahoc County Hazard Mitigation Plan – 2016 Update

<b>Summary of All Natural Hazards Potentially Affecting Sagadahoc County</b>		
<b>Natural Hazard</b>	<b>Determination of Applicability to Sagadahoc County</b>	<b>Comment</b>
<b>Hazards Profiled in this Plan</b>		
Flooding	Review of FEMA flood studies, flood maps, State data on disaster declarations, municipal official knowledge, and State Plan	There is a history of flooding in many parts of the County. The County contains numerous small streams and two major rivers.
Severe Winter Storms	Review of past disaster declarations, Committee and local knowledge, records from 1998 ice storm, State Plan, National Climate Data Center	Maine is frequently hit with blizzards and major “northeaster” storms. In 1998, a major ice storm hit Maine, knocking out power in many locations for days. Especially for Sagadahoc County, the impacts of winter storms include coastal erosion and wind damage.
Severe Summer Storms	Review of past disaster declarations, local knowledge, State Plan, and National Climate Data Center	Summer storms are often accompanied by high winds, road and culvert washouts and coastal erosion. On rare occasions, these storms may be accompanied by a microburst or small (unclassified) tornado, such as which occurred in late 2005.
Wildfire	Review of Maine Forest Service records, local knowledge and State Plan	Wildfires have been numerous and, with the exception of the 1947 fire, they have generally been small. Sagadahoc County faces access issues due to the many peninsulas, as well as a high reliance on volunteer fire departments.
<b>Hazards Not Profiled in this Plan</b>		
Avalanche	Review of USGS Maps, State Plan	There are no mountains in the County that hold large amounts of snow that would create avalanches.
Blight/Infestation	State Plan, local knowledge	There are no historical records of major blights or infestations with significant economic or public health impacts.
Coastal Erosion	See severe winter storms and severe summer storms	Included in profile for winter storms and summer storms.
Dam Failure	Review of Historical Records, State records	Included in profile for flooding.
Drought	State Plan	Severe, multi-year droughts occurred in Maine in the 1960’s and from 2000 to 2003. However, the effects of drought, such as wells running dry in some areas, have never been sufficient to create disaster conditions in Sagadahoc County, although they have increased the danger of wildfires.

## Sagadahoc County Hazard Mitigation Plan – 2016 Update

<b>Summary of All Natural Hazards Potentially Affecting Sagadahoc County</b>		
<b>Natural Hazard</b>	<b>Determination of Applicability to Sagadahoc County</b>	<b>Comment</b>
Earthquake	Maine Geological Survey, historical records, State Plan	Although Earthquakes are common in Maine, no significant motion has been shown for any fault since the last ice age about 20,000 years ago. The largest earthquake in Maine was recorded near Eastport (in Washington County) in 1904, but there are no records of any significant damage, and no indication that this area is threatened. All of the earthquakes that occur in Maine are intra-plate earthquakes. Maine is far inland from the boundaries of the North American plate which extends from the Mid-Atlantic ridge on the east to the western boundary of the U.S. Maine is near the middle of the plate and is therefore not subject to the frequent, deep and large earthquakes that are generated by the edges of the tectonic plates bumping into each other.
Hurricanes	Review of Historical Records, State records	Included in profile for severe summer storms.
Landslides	Review of Maine Geological Survey records, State Plan	Landslides are virtually unknown in Sagadahoc County. Sagadahoc County does not have any mountains or areas of steep terrain that could potentially be subject to landslides.
Subsidence	Review of Maine Geological Survey records, State Plan	There have been no known cases of significant land subsidence in Sagadahoc County.
Tornado, Severe Winds	Review NWS records, State Plan	On average, one to two tornadoes occur in the State of Maine each year, yet there has been no loss of life or major damage in many years (however, see profiles of winter and summer storms for high wind damages).

### **Climate Variation**

The purpose of this part of the plan is not to debate climate change or its causes, but to provide an overview of how climate has changed over time, as documented in various scientific studies, and how that change may be impacting the occurrence and severity of natural hazards in Sagadahoc County. Projecting future climate change can be problematic because, as stated in the document “Maine’s Climate Future, 2015 Update,” by the University of Maine, “climate projections are uncertain for several reasons: natural climate variability, incomplete descriptions of the climate system in computer models, and difficulty in predicting future greenhouse gas emissions” (page 6).

### **Temperature Changes**

Excerpts from the report “Maine’s Climate Future, 2015 Update,” prepared by the University of Maine, include the following:

*“Average annual temperature across Maine warmed by about 3.0 degrees F between 1895 and 2014....Although the overall warming trend...is clear, Maine’s temperature signal also features significant year to year fluctuations superimposed on a distinct pattern with periods of relative cold...and warmth...”* (page2).

*“Numerical models of the global atmosphere and ocean have been in development for over three*

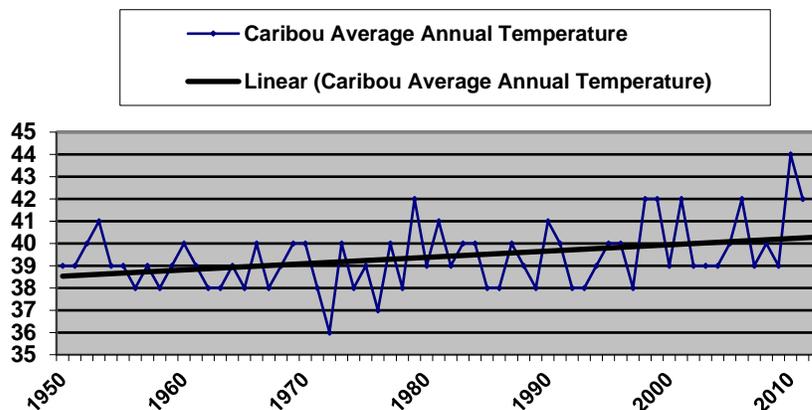
*decades. The most sophisticated of these models, such as those used by the Intergovernmental Panel on Climate Change (IPCC)...predict that annual temperature will increase another 3.0 – 5.0 degrees F...across Maine between now and 2050” (page 3 ).*

*“Maine’s warm season...increased by two weeks from the early 1900s to the 2000s. Global climate models predict that the warm season will increase by an additional two weeks over the next 50 years. Winter is warming at a faster rate than summer” (page 3).*

The following is an excerpt from the Maine State Hazard Mitigation Plan 2013 Update:

*“The National Weather Service in Gray, Maine, has compiled monthly average and annual average temperatures for a long period of time at three locations in Maine: The Portland International Jetport (1940-present); the Bangor International Airport (1953-1994 and 1999-present), and the Caribou Airport. The data from all three measuring stations show that annual average temperatures have gradually increased at all three locations...although the increase has been greatest at the Portland Jetport station” (page 3-4).*

The chart below, taken from the State’s Hazard Mitigation Plan, page 3-5, shows how temperature has changed at the Caribou Airport between 1950 and 2010.



According to “Maine’s Climate Future, 2015 Update,” the impacts of rising temperature in Maine include an increase in Lyme disease resulting from more suitable habitat for deer ticks and their hosts, and stresses on Maine’s plant and animal species. The report does not indicate that temperature increases affect the severity of the hazards identified in this plan.

### Precipitation Changes

Excerpts from the report “Maine’s Climate Future, 2015 Update,” include the following:

*“Since 1895, total annual precipitation has increased by about six inches...or 13%, with most of the additional amount falling in summer and fall. IPCC models predict that precipitation will continue to increase across the Northeast by 5-10% between now and 2050, although the distribution is likely to vary across the climate zones. Model predictions show greater increases in precipitation in interior Maine...whereas measurements to date from the weather stations*

*across the Maine landscape show that precipitation has increased most along the coast” (page 8).*

*“A significant increase in extreme precipitation events (more frequent and intense storms) has been observed across Maine and other parts of the eastern U.S....we define an extreme precipitation event for this analysis as one in which two or more inches (five or more cm) of precipitation falls within a 24-hour period. Historical measurements show that extreme events vary across the state, occurring most often in the coastal zone and western mountains. The northernmost sites, like Millinocket and Caribou, show fewer extreme events overall, but with similar relative increases over the most recent decade” (page 9).*

*“In general, the snow season has declined on average across Maine since the late 1800s...on a simplified linear trend, the snowfall has declined by about 15%...although the amount and duration of snow may decline in the future, extreme snowfall events with significant accumulation – strong nor’easters – are likely to increase in frequency” (page 10).*

*“The Northeast has experienced a greater recent increase in extreme precipitation than any other region in the U.S.; between 1958 and 2010, the Northeast saw more than a 70% increase in the amount of precipitation falling in very heavy events, taxing an already stressed and aging infrastructure” (page 11).*

The following is an excerpt from the Maine State Hazard Mitigation Plan 2013 Update:

*“The National Weather Service has also compiled monthly average and annual average precipitation at the Portland Jetport, the Bangor International Airport and the Caribou Municipal Airport. The data from all three measuring stations show that average annual precipitation ...has gradually increased at all three locations...The increase has been greatest at the Portland Jetport and the Caribou Municipal Airport” (page 3-5).*

The chart below, taken from the State’s Hazard Mitigation Plan, page 3-6, shows how precipitation has changed at the Caribou Airport between 1950 and 2010.

The following table rates the natural hazards to be profiled:

Key to rating:

<b>3</b>	<b>Severe</b>	Multiple deaths, mass casualties, or millions of dollars in damages
<b>2.5</b>	<b>High</b>	Deaths or injuries; or \$100,000’s in damages
<b>2</b>	<b>Moderate</b>	Single death or injuries, or \$10,000’s in damages
<b>1.5</b>	<b>Low</b>	Injuries; or \$1,000’s in damages
<b>1</b>	<b>Slight</b>	No deaths, single injury, or \$100s in damages
<b>A</b>	<b>Very likely</b>	
<b>B</b>	<b>Possible</b>	
<b>C</b>	<b>Very Unlikely</b>	

Sagadahoc County Hazard Mitigation Plan – 2016 Update

Rating of Hazards by Hazard Mitigation Planning Team			
Hazard	Damages	Rating	Priority
Flooding	Damages to structures, roads, bridges, culverts, utility infrastructure	3A	1
Severe Winter Storm	Downed power lines, blocked roadways and heavy snow damage to structures	3A	2
Severe Summer Storm	Localized flooding, high wind damage to utility lines, trees, roads and buildings	2.5A	3
Wildfires	Damage to timber, homes and businesses	2A	4

6. Profiling Hazards	
<b>Requirement §201.6(c)(2)(i):</b> (The risk assessment shall include a) description of the ...location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.	
<b>Elements</b>	<b>A.</b> Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the new or updated plan?
	<b>B.</b> Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the new or updated plan?
	<b>C.</b> Does the plan provide information on previous occurrences of each hazard addressed in the new or updated plan?
	<b>D.</b> Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the new or updated plan?

## FLOODING

### General Definition

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

### Types of Flooding in Sagadahoc County

There are several different types of potential flooding in Sagadahoc County:

- Erosion/Coastal Erosion: As defined in FEMA's Coastal Construction Manual, this includes:
  - a.) beach erosion;
  - b.) bluff erosion; and
  - c.) coastal landslides.

Under the National Flood Insurance Program, it's defined as 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 geological processes. Episodic erosion is induced by a single storm event.
- Dam Failure: The sudden release of water resulting from structural collapse or improper operation of the impounding structure. Dam failure can cause rapid downstream flooding, loss of life, damage to property, and the forced evacuation of people.
- Flash Flood: A flood event occurring with little or no warning where water levels rise rapidly due to heavy rains, ice jam release, or rapid snow melt.
- Ice Jam: An accumulation of floating ice fragments that blocks the normal flow of a river. During a thaw or rainstorm, the rapid increase in discharge from snow melt and/or rainfall can rapidly lift and break up a thick ice cover and carry it downstream as an ice run. Ice runs can jam in river bends or against the sheet ice covering flatter reaches. The resulting ice jams can block flow so thoroughly that serious flooding may result within an hour of their formation. Failure of an ice jam suddenly releases water downstream. Damages from ice jam flooding usually exceed those of clear water flooding because of higher than predicted flood elevations, rapid increase in water levels upstream and downstream, and physical damage caused by ice chunks. Moving ice masses can shear off trees and destroy buildings and bridges above the level of the flood waters.
- 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 snowmelt. 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.
- Beaver Dam Flooding: Flooding resulting from back-up and overflow of water resulting from beaver dams. In Sagadahoc County, flood damages from beaver dams have included washouts of roadways and other properties. For example, Phippsburg has identified at least one location vulnerable to this hazard.

#### A. Location of Flooding Hazard

The County EMA has reviewed the County's Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies to compile a profile of the flooding hazard in the County. The Sagadahoc County Flood Maps

were updated and the new version was effective in July 2015. Towns adopted the new maps, and updated flood management ordinances at their Town meeting in May and June of 2015. Flood zones are shown on some of the municipal base maps included in this Plan. Floods are described in local flood hazard studies in terms of their extent, including the horizontal area affected, and the related probability of occurrence. Flood studies use historical records to determine the probability of occurrence for different extents of flooding. The most widely adopted design and regulatory standards for floods in the United States is the 1 percent annual chance flood and this is the standard formally adopted by FEMA. The 1 percent annual flood, also known as the base flood, has a 1 percent chance of happening in any particular year. It is also referred to as the “100-year flood.”

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

## **B. Extent (Severity) of the Hazard**

Major riverine flooding (100-Event) is indicated by the following readings at the flood gauges on the Kennebec and Androscoggin Rivers as follows: North Sidney station at 11,000 cubic feet per second and at Auburn station at 17,000 cubic feet per second. Local flooding events occur when rainfall events over a 24 hour period begin to exceed over 3 inches. The highest 24 hour period rain event was 6.26 inches which occurred in the fall. 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.

The majority of the flood damage in the County is caused by winter runoff in the springtime, which undercuts or overtops local roads. When Sagadahoc County has above average snowfall for the winter, and then warmer temperatures and rainfall suddenly arrive in the spring, the snow pack melts off more quickly than the watersheds can handle. This causes local water bodies to overflow their boundaries and flood nearby road surfaces. Usually, the road damage is not major, but it can be significant, in which case it absorbs or exceeds a major portion of a municipal road budget.

Flood damages to roads, bridges and ditches continue to be a common occurrence throughout Sagadahoc County. 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.

## **Nature of Coastal Erosion Hazard**

While flooding does cause erosion, wave action generated by winter storms, particularly northeasters, is the most threatening and of a short term emergency response type of natural hazard. In addition, chronic long-term erosion along many beaches is on the order of a foot per year, so there is a second form of erosion hazard that is more gradual but, nevertheless, a natural hazard that requires mitigation. The Patriot’s Day storm that occurred on April 16, 2007, was a northeaster that caused significant damage throughout Sagadahoc County.

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 Sagadahoc County Coast, if the 10-year

and 100-year storm elevations are only one foot apart, a sea level rise of one (1) foot means that a storm that had a 1% chance of occurring in any one year (the 100-year storm) at the original elevation will have a 10% chance of occurring in any one year (the 10-year storm) at the new elevation. As a result, more homes, businesses, public infrastructure such as roads, and entire communities will be subject to more devastating coastal storms, as well as coastal erosion and landslides, on a more frequent basis. There is also concern in the scientific community that global warming may be increasing the intensity of coastal storms.

A lack of detailed, accurate mapping of flood hazards along the coast has been an issue for many years. However, there have been several major mapping initiatives dating from the mid 2000s including the preparation of Hurricane Surge Inundation Maps by the US Army Corps of Engineers, and LIDAR mapping being undertaken the Maine Geological Survey for Sagadahoc County which were incorporated in the County's new Maps effective in July 2015.

### **Dam Failure Risk**

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 Sagadahoc County the majority of these structures are nearly 100 years old and beyond the normal design life of civil engineering works. Many are low head dams constructed using local materials of stone, timber and earth. 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 fail, High Hazard dams could cause loss of life; Significant Hazard dams could cause significant property damage and Low Hazard dams would generally cause damage only to the owner's property. Therefore, it's possible that a small (low head) dam located above a large community could be rated High Hazard while a structurally larger dam sited in an unpopulated area could be a Low Hazard potential.

In Sagadahoc County, there are no High Hazard or significant hazard dams. In 2010, the Stoddard's Dam (MEMA ID #812) in Bowdoin was reclassified from Significant to Low Hazard because a vertical drop outlet pipe was installed to regulate the water (impoundment) level.

### **C. Previous Occurrences**

The following table contains a summary of floods that have occurred in Sagadahoc County, as reflected primarily in Presidential Disaster Declarations. There have been no declarations for flooding in the county since 2010.

## Sagadahoc County Hazard Mitigation Plan – 2016 Update

<b>Historical Summary of Major Flood Events in Sagadahoc County Since 1978</b>			
<b>Year</b>	<b>Month/Day</b>	<b>General Description</b>	<b>Presidential Disaster Declaration #</b>
1978	Feb 8	High winds, tidal surge, coastal flooding	FEMA 550
1987	Apr 1	Major damage to homes, businesses, public buildings, sanitation facilities, erosion	FEMA 788
1991	Aug 28	Flooding, hurricane Bob	FEMA 915
2004	Dec 10-31	Severe storms, flooding, snow melt and ice jams	FEMA 1508
2007	Apr 15-23	Severe storms and inland and coastal flooding	FEMA 1693
2008	Dec 11-29	Severe winter storm and flooding	FEMA 1815
2010	Feb 23-Mar 2	Severe winter storms and flooding	FEMA 1891

Source: FEMA website and MEMA records

### **Patriot’s Day Storm, April 16, 2007**

The Patriot’s Day Storm of 2007 was one of the most damaging storms to hit Sagadahoc County in recent years. 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 16<sup>th</sup>. 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 7<sup>th</sup> 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).

### **Flood Losses in Dollars by Municipality**

The following table contains a summary of flood losses by Town for various Federal Disaster Declarations since 1987. The table includes only public assistance losses and does not include individual and business losses which can be substantial. Note that the storm of 2008 resulted in greater damages for Sagadahoc County as a whole, in large part because of very high damages in several towns (e.g. Bath and Topsham).

## Sagadahoc County Hazard Mitigation Plan – 2016 Update

<b>Historical Summary of Recent Floods in Sagadahoc County</b>				
<b>Flood Disaster #, Year, and Public Works Damages</b>				
<b>Town</b>	<b>#915 1991</b>	<b>#1693 2007</b>	<b>#1815 2008</b>	<b>#1891 2010</b>
Arrowsic	0	0	0	0
Bath	\$7,126	\$28,845	\$152,724	\$77,246
Bowdoin	12,282	34,492	20,997	0
Bowdoinham	3,449	11,889	36,381	0
Georgetown	3,721	60,223	2,012	24,620
Phippsburg	0	26,111	54,576	24,770
Richmond	5,199	8,105	52,739	0
Topsham	21,634	30,453	90,676	17,814
West Bath	1,729	22,533	9,705	5,916
Woolwich	17,560	42,035	7,993	24,725
Other	2,157	4,262	0	8,545
<b>Total</b>	<b>\$74,857</b>	<b>\$268,947</b>	<b>\$427,804</b>	<b>\$183,636</b>

### D. Probability of Occurrence

There are FEMA Flood Insurance Studies published for some Sagadahoc communities which provide some guidance on the probability of flood occurrence. However, it can be expected that on average a major flood event will cause mostly road damage in Sagadahoc County at least once every 5-10 years.

### SEVERE WINTER STORMS

Sagadahoc County is subject to severe winter storm events including “Northeaster” winter storms that include very high winds. The entire county is subject to major snowfall events, but the northern half of the county typically will receive greater snowfall amounts. The entire County can experience a major ice storm, as it did in January 1998.

#### General Definition

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

#### Types of Winter Storms in Sagadahoc County

A single winter storm may include one or more of the following:

- **Blizzard:** Sustained winds of 40 mph (miles per hour) or more or gusting up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening travel conditions.
- **Ice Storms:** Rain which freezes upon contact. Ice coatings of at least one-fourth inch in thickness are heavy enough to damage trees, overhead wires, and similar objects and to produce widespread power outages.
- **Northeaster:** Northeasters (or nor’easters) are extra-tropical coastal storms that can produce tremendous amount 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, but in accumulated depths of two inches or more, produces hazardous driving conditions.
- Heavy snow storm: A snowfall of fifteen inches or more within 12 to 24 hours, which disrupts or slows transportation systems and the response time of public safety departments.

#### **A. Location of Hazard**

All ten municipalities in the County are subject to severe winter storms every winter.

#### **B. Extent (Severity) of the Hazard**

Severe winter storm falls can exceed 31.40 inches which can typically occur in January or February. Heavy snow fall in high wind conditions exceeding 40 miles per hour will create blizzard conditions. Likewise icing events begin to become a serious problem when it exceeds ¼ inch. Ice events exceeding one inch are common. Sagadahoc County is subject to severe winter storm events in the form of ice storms and blizzards, accompanied by high winds, wave action, coastal erosion and flooding. Winter storms can threaten Sagadahoc County at any time from November through April. The Gulf Stream follows a path up the eastern seaboard, bringing major storms with it to the Gulf of Maine. Air streams containing much colder air flow down from Canada and collide with the Gulf Stream over the New England region. Nor'easters, the most severe storm in Sagadahoc County, occur during the winter, spring and fall. They rarely develop during the summer.

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

Total snowfall ranges from between 50 and 80 inches with variability correlating with distance from the immediate coast.

The snow pack makes an important contribution to both surface and groundwater supplies, and years with a low snow pack can lead to water shortages by late summer. Melting of the snow pack in March and April is often gradual enough to prevent serious flooding, but in Sagadahoc County, melting snow, combined with rainstorms, often overwhelms watersheds, ditches and culverts, which can lead to road washouts.

Along the coast, high winds associated with northeasters can also cause damage. The majority of coastal storms cause damage only to low coastal roads, boats, beaches, and seawalls. Occasionally, a major storm accompanied by strong onshore winds and high tides results in surge and wave activity that causes property damage and erosion.

The ice storm of January 1998 had a major impact on Sagadahoc County. Significant amounts of ice accumulated on utility lines, causing them to break. The costs of the ice storm were substantial. Utility crews from Maine and throughout the East Coast worked around the clock to clear downed trees and replace power lines.

On average, the length of annual maximum snow cover is four months or more throughout the county.

**C. Previous Occurrences**

The following table contains a summary some of the most severe winter storms that have occurred in Sagadahoc County, as reflected primarily in Presidential Disaster Declarations.

<b>Historical summary of Major Winter Storm Events in Sagadahoc County Since 1972</b>			
<b>Year</b>	<b>Month</b>	<b>General Description</b>	<b>Presidential Declaration #</b>
1972	Mar 7	Ice storm, severe storms, flooding	FEMA 326
1993	Mar 13 14	Blizzard	FEMA 3099-EM
1998	Jan 5-25	“Great Ice Storm of “98”; power outages, forestry damage	FEMA 1198-DR
2001	Mar 5-31	Severe winter storm	FEMA 3164-EM
2008	Dec 11	Severe winter storm and extreme cold	FEMA 3298-EM
2013	Feb 8-9	Severe winter storm	FEMA 4108-DR
2015	Jan 26-28	Blizzard	FEMA 4208-DR

The most severe winter storm was the ice storm of January, 1998, which caused over \$542,000 in damages throughout the County. This was far less than in counties farther inland, but it was still significant. Below freezing temperatures, combined with record rainfall, contributed to a blanket of solid ice throughout central Maine. Most State government offices were closed, and innumerable businesses were forced to close and remain closed because of blocked roadways and power outages.

The following table provides a town-by-town summary of damages resulting from the ice storm of 1998. The table includes only public assistance losses and does not include individual and business losses which can be substantial.

<b>Ice Storm of January, 1998 Town-by-Town Summary of Damages</b>	
Arrowsic	0
Bath	\$83,270
Bowdoin	64,817
Bowdoinham	110,210
Georgetown	0
Phippsburg	21,409
Richmond	112,038
Topsham	99,617
West Bath	14,673
Woolwich	14,923
Other	21,242
<b>Total</b>	<b>\$542,199</b>

#### **D. Probability of Occurrence**

No probability studies have been done, but Sagadahoc County’s location in the Northeast, and its long experience with winter storms, indicate that between November and April of every year, there is a high probability that such storms will occur.

#### **SEVERE SUMMER STORMS**

Severe summer storm damages typically involve downed overhead utility lines, flooding from heavy rains, debris in the roads, and often erosion, particularly along the immediate coast.

#### **General Definition**

A violent weather phenomenon producing winds, heavy rains, lightning, and hail that can cause injuries and destruction of property, crops and livestock. Severe summer storms generally occur between June and early October.

#### **Types of Summer Weather Events**

There are several different types of summer weather events in Sagadahoc County:

- **Hurricane:** An intense, tropical cyclone, formed in the atmosphere over warm ocean areas, in which wind speeds reach 74 miles per hour or more and blow in a large spiral around a relatively calm center called the “eye”.
- **Lightning:** An electrical discharge that results from the buildup of positive and negative charges within a thunderstorm. When the buildup becomes strong enough, 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 storm formed from a combination of moisture, rapidly rising warm air and a force capable of lifting air such as a warm or cold front or 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 up to 300 miles per hour at the central core, destroys everything along its narrow ground path.

- **Microburst:** A small, extremely intense downdraft which descends to the ground creating strong wind divergence. Microbursts are typically limited to areas less than 2.5 miles across. This weather phenomenon is capable of producing damaging surface winds in excess of 100 mph. Generally, a microburst event will last no longer than 15 minutes.

**A. Location of Hazard**

The entire County is vulnerable to one or more severe summer storms each year, usually in the form of thunderstorms. The effects of summer storms are usually more common in the inland areas of the County and less noticeable along the coast where the cooling effects of the ocean tend to suppress thunderstorm activity.

**B. Extent (Severity) of the Hazard**

**Extent – this one is closer – see blue font further in the paragraph** Sagadahoc County is subject to summer storms. During summer months, southwest to southerly winds become quite prevalent across the State. Because of the frequent formation of sea breezes, southerly winds are prevalent. When severe summer storms arrive in Sagadahoc County, high winds (40 mph) can fell trees and branches onto power lines, causing power and communication outages. Heavy rains (3 inches in 24 hour period) that often accompany thunderstorms can result in flash flooding or erosion. Lightning strikes can start fires. Any of these weather events can cause personal injury or property damage.

The impact of summer storms in Sagadahoc County is usually restricted to flooding and erosion caused by the large amounts of moisture these storms can carry. Summer storms can cause damage to low lying coastal roads, boats, beaches, seawalls and land area.

**C. Previous Occurrences**

The following table contains a summary of severe summer storms that have occurred in Sagadahoc County. Note: Flooding during the spring is often a result of snowmelt, which may be from winter storms. There have been no declarations for hurricanes or other severe summer storms in Sagadahoc County since 1991.

Historical Summary of Severe Summer Storm Events in Sagadahoc County			
Year	Incident Period	General Description	FEMA Disaster Declaration #
1954	Aug 25 - Sept 1	Hurricane Carol	None
1954	Sept 2 -15	Hurricane Edna	Presidential #24
1991	Aug 16 - 20	Hurricane Bob <sup>1</sup>	FEMA 915

<sup>1</sup> Tropical storm by the time it passed through Sagadahoc County. Source: FEMA/MEMA

The occurrence of tornadoes in the county has been very infrequent. There have been no F3 or greater tornadoes reported in Maine. According to data from the National Climate Data Center, from 1/1/1950 to 9/30/2010, Sagadahoc did not experience any tornadoes of any reportable strength. Some counties in Maine have experienced from one to several F2 tornadoes during this same 55-year time period. F2 tornadoes include winds of 113 to 157 miles per hour and are considered significant tornadoes. F2 tornadoes can tear roofs off frame houses, lift and move frame houses with weak foundations, demolish mobile homes, and snap or uproot trees.

## **D. Probability of Occurrence**

There have been no probability studies to indicate the frequency of summer storms. However, Sagadahoc County's location in the northeast, and its long experience with summer storms, indicate that each summer there is a high probability that summer storms will occur. In addition, impacts from hurricanes (the most severe storms) have occurred only three times during the past 60 years.

### **WILDFIRE**

Sagadahoc County could be subject to wildfires. Nearly 80% of the County is forest land and the accessibility by vehicle to many areas is limited. A wildfire in October 1825 burned 3,000,000 acres in Maine and New Brunswick. The most severe wildfire in the State's recent history occurred in October of 1947. This fire burned 205,678 acres and caused 16 deaths. However, most of the damages were confined to Cumberland, Hancock, Oxford and York Counties.

All parts of the County could be subject to wildfires. However, the most northern portion of the county has the least accessibility to the productive forestland due to the lack of roads and development and the central and southern portion of the County has a larger number of homes and businesses within the Urban-Wildland Interface.

#### **General Definition**

A wildfire is a fire that burns vegetative cover such as grass, timber, or slash. Historically, wildfires have been primarily a natural phenomenon caused by lightning strikes, particularly during dry weather or drought conditions. However, in the recent past, humans have become the greatest cause of wildfire in Maine.

#### **Types of Wildfires**

There are two types of wildfires:

- Wildland fires: Burn vegetative cover or forest fuel.
- Wildland Urban Interface Fires: Created where homes meet with highly volatile forest fuels.

#### **A. Location of Hazard**

The Maine Department of Conservation, Forest Service, and 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. Most of these causes tend to correlate with population density. The number of fires by cause is shown on the next page, followed a town-by-town summary of fires.

#### **B. Extent (Severity) of the Hazard**

On average between 1 and 4 acres of land throughout the county is affected by wildfire. The most significant cause is machinery which could indicate vehicles or other farm/yard equipment. Based on historical records, Sagadahoc County could be subject to wildland fires and wildland urban interface fires because much of it is forested. Due to emergency access issues, the peninsulas might be the most impacted.

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Historically, forest fires were one of the State’s most significant hazards. Maine averages about 700 low acreage forest fires annually. Today, about 90% of all forest fires are caused by human activity, while 10% are caused by lightning. During dry periods, fire danger increases rapidly.

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 dead trees left standing on the forest floor after insect infestations or from logging operations.

### C. Previous Occurrences

Based on information obtained from the Maine Forest Service, there have been no major fires in Sagadahoc County in recent years. All of the wildfires known to have occurred were confined to relatively small land areas. The County has been hit with 49 wildfires from 2004 to 2009.

<b>Fires in Sagadahoc County 2004 – 2009</b>						
<b>Town by Year &amp; Number of Fires</b>						
<b>Town</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
Arrowsic	1	0	0	0	0	0
Bath	1	0	0	0	0	1
Bowdoin	3	0	1	1	0	0
Bowdoinham	2	0	2	0	2	2
Georgetown	0	0	0	1	0	0
Phippsburg	0	0	0	0	0	0
Richmond	3	1	5	1	4	2
Topsham	0	0	0	1	0	0
West Bath	0	1	2	0	2	0
Woolwich	0	2	2	1	4	1
<b>Sagadahoc Co.</b>	<b>10</b>	<b>4</b>	<b>12</b>	<b>5</b>	<b>12</b>	<b>3</b>

<b>Fire in Sagadahoc County 2004 – 2009</b>						
<b>Total Acreage Burned</b>						
<b>Town</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
Arrowsic	0.9	0	0	0	0	0
Bath	2	0	0	0	0	1
Bowdoin	0.3	0	8.4	0.25	0	0
Bowdoinham	1.1	0	0.45	0	4.62	0.2
Georgetown	0	0	0	1	0	0
Phippsburg	0	0	0	0	0	0
Richmond	2.4	0.25	2.05	0.5	4.08	0.45
Topsham	0	0	0	0.3	0	0
West Bath	0	0.05	0.36	0	0.6	0
Woolwich	0	1.5	2.85	0.44	2.70	0.1
<b>Sagadahoc Co.</b>	<b>6.7</b>	<b>1.8</b>	<b>14.1</b>	<b>2.49</b>	<b>12</b>	<b>1.75</b>
<b>Sagadahoc County 2004 – 2009</b>						

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Number of Fires by Cause						
Cause	2004	2005	2006	2007	2008	2009
Campfire	1	1	0	1	2	0
Children	3	1	3	0	0	0
Debris	2	2	4	0	3	2
Incendiary	0	0	1	1	1	0
Lighting	0	0	0	0	1	1
Machinery	1	0	1	1	2	2
Misc.	3	0	2	0	1	1
Smoking	0	0	1	2	2	0
<b>Total</b>	<b>10</b>	<b>4</b>	<b>12</b>	<b>5</b>	<b>12</b>	<b>6</b>

Sagadahoc County 2010 - 2015 Number of Fires and Acreage Burned by Cause								
Cause	Total Fire Events	2010 Acres Burned	2011 Acres Burned	2012 Acres Burned	2013 Acres Burned	2014 Acres Burned	2015 Acres Burned	Total Acres by Cause
Camp	5	1.1	0.25	0.1	0	0.5	0	1.95
Campfire	1	0	0	0	0	0	0.2	0.2
Children	3	0	0	0.8	1	0	0	1.8
Debris	5	0.7	0	0.1	0.15	0	0	0.95
Debris Burn	1	0	0	0	0	0	1	1
Equipment Use	2	0	0	0	0	0	0.35	0.35
Incendiary	4	0.3	0	0.35	0	0	0	0.65
Lighting	1	0	0	0.25	0	0	0	0.25
Machinery	15	0.5	1.1	2.14	0	0	0	3.74
Miscellaneous	7	0	0	0	0	0.17	2.45	2.62
Smoking	2	0.25	0	0	1	0	0	1.25
<b>Totals</b>	<b>46</b>	<b>2.85</b>	<b>1.35</b>	<b>3.74</b>	<b>2.15</b>	<b>0.67</b>	<b>4</b>	<b>14.76</b>

**D. Probability of Occurrence**

While probability studies have not been done, based on historical records of fires, the Maine Department of Conservation, Maine Forest Service, Forest Protection Division, anticipates that there will be between 600 and 700 low acreage fires (from all causes) in Maine each year. However, using the last three years of fire records, the probability of a major wildfire is once a decade. Sagadahoc County faces access issues due to the many peninsulas, as well as a high reliance on volunteer fire departments.

**7. Assessing Vulnerability: Overview**

**Requirement §201.6(c)(2)(ii):** (The risk assessment shall include a) description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

<b>Elements</b>	<b>A.</b> Does the new or updated plan include an overall summary description of the jurisdiction’s vulnerability to each hazard?
	<b>B.</b> Does the new or updated plan address the impact of each hazard on the jurisdiction?

## **A. Vulnerability of Sagadahoc County to each Hazard**

### **Flooding**

Some of the County's most serious flooding is caused by winter runoff in the springtime when water undercuts or overtops local roads. Coastal beach erosion is also an issue in several locations. Most of the developed areas in Sagadahoc County are located outside of designated flood plains, and are thus not very vulnerable to flooding. On the other hand, many parts of the County are very rural in nature, and are served by a network of rural roads that do not have proper storm drainage systems. These roads are very vulnerable to flooding caused by heavy downpours and/or the blockage of drainage systems by ice or debris, even though these roads may not be in an identified flood plain. See also discussion of dam breach flooding on page 4-7.

### **Severe Winter Storms**

Sagadahoc County's location in Northern New England places it in a high-risk area for winter storms. While the majority of winter storms in Sagadahoc County occur during the winter season of December through March, there are occasional winter storms in the late fall (November and early December) and in the spring (March through April). However, the severity of storms is typically most serious in January and February, with storms in the earlier and later parts of the seasons usually being of lesser magnitudes.

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

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

As noted earlier in this Assessment, Sagadahoc County has been included in several Presidential Disaster Declarations for winter storms. Sagadahoc County contains at-risk populations that could be impacted by a major winter storm. Sagadahoc County maintains a list of people who are at risk, and contacts them by phone during winter storms to see if they need any assistance.

### **Severe Summer Storms**

The entire County is vulnerable to thunderstorms, microbursts and high winds, especially from the very high winds that often accompany severe coastal summer storms. Heavy rains that often accompany such storms can erode vulnerable shoreland areas.

### **Wildfires**

Sagadahoc County is heavily forested, and is vulnerable to wildfires. However, all of the organized municipalities in Sagadahoc County are served by capable fire departments. The Maine Forest Service has been very active in forest fire prevention activities, and, through meetings convened by the Sagadahoc County Emergency Management Agency, meets periodically with municipal fire chiefs on matters related to wildfire prevention and response activities. It is important to note that a wildfire event much like any other hazard event which occurs on a peninsula poses a particular vulnerability due having only a single road out of the peninsula.

**B. Impacts of Each Hazard on Sagadahoc County**

**Flooding**

Damages resulting from flooding in Sagadahoc County include damages to roads and their respective drainage systems. Historically, flood damages have included partial or complete road washouts, as well as severe erosion of roadside ditches, resulting in hazards to motorists if their vehicles go off the road. See also discussion of dam breach flooding on page 4-7.

**Severe Winter Storms**

The impacts of severe winter storms include road closures (and the subsequent inability of emergency vehicles to provide help), the loss of power for extended periods of time, high costs to local governments for snow removal/ice treatment efforts, and loss of income to businesses and individuals due to business closures.

**Severe Summer Storms**

The damages from severe summer storms typically involve the washout of roads, downed utility lines and debris clearance. If severe enough, this can result in the loss of income to businesses and individuals due to business closures.

**Wildfires**

The primary impacts include damages to homes located in the wildland-urban interface and loss of valuable timberland. A larger percentage of homes in rural towns are located in the wildland-urban interface than homes in village areas.

<b>8. Assessing Vulnerability: Addressing Repetitive Loss Properties</b>	
<b>Requirement §201.6(c)(2)(ii):</b> (The risk assessment) must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged (by) floods.	
<b>Element</b>	<b>A.</b> Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?

Based on information obtained from the Maine FloodPlain Office, there are three repetitive loss properties in Sagadahoc County, as shown in the table below. In accordance with the Federal Privacy Act, the Maine FloodPlain Office will not disclose the addresses, owner names or claim information of these repetitive loss properties.

<b>Sagadahoc County Repetitive Loss Properties</b>				
<b>Town/City</b>	<b>Residential Structures</b>		<b>Non-Residential Structures</b>	
	<b># Properties</b>	<b># Losses</b>	<b># Properties</b>	<b># Losses</b>
Bath	0	0	1	4
Bowdoinham	0	0	1	2
Phippsburg	1	3	0	0

Source: NFIP Program

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Summary of Flood Insurance Policies in Sagadahoc County							
Town/City	Total Premium	V Zone	A Zone	# Policies	Total Coverage	Total Claims Since 1978	Total Paid Since 1978
Arrowsic	\$2,190	0	1	2	\$482,400	0	0
Bath	\$50,217	0	15	42	\$9,734,400	13	\$376,399
Bowdoin							
Bowdoinham	\$6,638	0	4	8	\$1,480,200	5	\$68,373
Georgetown	\$41,828	5	5	34	\$8,782,900	8	\$7,262
Phippsburg	\$56,255	1	31	61	\$13,733,500	32	\$166,454
Richmond	\$5,534	0	4	7	\$970,500	6	\$24,521
Topsham	\$14,504	0	10	25	\$6,223,000	6	\$19,494
West Bath	\$8,568	0	5	9	\$1,821,300	2	\$14,893
Woolwich	\$1,702	0	0	4	\$1,400,000	2	\$5,621
<b>Totals:</b>	<b>\$187,436</b>	<b>6</b>	<b>75</b>	<b>192</b>	<b>\$44,628,200</b>	<b>74</b>	<b>\$683,017</b>

9. Assessing Vulnerability: Identifying Structures	
<b>Requirement §201.6(c)(2)(ii)(A):</b> The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area.	
<b>Elements</b>	<p><b>A.</b> Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?</p> <p><b>B.</b> Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?</p>

This section of the Plan identifies existing buildings, infrastructure and critical facilities within the County and the hazards to which these facilities are susceptible. A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the County or fulfills important public safety, emergency response, and/or disaster recovery functions.

The Sagadahoc County Hazard Mitigation Planning Team used GIS map data, information contained in local comprehensive plans, State databases, and local knowledge to locate the County’s critical facilities and determine which are most likely to be affected by hazards. The four hazards most likely to impact the County are flooding, winter storms, summer storms and wildfires. The analysis revealed the following:

**A. Vulnerability of Existing Buildings, Infrastructure and Critical Facilities Flooding**

### Facilities Flooding

- **Buildings:** Flooding of buildings has occurred in the City of Bath and in the Town of Phippsburg, particularly in the Popham Beach area. However, most of the developed areas of Sagadahoc County are located outside designated flood plains.
- **Infrastructure:** The typical damage resulting from flooding in Sagadahoc County is structural damage to roads and utility infrastructure. There may be other types of infrastructure that are susceptible to damage from flooding, but insufficient data was available to determine these facilities.
- **Critical Facilities:** Due to the varied topography within the County and the availability of higher elevation sites within all municipalities, nearly all critical facility structures are located outside of the flood zones.

### Severe Winter Storms

- **Buildings:** All buildings in Sagadahoc County are vulnerable to winter storms. Damages can include burst water pipes during power outages, interior water damages due to ice dams forming on roofs, and occasionally, roof collapses due to heavy snow loads.
- **Infrastructure:** A “Northeaster”, blizzard, ice storm or severe coastal storm of the severity that occurs once every 3-5 years, and/or a winter storm with severe winds, would have a negative impact on all roads in the County and on all overhead electrical power and telephone lines. Roads may be covered in snow, washed out or blocked with tree debris. Utility lines and poles will be felled. A coastal storm could cause general erosion to local roads and beach areas and wind damage to coastal buildings, as well as flooding of some roads.
- **Critical Facilities:** No critical facilities were identified as being in danger from a severe winter storm.

### Severe Summer Storms

- **Buildings:** Localized events, such as microbursts or small tornadoes, have the potential to cause significant damage to structures. Damages can result from debris like tree limbs, and from high winds and interior water damages due to wind-driven rain. Infrastructure. The more widespread events, such as hurricanes and tropical storms will typically impact the county through severe damage to overhead electric and utility line infrastructure and blockage of roads by debris. When accompanied by flooding, the impacts will be as described above. A summer storm could cause erosion to local roads and beach areas.
- **Critical Facilities:** All critical facilities in Sagadahoc County are vulnerable to summer storms in the same manner that individual buildings are vulnerable. However, some of the critical facilities throughout the County have back-up generator systems, which allow building systems to continue operating during a power outage. The municipal base maps that are included in this Plan update identify the location of critical facilities.

### Wildfires

- **Buildings:** Wildfires could have a large impact on homes located in the wildland/urban interface, as well as some commercial structures.
- **Infrastructure:** Wildfires would likely have a lesser impact on overhead electrical and telephone transmission lines. Roads and their storm drainage systems are much less vulnerable, although road access to certain areas could be blocked by fires and by emergency fire-fighting vehicles.

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- **Critical Facilities:** Wildfires in Sagadahoc County have tended to be relatively small, and have not been a threat to critical facilities. In the event of a very large wildfire, some critical facilities could be damaged by fire and smoke.

**Critical Facilities.** The critical facilities identified in Sagadahoc County are:

- Municipal offices
- Fire and police stations
- Post offices
- Town garages and salt/sand sheds
- Hospitals and clinics
- Schools that have been identified as shelters
- Electrical, communication and pipeline utilities
- Water and wastewater treatment facilities
- Hazardous material sites
- Airports
- Dams
- Bridges
- Rail Systems

**County Asset Inventory**

The following chart identifies the type and number of critical facilities in each town in Sagadahoc County. (Chart updated in 2016)

County Asset Inventory by Municipality												
Town/City	Town Office	Fire/Rescue	Police	Public Works, Salt/Sand	School	Hospital/Health	Sewage Treatment	Water Supply	Dams	Bridges	Hazardous Facilities	Other
Arrowsic	1	2	0	0	0	0	0	0	0	0	0	0
Bath	1	2	1	3	7	1	1	1	2	2	0	0
Bowdoin	1	1	0	1	1	0	0	0	1	1	0	0
Bowdoinham	1	1	0	1	1	1	0	0	1	0	1	0
Georgetown	1	2	0	3	1	1	0	0	0	0	0	0
Perkins Township	0	0	0	0	0	0	0	0	0	0	0	0
Phippsburg	1	2	0	2	1	0	0	0	0	2	0	0
Richmond	1	1	1	3	2	1	1	1	0	0	0	0
Topsham	1	1	1	2	3	1	0	0	5	4	0	1
West Bath	1	1	0	1	1	0	1	0	0	1	0	1
Woolwich	1	2	0	3	1	0	0	0	0	3	0	0
<b>Totals</b>	<b>10</b>	<b>15</b>	<b>3</b>	<b>19</b>	<b>18</b>	<b>5</b>	<b>3</b>	<b>2</b>	<b>9</b>	<b>13</b>	<b>1</b>	<b>2</b>

In addition to critical facilities, Sagadahoc County contains at-risk populations that should be factored into the vulnerability assessment. These include a relatively large population of elderly residents who live alone in very rural areas and who have limited mobility.

## **B. Vulnerability of Future Buildings, Infrastructure and Critical Facilities**

As documented more fully in Section 6, there are a number of local ordinances that will significantly reduce the vulnerability of future buildings, infrastructure and critical facilities to the hazards profiled in this Plan. All of the municipalities have a comprehensive plan, all are members of the National Flood Insurance Program and have a floodplain management ordinance, all have shoreland zoning ordinances, and subdivision regulations. Beginning in December of 2010, a new, statewide building code went into effect. It is too early to predict whether or not this will have an impact on the vulnerability of future buildings and critical facilities, but it will regulate methods of construction.

The Mid Coast Council of Government of Governments has projected that Sagadahoc County's population will decrease, in part because of the closure of the Brunswick Naval Air Station. The County is expected to decline from about 36,332 people in 2008, to about 34,964 people by 2018 (a loss of about 1,368 people, or 3.8 %). Given the projected decline, there will be very few if any future buildings, infrastructure or critical facilities that will be vulnerable to the identified hazards.

### **Flooding**

- **Buildings:** The majority of damages from flooding are to roads, not structures. All of the municipalities in Sagadahoc County have floodplain ordinances that provide control over development in flood prone areas, and these ordinances would also regulate the location of future buildings.
- **Infrastructure:** Future roads and their associated storm drainage systems would seem to be the most likely category of infrastructure that would be vulnerable to flooding. However, State and local road construction standards generally ensure that new roads are properly constructed with adequate storm drainage systems. Most if not all roads in the public domain must be designed by a registered professional engineer. Therefore, flooding of future roads is not likely to be a serious issue in Sagadahoc County.
- **Critical Facilities:** Because of the requirements of the Flood Insurance Program, as well as shoreland zoning requirements and a greater awareness of flooding in all communities, future critical facilities will continue to be located outside floodplain areas. The exception may be wastewater treatment plants, due to the need to locate these facilities at lower elevations.

### **Severe Winter Storms**

- **Buildings:** Improvements in building construction due to the State's new building code will help protect future buildings against damage from heavy snow loads and ice buildup. Damages may include burst water pipes, but many newer buildings will be better insulated than older ones, thus being better able to retain heat during longer periods of time when there is a power outage. There will be less interior water damage due to ice dams forming on roofs because the roofs of newer buildings generally are properly vented, which allows the roofs to remain cold. Roof collapses due to heavy snow loads will be very rare because newer roofs are designed to withstand heavy snow loads.
- **Infrastructure:** Roads will continue to be the most vulnerable category of infrastructure. New roads can be just as easily blocked on a temporary basis due to heavy snowfall, ice building up on the road surface, and debris such as tree limbs accumulating on the road surface during a storm event. However, in the present economy, it is unlikely that Sagadahoc County will

experience much new road construction, with the possible exception of small road segments serving subdivisions.

- **Critical facilities:** Future critical facilities in Sagadahoc County will be vulnerable to winter storms in the same manner that individual buildings will be vulnerable. However, some of them will have back-up generator systems which will allow heating systems to continue operating during a power outage.

**Severe Summer Storms:**

- **Buildings:** It is unlikely that severe summer storm will have any impact on future structures, with the possible exception of a hurricane which is a once-per-decade event in Sagadahoc County. Most of the damages from summer storms are erosion-related, resulting in damages to roads. New buildings in Sagadahoc County will be less vulnerable to severe summer storms because they are built to meet modern code requirements. State- mandated shoreland zoning ordinance regulations for areas within 250 feet of the shoreline of the coast, lakes and ponds, and within 75 feet of streams, limit the location of new buildings in areas prone to coastal erosion and storm surges that often result from Severe Summer Storm Events. Damages may include roof damage from falling trees and debris. There will be less Interior water damage due to wind-driven heavy rains because the roofs of newer buildings generally are properly designed and roofing materials are more resistant to water infiltration.
- **Infrastructure:** Roads will continue to be the most vulnerable category of infrastructure. New roads can be blocked on a temporary basis due to heavy rainfall, and debris such as tree limbs accumulating on the road surface during a storm event.
- **Critical Facilities:** Future critical facilities in Sagadahoc County will be vulnerable to summer storms in the same manner that individual buildings will be vulnerable. However, some of them will have back-up generator systems which will allow building systems to continue operating during a power outage. The municipal base maps that are included in this Plan update identify the location of critical facilities.

**Wildfires**

- **Buildings:** Forest fires in Sagadahoc County primarily threaten residential structures in the wildland/urban interface. In most Sagadahoc County communities, homes are allowed to be constructed in most locations in the community.
- **Infrastructure:** Future power, phone and cable lines can be damaged during a wildfire, although the level of future development is expected to be minimal, primarily because of the projected population decline for the County.
- **Critical Facilities:** Future critical facilities may be vulnerable to a very large wildfire. However, the expectation is that there will be very few new critical facilities constructed during the life of this plan.

<b>10. Assessing Vulnerability: Estimating Potential Losses</b>	
<b>Requirement §201.6(c)(2)(ii)(B):</b> (The plan should describe vulnerability in terms of an) estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate.	
<b>Elements</b>	<b>A.</b> Does the new or updated plan estimate potential dollar losses to vulnerable structures?
	<b>B.</b> Does the new or updated plan describe the methodology used to prepare the estimate?

## Sagadahoc County Hazard Mitigation Plan – 2016 Update

### Overview

This section of the Plan relies on historical damages as the basis for estimating future losses, subject to the following:

- Historical damage estimates have been updated, using the Consumer Price Index shown below;
- Presidential Disaster Declarations have been used where possible, updated for inflation using the Consumer Price Index below;
- Where statewide or county damages are used to determine damages for a specific jurisdiction, the damages are pro-rated using the 2010 Census.

The average annual Consumer Price Index for various years is shown below based on a value of 100 for the years 1982-1984.

Consumer Price Index, 1982-1984 = 100					
Year	Price Index	Year	Price Index	Year	Price Index
1947	22.3	1991	136.2	2004	188.9
1954	26.9	1992	143.3	2005	195.3
1980	82.4	1993	144.5	2006	201.6
1981	90.9	1994	148.2	2007	207.3
1982	96.5	1995	152.4	2008	215.3
1983	99.6	1996	156.9	2009	214.5
1984	103.9	1997	160.5	2010	218.1
1985	107.6	1998	163.0	2011	224.9
1986	109.6	1999	166.6	2012	229.6
1987	113.6	2000	172.2	2013	232.9
1988	118.3	2001	177.1	2014	236.7
1989	124.0	2002	179.9	2015	236.8
1990	130.7	2003	184.0		

**Flooding:** This plan uses worst-case, real-life damages to calculate potential flood losses, and assumes that historic patterns will hold for the future. The worst case flood is the Patriot's Day storm of 2007, which resulted in a Presidential Disaster Declaration of about \$22 million in damages to 13 counties. Using the Consumer Price Index (CPI), the damages in ~~2010~~ 2015 dollars would be about ~~\$23,146,165~~ **\$25,120,115** (multiply \$22,000,000 by ~~248.4~~ **236.7** – the CPI for ~~2010~~ **2015**, and divide by 207.3 – the CPI for 2007). Damages in Sagadahoc County from the Patriot's Day storm amounted to ~~\$268,947,000~~ **\$268,947,000** which would be ~~\$282,959~~ **\$307,090,000** in ~~2010~~ 2015 dollars.

The methodology for calculating potential losses in Sagadahoc County is to assume the greater of:

- 1) Actual damages from the Patriot's Day storm updated using the Consumer Price Index (column A in the table on the next page),
- 2) Actual damages from flooding in 2008, updated using the Consumer Price Index, (column B; the 2008 storm resulted in much greater damages to five Sagadahoc County towns than the Patriot's Day storm),

Sagadahoc County Hazard Mitigation Plan – 2016 Update

3) Flood losses based on ~~\$24~~ **\$23** per capita (column C). The ~~\$21~~ **\$23** is calculated by taking the population of the counties that suffered damages in the Patriot’s Day Storm (1,085,033 – the population of the State exclusive of Aroostook, Penobscot and Piscataquis Counties which were not included in the declaration) and dividing it into total Patriot’s Day storm damages in ~~2010~~ **2015** dollars (~~\$23,146,165~~) to get a per capita cost of **\$21**. Each town’s population is multiplied by **\$21** to get potential damages.

The maximum flood loss (column D) is the greater of columns A, B or C. In most cases, column C results in the highest loss estimate.

Potential Flood Losses in Sagadahoc County				
Town/City	A. Updated 2007 Flood Losses Using <b>2015</b> <del>2010</del> CPI	B. Updated 2008 Flood Losses Using <b>2015</b> <del>2010</del> CPI	C. Flood Losses Based on <del>\$21</del> <b>\$23</b> /Capita	D. Maximum Potential Flood Loss
Arrowsic	0	0	<del>\$10,235</del> <b>\$8,967</b>	<del>\$10,235</del> <b>\$8,967</b>
Bath	<del>\$32,936</del> <b>\$30,348</b>	<del>\$167,904</del> <b>\$154,709</b>	<del>\$191,452</del> <b>178,794</b>	<del>\$191,452</del> <b>178,794</b>
Bowdoin	<del>\$39,384</del> <b>36,289</b>	<del>\$23,084</del> <b>21,270</b>	<del>\$70,518</del> <b>64,281</b>	<del>\$70,518</del> <b>64,281</b>
Bowdoinham	<del>\$13,575</del> <b>12,508</b>	<del>\$39,997</del> <b>36,854</b>	<del>\$66,240</del> <b>60,669</b>	<del>\$66,240</del> <b>60,669</b>
Georgetown	<del>\$68,764</del> <b>63,361</b>	<del>\$2,212</del> <b>2,038</b>	<del>\$22,954</del> <b>21,882</b>	<del>\$68,764</del> <b>63,361</b>
Phippsburg	<del>\$29,814</del> <b>27,471</b>	<del>\$60,000</del> <b>55,285</b>	<del>\$49,519</del> <b>46,536</b>	<del>\$60,000</del> <b>55,285</b>
Richmond	<del>\$9,254</del> <b>8,525</b>	<del>\$57,981</del> <b>53,425</b>	<del>\$78,039</del> <b>71,631</b>	<del>\$78,039</del> <b>71,631</b>
Topsham	<del>\$34,772</del> <b>32,040</b>	<del>\$99,689</del> <b>91,855</b>	<del>\$201,250</del> <b>184,464</b>	<del>\$201,250</del> <b>184,464</b>
West Bath	<del>\$25,729</del> <b>23,707</b>	<del>\$10,669</del> <b>0</b>	<del>\$45,494</del> <b>39,417</b>	<del>\$45,494</del> <b>39,417</b>
Woolwich	<del>\$47,996</del> <b>44,225</b>	<del>\$8,787</del> <b>0</b>	<del>\$70,495</del> <b>64,512</b>	<del>\$70,495</del> <b>64,512</b>
Other	<del>\$4,866</del> <b>4,484</b>	0	0	<del>\$4,866</del> <b>4,484</b>
<b>Total</b>	<del><b>\$307,090</b></del> <b>\$282,958</b>	<del><b>\$470,323</b></del> <b>\$470,323</b>	<del><b>\$633,886</b></del> <b>\$741,153</b>	<del><b>\$867,353</b></del> <b>\$795,865</b>

**Winter Storms:** This plan uses worst-case, real-life damages to calculate potential winter storm damages, and assumes that historic patterns will hold for the future. For Sagadahoc County, the worst storm is the ice storm of 1998, which resulted in a statewide Presidential Disaster Declaration of \$47,748,466. The actual damages were closer to \$100,000,000 because the Disaster Declaration did not cover damages to power lines and private structures. Using the Consumer Price Index, the \$47.7 million in damages would be ~~\$63.8~~ **\$69.4** million in ~~2010~~ **2015** dollars (multiply \$47.7 million by ~~218.1~~ **236.7** – the CPI for ~~2010~~ **2015** and divide by 163.0 – the CPI for 1998). The 1998 damages in Sagadahoc County totaled \$542,199 (far less than some interior counties), which would be ~~\$725,462~~ **\$787,352** in ~~2010~~ **2015** dollars.

The methodology for calculating potential losses in Sagadahoc County is to assume the greater of:

- 1) Actual damages updated using the Consumer Price Index (column B in the table below), or
- 2) Winter storm losses based on \$48 per capita (column C in the table below). The \$48 is calculated by taking the 2010 population of the State (1,328,361) and dividing it into total 1998 ice storm damages in 2010 dollars (\$63,800,000) to get a per capita cost of \$48. Each town’s population is multiplied by \$48 to get potential damages.

The maximum winter storm loss (column D) is the greater of column B or C. In most cases, column C results in greater potential damages.

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Potential Winter Storm Losses in Sagadahoc County				
Town/City	A. Actual 1998 Ice Storm Damages	B. Updated Ice Storm Losses Using <b>2015</b> CPI	C. Winter Storm Losses Based on \$48 Per Capita	D. Maximum Potential Winter Storm Loss
Arrowsic	0	0	<del>\$20,496</del> <b>\$21,360</b>	<del>\$20,496</del> <b>\$21,360</b>
Bath	\$83,270	<del>\$111,415</del> <b>\$120,920</b>	<del>408,672</del> <b>\$399,552</b>	<del>408,672</del> <b>\$399,552</b>
Bowdoin	64,817	<del>86,725</del> <b>\$94,124</b>	<del>146,928</del> <b>\$147,168</b>	<del>146,928</del> <b>\$147,168</b>
Bowdoinham	110,210	<del>147,461</del> <b>\$160,041</b>	<del>138,672</del> <b>\$138,240</b>	<del>147,461</del> <b>\$160,041</b>
Georgetown	0	0	<del>50,016</del> <b>\$47,904</b>	<del>50,016</del> <b>\$47,094</b>
Phippsburg	21,409	<del>28,645</del> <b>\$31,089</b>	<del>106,368</del> <b>\$103,344</b>	<del>106,368</del> <b>\$103,344</b>
Richmond	112,038	<del>149,907</del> <b>\$162,695</b>	<del>163,728</del> <b>\$162,864</b>	<del>163,728</del> <b>\$162,864</b>
Topsham	99,617	<del>133,288</del> <b>\$144,658</b>	<del>421,632</del> <b>\$420,000</b>	<del>421,632</del> <b>\$420,000</b>
West Bath	14,673	<del>19,632</del> <b>\$21,307</b>	<del>90,096</del> <b>\$94,944</b>	<del>90,096</del> <b>\$94,944</b>
Woolwich	14,923	<del>19,967</del> <b>\$21,670</b>	<del>147,456</del> <b>\$147,120</b>	<del>147,456</del> <b>\$147,120</b>
Other	21,242	<del>28,422</del> <b>\$30,846</b>	0	<del>28,422</del> <b>\$30,846</b>
<b>Total</b>	<b>542,199</b>	<del><b>\$725,462</b></del> <b>\$787,462</b>	<del><b>1,694,064</b></del> <b>\$1,682,496</b>	<del><b>1,731,275</b></del> <b>\$1,735,143</b>

**Severe Summer Storms:** Hurricane damages are included in the Severe Summer Storm Events category profiled in this Plan, and not as a separate category due to the low occurrence of hurricanes in Sagadahoc County, as noted earlier in this Plan. Worst case, real life damages were used to calculate potential damages from hurricanes. The most recent, devastating hurricane to hit Sagadahoc County was Hurricane Carol in 1954.

Carol produced \$5,000,000 in damages to a swath of coastal Maine that included the following counties: Sagadahoc, Cumberland, Knox, Lincoln, Waldo and York. The population of these six counties totaled 351,465 people (1950 Census), resulting in a per capita damage of \$14/person. In ~~2010~~ **2015** dollars, this would be ~~\$113.5~~ **\$123.2**/person (multiply \$14 by the ~~2010~~**2015** CPI of ~~218.1~~ **236.7** and divide by the 1954 CPI of 26.9). There has been a substantial amount of primary and secondary home and commercial development in these six counties since 1954, and the population of these six counties increased to 627,077 people by the year 2010 (U.S. Census). The per capita damages should therefore be increased to ~~\$203~~ **\$220** (multiply ~~\$113.5~~ **123.2** by 627,077 – the six-county population for 2010, and divide by 351,465 – the six-county population for 1954).

The following table includes a town-by-town estimate of potential hurricane damages based on the ~~2010~~ **2013** Census and a per capita damages figure of ~~\$203~~ **\$220**.

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Potential Hurricane Damages in Sagadahoc County		
Town/City	Population <del>2010</del> 2013	Potential Hurricane Damages (Population x <del>\$204</del> \$220)
Arrowsic	445 <del>427</del>	\$97,900 <del>\$86,681</del>
Bath	8,324 <del>8,514</del>	\$1,831,280 <del>1,728,342</del>
Bowdoin	3,066 <del>3,061</del>	\$674,520 <del>621,383</del>
Bowdoinham	2,880 <del>2,889</del>	\$633,600 <del>586,467</del>
Georgetown	998 <del>1,042</del>	\$219,560 <del>211,526</del>
Phippsburg	2,153 <del>2,216</del>	\$473,660 <del>449,848</del>
Richmond	3,393 <del>3,411</del>	\$746,460 <del>692,433</del>
Topsham	8,750 <del>8,784</del>	\$1,925,000 <del>1,783,152</del>
West Bath	1,978 <del>1,877</del>	\$435,160 <del>381,031</del>
Woolwich	3,065 <del>3,072</del>	\$674,300 <del>623,616</del>
<b>Total</b>	<b>35,194<del>35,293</del></b>	<b>\$7,742,680<del>\$7,164,479</del></b>

**Wildfires:** This plan uses worst-case, real-life damages to calculate potential wildfire losses, and assumes that historic patterns will hold for the future. The 1947 fire was the worst on record, although it was actually a series of wildfires that flared over Eastern and Southern Maine. The 1947 fire caused an estimated \$30,000,000 in damages to Cumberland, Hancock, Oxford and York Counties. The damage in ~~2010~~2015 dollars would be about ~~\$293,000,000~~\$318,430,493 (multiply \$30 million by ~~218.4~~ 236.7 – the CPI for ~~2010~~ 2015, and divide by 22.3 – the CPI for 1947). While there is significantly more development in each of these counties today than there was in 1947, fire-fighting capabilities have also increased substantially since that time so there may be no need to further increase the damage estimate. The probability that a wildfire such as the 1947 fire will hit Sagadahoc County during the five-year period covered by this Plan is low.

The methodology for calculating potential wildfire losses in Sagadahoc County is based on the damages that occurred in the 1947 fire in Cumberland, Hancock, Oxford and York Counties. The population of these counties is 591,056. Divide ~~\$293,000,000~~ \$318,430,493 (the 1947 fire in ~~2010~~ 2015 dollars) by 591,056 to get a per capita cost of ~~\$496~~\$539. Multiply each town's population by ~~\$496~~ \$539 to get potential wildfire damages.

Potential Wildfire Damages in Sagadahoc County		
Town/City	Population <del>2010</del> 2013	Potential Wildfire Damages (Population x <del>\$496</del> \$539)
Arrowsic	445 <del>427</del>	\$239,855 <del>\$211,792</del>
Bath	8,324 <del>8,514</del>	\$4,486,636 <del>4,222,944</del>
Bowdoin	3,066 <del>3,061</del>	\$1,649,879 <del>1,518,256</del>
Bowdoinham	2,880 <del>2,889</del>	\$1,552,320 <del>1,432,944</del>
Georgetown	998 <del>1,042</del>	\$537,922 <del>516,832</del>
Phippsburg	2,153 <del>2,216</del>	\$1,160,467 <del>1,099,136</del>
Richmond	3,393 <del>3,411</del>	\$1,828,827 <del>1,691,856</del>
Topsham	8,750 <del>8,784</del>	\$4,716,250 <del>4,356,864</del>
West Bath	1,978 <del>1,877</del>	\$1,066,142 <del>930,992</del>
Woolwich	3,065 <del>3,072</del>	\$1,652,035 <del>1,523,712</del>
<b>Total</b>	<b>35,194<del>35,293</del></b>	<b>\$18,969,566<del>\$17,505,328</del></b>

<b>11. Assessing Vulnerability: Analyzing Development Trends</b>	
<b>Requirement §201.6(c)(2)(ii)(C):</b> (The plan should describe vulnerability in terms of) providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use descriptions.	
<b>Element</b>	<b>A.</b> Does the new or updated plan describe land uses and development trends?

**Changes in the Economy**

There are three principal economic trends within Sagadahoc County. The first is the continued uncertainty related to Bath Iron Works, Maine’s largest employer. The workforce at Bath Iron Works in January, 2011 was approximately 5,600 employees, down from 12,000 in 1990. During the 1990s the U.S. Economic Service developed a county level typology for non-metropolitan counties based on their dominant economic traits, using the categories of “manufacturing dependent”, “government dependent”, “services dependent”, and “non-specialized”. Sagadahoc was designated as “manufacturing dependent”.

The second trend is the closure of the Brunswick Naval Air Station (BNAS), located in the Town of Brunswick. Although Brunswick is not in Sagadahoc County, the geography is such that the Naval Air Station is situated between the municipalities of Bath and Topsham, Sagadahoc County’s two most populous communities. Closure of the BNAS has negatively impacted employment and population growth in the County.

The third trend is the relatively rapid commercial and retail growth in the Town of Topsham, which has transformed that community into the retail center of the southern region of mid- coast Maine.

Seven of the ten municipalities in Sagadahoc County have prepared comprehensive plans that are certified by the **Maine State Planning Office** (what goes here? COG?) as being consistent with the growth management law, and many of these can be used to support municipal zoning ordinances in the event that these communities choose to enact such controls. The following is a summary of the status of these plans:

<b>Status of Comprehensive Plans</b>		
<b>Municipality</b>	<b>Consistency with State Requirements</b>	<b>Adoption Date</b>
Arrowsic	No	1 March 1989
Bath	Yes	2 September 2009
Bowdoin	No	26 October 1991
Bowdoinham	Yes	<del>1 November 2000</del> 6 June 2014
Georgetown	Yes	1 November 1993
Phippsburg	Yes	8 May 2006
Richmond	Yes	<del>27 February 1991</del> March 2016
Topsham	Yes	19 May 2005
West Bath	Yes	14 June 2006
Woolwich	No	6 May 2009

The Towns of Bowdoin, West Bath and Topsham are also considering undertaking a plan update in the near future.

**Impact of Hazards on Future Development**

In the event that employment should drop significantly due to trends in the manufacturing sector, there could be effects relating to all hazards. These effects include a reduced tax base to fund municipal mitigation activities, an increase in vacant structures, and increased commuting time for residents to jobs outside the county, resulting in greater reliance on the transportation infrastructure and less time available for community activities such as volunteer firefighting.

**Flooding** will have an impact on floodplains and on roads in vulnerable locations. This hazard will continue to have the primary impact of shutting down transportation in some areas, since it is primarily the roads that are the objects of flooding in the County. Flooded roads could impact businesses, industry, commerce and schools, and could also delay many social and emergency services. Increased high-density development, particularly in Topsham, results in areas with a high percentage of impervious surfaces, making these areas more vulnerable to flooding from surface runoff.

**Severe Winter and Summer Storms** will have an impact on all land areas within Sagadahoc County. These two hazards will have the primary impact of shutting down transportation and power which will, in turn, shut down businesses, industry, commerce and schools and will stop or impede social and emergency services.

All the municipalities in Sagadahoc County have joined the Federal Flood Insurance Program (FFIP) and, as a condition of participation in the program, have enacted floodplain management ordinances that limit new development in floodplain areas. There are some homes and seasonal dwellings in Sagadahoc County that are in the 100-year floodplain. As these properties are sold and mortgaged, owners may be required to upgrade these homes in order to meet the requirements of local floodplain management ordinances as well as the demands of lenders.

**Wildfires** will continue to have an impact on residential properties located within the County’s wildland/urban interface.

<b>12. Multi-Jurisdictional Risk Assessment</b>	
<b>Requirement §201.6(c)(2)(iii):</b> For multi-jurisdictional plans, the risk assessment must assess each jurisdiction’s risks where they vary from the risks facing the entire planning area.	
<b>Element</b>	<b>A.</b> Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?

The following are hazards for which all areas of the county are subject to the same general risk:

- Flooding
- Severe summer and winter storms
- Wildfires (with some limited variance among the communities, ~~particularly a lower degree of risk within the immediate Greater Portland area).~~

The following hazards primarily affect the coastal communities of Arrowsic, Bath, Bowdoinham, Georgetown, Phippsburg, Topsham, West Bath and Woolwich:

- Coastal flooding
- Coastal erosion

The following hazards primarily affect the communities of Bowdoinham, Richmond, and Topsham:

- Riverine flooding

**Maps**

The following pages contain base maps for each of the municipalities in Sagadahoc County.



## SECTION 5. MITIGATION STRATEGIES

<b>Mitigation Strategy</b>
<b>Requirement §201.6(c)(3):</b> The plan shall include a mitigation strategy that provides the jurisdiction’s blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

The following pages contain goals, objectives and strategic actions for each of the hazards identified earlier in this report, followed by a town by town summary of prioritized projects. The list of local projects was developed separately by each municipality. Local officials did not use formal, written criteria for the identification of local projects. Local officials relied on common sense, local knowledge of the frequency and extent of local damages, local knowledge of which projects were of the highest priority based on frequency and severity of damages, local knowledge of the weather, the geography and topography of the community, and the technical and financial abilities of their respective communities to address hazards and mitigate the impacts of hazards.

<b>13. Local Hazard Mitigation Goals</b>	
<b>Requirement §201.6(c)(3)(i):</b> (The hazard mitigation strategy shall include a) description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.	
<b>Element</b>	<b>A.</b> Does the new or updated plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards?

**A. Mitigation Goals**

See Goal/Mission Statements for flooding (page 5-3), severe winter and severe summer storms (page 5-5) and wildfires (page 5-7).

<b>14. Identification and Analysis of Mitigation Actions</b>	
<b>Requirement §201.6(c)(3)(ii):</b> (The mitigation strategy shall include a) section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.	
<b>Elements</b>	<b>A.</b> Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?
	<b>B.</b> Do the identified actions and projects address reducing the effects of hazards on <b>new</b> buildings and infrastructure?
	<b>C.</b> Do the identified actions and projects address reducing the effects of hazards on <b>existing</b> buildings and infrastructure?

**A. Comprehensive Range of Mitigation Actions and Projects**

Pages 5-3 to 5-7 contain goals, objectives and strategic actions for each of the hazards identified earlier in this report, followed by a town by town summary of prioritized projects on pages 5-11 to 5-13.

The goals, objectives and mitigation actions were modified from the goals, objectives and mitigation actions contained in the ~~2006~~ **2011** Plan. The Hazard Mitigation Planning Team relied heavily on MEMA staff input as well as Sagadahoc County EMA's contacts with individual municipalities for the development of the prioritized mitigation projects.

**B. Actions and Projects that Reduce Hazards on New Buildings and Structures**

**Flooding:** See 2C and 2E

**Severe Winter and Severe Summer Storms:** Note: there are no actions related to new structures because storm-related hazards such as roof collapses are adequately covered by the State's new building code which became effective on December 15, 2010

**Wildfires:** See 2A

**C. Actions and Projects that Reduce Hazards on Existing Buildings and Structures**

**Flooding:** See 2A, 2B, 2D, 3A, 3B and 3C

**Severe Winter and Severe Summer Storms:** See 3A and

**3B Wildfires:** See 2A

**Table 1  
General Goals, Objectives and Mitigation Actions**

**FLOODING**

In Sagadahoc County, the most likely damages caused by flooding are the destruction of roads caused by washouts and undercutting. There are few critical facilities in the 100-year floodplain. All communities have joined the National Flood Insurance Program and are controlling future development through the enforcement of a local flood hazard ordinance. Several communities, such as Phippsburg, have experienced serious flooding and road damage caused by beaver activity.

**Goal/Mission Statement:** Reduce loss of life, injury and property damage in Sagadahoc County caused by flooding.

**Category: Flooding**

Objective: ??					
Mitigation Action	Responsibility	Time Frame	Status/Rational if No Action	Funding Sources	
<b>Contact List:</b> Update lists of property owners/renters in floodplain areas especially people with functional and sensory needs.	Sagadahoc EMA, Local EMA's	Update every two years	New-Continue to update list	Local Funds	
Objective: Lessen property damages caused by flooding.					
Mitigation Action	Responsibility	Time Frame	Status/Rational if No Action	Funding Sources	
<b>NFIP Participation:</b> Encourage participation in the flood insurance program where there are flooding problems as well as actions needed to ensure municipal compliance with flood insurance requirements.	County EMA Director, local EMA Directors, State Planning Office, DACF MEMA	Annually	All ten municipalities in the County continue to participate in the NFIP	Local Funds	
<b>Repetitive Loss Properties:</b> Encourage municipalities to apply for funds to address repetitive loss properties as long as it is cost beneficial.	Sagadahoc EMA, local EMA Directors, SPO DACF, MEMA	Annually	New-Continue to promote strategies to address repetitive loss properties	Local Funds	
<b>Ordinance Enforcement:</b> Enforce local floodplain management ordinances so as to minimize future flood losses caused by new construction.	Code Enforcement Officers, Planning Boards	Annually	Continue to enforce as needed	Local Funds	

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<p><b>Beaver Dams:</b> Undertake pest management control (beavers) at drainage structures.</p>	<p>Municipal Officials</p>	<p>As needed</p>	<p>Continue to Address as needed</p>	<p>Local Funds</p>
<p><b>Improved Maps:</b> Encourage FEMA to <b>continue</b> to improve the accuracy of flood insurance rate maps as new data such as LIDAR becomes available.</p>	<p>Sagadahoc EMA, Local EMA Directors, <del>SPO, DACE, MEMA, Town Officials</del></p>	<p>As new data is available</p>	<p><del>New</del> Continue</p>	<p>Local Funds</p>
<p><b>Culvert Design:</b> Use the Steam Stat web-designed based GIS application developed by USGIS &amp; ESRI to compute stream flow statistics to determine the proper culvert size-based upon the 100-year flood.</p>	<p>Public Work Directors</p>	<p>Annually</p>	<p>New</p>	<p>Local Funds</p>
<p><b>Objective: Ensure critical transportation links.</b></p>				
<p><b>Mitigation Action</b></p>	<p><b>Responsibility</b></p>	<p><b>Time Frame</b></p>	<p><b>Status/Rational if No Action</b></p>	<p><b>Funding Sources</b></p>
<p><b>Problem Documentation:</b> Encourage municipalities to document the costs of repairing recurring flood damages to ditches, culverts, roadway drainage systems and roads.</p>	<p>MEMA, Sagadahoc EMA, Local EMA's</p>	<p>Annually</p>	<p><del>New</del> Continue</p>	<p>Local Funds</p>
<p><b>Best Practices:</b> Where recurring problems can be documented using tools such as Road Tracker, encourage towns to participate in Maine DOT and other road building and maintenance best practices ( see appendix for copy of Road Tracker)</p>	<p>County EMA, Municipal Public Works or Contractor</p>	<p>Annually</p>	<p><del>New</del> Continue</p>	<p>Local Funds</p>
<p><b>Grant Applications:</b> Where recurring problems can be documented apply for grants to upgrade roads, culverts, ditches and drainage systems in accordance with plans for making roads safe from flooding</p>	<p>County EMA, Municipal Public Works or Contractor</p>	<p>As applicable</p>	<p>Continue to be deferred, lack of problem documentation has been an obstacle. More towns are beginning to use the road tracker to keep track of local road expenditures.</p>	<p>Local Funds</p>

<b>Culvert Grants:</b> Use the Maine DEP Culvert Grant Program to replace and upgrade culverts. The program will be funded until 2017.	Public Work Directors	Participate in the program while funds are available	New	Grant
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**SEVERE WINTER AND SEVERE SUMMER STORMS** (combined because many actions are the same for both kinds of storms)

**Severe Winter Storms**

In Sagadahoc County, the most likely damages caused by a severe winter storm event are the loss of electrical power from downed power transmission lines, the blockage of roads from tree debris or winter snow and ice, wash-outs and erosion caused by water runoff that overwhelms local drainage systems, erosion caused by tidal action, high river flows and/or strong winds, and structural failure from heavy snow loads. There could be injuries or loss of life caused by delayed responses from emergency services, the improper use of back-up heat sources, debris falling on an individual, or from storm-related vehicle accidents resulting from icy conditions, road wash-outs or erosion. Other types of general damage to personal and real property may be caused by blizzard conditions or high winds. Major winter storms can shut down businesses, resulting in major losses of income to local businesses and individuals.

**Severe Summer Storms**

In Sagadahoc County, the most likely damages caused by a severe summer storm or hurricane are the loss of electrical power from downed power transmission lines, the blockage of roads from tree debris, wash-outs caused by water runoff that overwhelms local drainage systems, and erosion resulting from wave action, river flow and/or extreme high tide. There could be injuries or loss of life caused by delayed responses from emergency services, debris falling on an individual, or from storm-related vehicle accidents resulting from downed tree limbs, road wash-outs or erosion. Other types of general damage to personal and real property may be caused by high winds, including damage to boats and public and private piers and landings. If power is lost for extended periods of time, major summer storms can shut down businesses, resulting in major losses of income to local businesses and individuals.

**Goal/Mission Statement:** Reduce loss of life, injury and property damage in Sagadahoc County caused by severe winter storms, severe summer storms and hurricanes, water runoff and erosion.

**Category: Severe Winter and Severe Summer Storms**

<b>Objective: Lessen loss of life and injuries resulting from severe winter storms and severe summer storms and hurricanes, including the resulting water runoff or erosion.</b>				
Mitigation Action	Responsibility	Time Frame	Status/Rational if no Action	Funding Sources
<b>Public Education:</b> Develop an on-line brochure to educate the public about the dangers of severe storms. Include a link to the MEMA website.	County EMA Director	8 weeks	New-Continue to educate and inform the public.	County Funds

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<p><b>Functional and Sensory Needs Population:</b> Update lists of functional and sensory needs people who would be vulnerable during a power outage. Encourage the public to check on the safety of elderly or inform neighbors and relatives who may be adversely affected by power outages.</p>	<p>Municipal fire departments, Social service agencies. Local EMA Directors, County EMA</p>	<p>Update annually</p>	<p>2011 to 2012 anticipate Continue updating lists.</p>	<p>Local and County Funds</p>
<p><b>Improve Cell Phone Service:</b> Advocate for improved cell phone coverage/service with the existing carriers to ensure the service is operating during and after a storm event.</p>	<p>County and Local EMA Directors</p>	<p>Annually</p>	<p>New</p>	<p>Local Funds</p>
<p><b>Objective: Lessen property damages caused by severe winter storms and the resulting water runoff or erosion.</b></p>				
<p><b>Mitigation Action</b></p>	<p><b>Responsibility</b></p>	<p><b>Time Frame</b></p>	<p><b>Status/Rational if No Action</b></p>	<p><b>Funding Sources</b></p>
<p><b>Public Education:</b> Develop an on-line brochure to educate the public about the dangers of severe storms. Include a link to the MEMA website.</p>	<p>County EMA Director</p>	<p>8 weeks</p>	<p>New Continue to educate and inform the public</p>	<p>County Funds</p>
<p><b>Objective: ???</b></p>				
<p><b>Mitigation Action</b></p>	<p><b>Responsibility</b></p>	<p><b>Time Frame</b></p>	<p><b>Status/Rational if No Action</b></p>	<p><b>Funding Sources</b></p>
<p><b>Upgrade Plans:</b> Where recurring problems can be documented develop plans to upgrade roads, culverts ditches and drainage systems and stabilize eroding banks to make roads safe from winter storms and water runoff.</p>	<p>Municipal officials Sagadahoc County</p>	<p>As identified</p>	<p>Continue to be deferred. Lack of local funds have impeded some towns from taking this step to address recurring problems.</p>	<p>Grants, Local Funds</p>

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<p><b>Grant Applications:</b> Where recurring problems can be documented apply for grants to upgrade roads, culverts, ditches and drainage systems in accordance with plans for making roads safe from winter storms and water runoff.</p>	Municipal officials	As grants funds are identified	Continue to be deferred. Lack of problem documentation has been an obstacle. More towns are beginning to use the Road Tracker to keep track of local expenditures.	Grants, Local Funds
<p><b>Training:</b> Encourage attendance at Roads Scholar training offered by the Maine Department of Transportation.</p>	Municipal officials	As training is available	Some towns have participated in this program. Additional participation is anticipated during the next five years.	Local Funds
<p><b>Tree Trimming:</b> Encourage Central Maine Power municipalities and private road owners to trim trees along power lines and in the road right-of- way to keep the roads open and power on.</p>	County and Local EMA Directors	Annually as tree trimming work is scheduled	New	Local Funds
<b>Objective: Ensure that all emergency facilities have back-up power.</b>				
<b>Mitigation Action</b>	<b>Responsibility</b>	<b>Time Frame</b>	<b>Status/Rational if No Action</b>	<b>Funding Sources</b>
<p><b>Generators:</b> Raise funds or apply for grants for installation of generators at critical facilities such as municipal offices, fire stations, designed shelters and schools.</p>	Municipal Fire Departments, approval via town meetings, County EMA, Local EMA	As grant funds are available	Continue to be deferred due to poor economic conditions.	Grants, Local Funds

**WILDFIRES**

In Sagadahoc County, the most likely damages caused by a wildfire are the loss of life and the destruction of personal and real property, especially homes. The loss of electricity is also possible, since many high voltage transmission lines pass through either wooded areas or wildland/urban interface areas. Major wildfires may close commerce, resulting in major losses to local businesses and individuals.

**Goal/Mission Statement:** Reduce loss of life, injury and property damage in Sagadahoc County caused bywildfires.

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Objective: Lessen the loss of life and injuries resulting from wildfires.				
Mitigation Action	Responsibility	Time Frame	Status/Rational if No Action	Funding Sources
<b>Public Education:</b> Educate the public through links on the County EMA website to the Maine Forest Service website about the dangers of forest fires to existing and new structures, particularly during dry conditions or a drought.	Maine Forest Service, County EMA, Municipal Fire Departments	8 weeks	New-Continue to educate and inform the public	Local Funds
<b>Grant Applications:</b> Apply for grants to improve local fire protection especially forest firefighting vehicles and related equipment	Municipal Fire Departments	Annually	Apply as needed. Some local fire departments have applied for grants	Grants
Objective: Lessen property damages caused by wildfires.				
Mitigation Action	Responsibility	Time Frame	Status/Rational if No Action	Funding Sources
<b>Subdivision fire ponds:</b> Require that developers construct fire ponds in new subdivisions located in remote wooded areas, or other high risk areas.	Planning Boards, Town Meeting/City Council	As projects are proposed	Continued to be deferred; lack of significant development activity	Local Funds
<b>Wildfire Pre-planning:</b> Employ steps to mitigate property damage from wildfires such as identifying access point to inland forest areas and to promote timber cutting to lessen fire potential.	County EMA Directors in cooperation with Local EMA Directors and Fire Chiefs	16 weeks	New activity	Local Funds

**Rating of Actions and Establishment of Priorities**

The 2006 Hazard Mitigation Plan did not rate actions or establish priorities. The Sagadahoc County Hazard Mitigation Planning Team in 2011 established priorities by hazard for the general mitigation actions set forth on the previous pages. The Team used the following criteria to rank each of the actions: **The rating system established in the 2011 plan will be kept in the 2016 plan.**

Key to Rating:

1. Life safety
2. Population benefited
3. Probability of community acceptance
4. Probability of funding
5. Feasibility of implementation

Key to Priority:

Each strategy was rated high (3 points), medium (2 points) or low (1 point) for each of the criteria, with the result that priorities were established by total score (the higher the points, the higher the priority).

Rating of Flood Mitigation Actions						
	Life Safety	Population Benefited	Probability Community Acceptance	Probability Funding	Feasibility of Implementation	Total Score
<b>1A</b> Contact Lists	3	1	3	3	3	13
<b>2A</b> NFIP Participation	2	2	3	3	3	13
<b>2B</b> Repetitive Loss Properties	3	1	3	1	1	9
<b>2C</b> Ordinance	2	1	3	3	3	12
<b>2D</b> Beaver Dams	1	3	3	1	2	10
<b>2E</b> Improved Maps	3	2	3	1	1	10
<b>3A</b> Problem Documentati	2	3	3	2	2	12
<b>3B</b> Best Practices	2	3	3	1	2	11
<b>3C</b> Grant Applicatio	1	3	2	1	1	8

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Rating of Severe Winter and Summer Storm Mitigation Actions						
	Life Safety	Population Benefited	Probability Community Acceptance	Probability Funding	Feasibility of Implementation	Total Score
1A Public	3	3	3	3	3	15
1C Functional Needs	2	1	3	3	3	12
2A Public	3	3	2	2	3	13
3A Upgrade Plans	2	3	3	1	2	11
3B Grant Applicatio	2	3	3	1	1	10
3C Training	3	3	3	2	3	14
4A Generators	1	2	1	1	3	8

Rating of Wildfire Mitigation Actions						
	Life Safety	Population Benefited	Probability Community Acceptance	Probability Funding	Feasibility of Implementation	Total Score
1A Public	1	2	3	3	3	12
1B Grant Applicatio	3	1	3	1	3	11
2A Fire Ponds for Subdivisions	1	1	2	3	3	10

**PRIORITIZED MITIGATION PROJECTS**

**Projects Listed in Priority Order**

All of the municipalities in Sagadahoc County identified one or more action items consistent with the County-wide goals, **objectives** and actions, to mitigate hazards at the local level. The jurisdictions, as well as the specific actions they will pursue, are listed in priority order in the following table (**the most important actions are listed first**). The time frames shown are based upon the availability of materials and funding.

**Criteria for Prioritization**

The list of local projects was developed separately by each municipality. Local officials did not use formal, written criteria for the identification of local projects. Local officials relied on common sense, local knowledge of the frequency and extent of local damages, local knowledge of which projects were

of the highest priority, based on frequency and severity of damages, local knowledge of the weather, the geography and topography of the community, and the technical and financial abilities of their respective communities to address hazards and mitigate the impacts of hazards.

**How the Actions will be Implemented**

Table 2 identifies a timeframe for each project, and identifies one or more parties who will be responsible for implementation. If the towns apply for grant funds, a benefit/cost analysis will be undertaken.

**Status of Completed, Deleted or Deferred Projects**

Table 2 contains the prioritized list of town projects, including a status column.

**Table 2**  
**Town Projects and Current Status**

**Hazard Mitigation Projects**

All projects for each municipality are listed in Priority order **(The most important items are listed first)**

Arrowsic					
Project	Cost	Time Frame	Responsible Agency	Funds	Status
Bald Head Road: Dig-out and build up the under layer in 5 specific sections and then recover with dirt to help with draining	\$250,000	52 weeks	Road Commissioner	Town	New Deferred until funding is available
Bath					
Project	Cost	Time Frame	Responsible Agency	Funds	Status
North Bath Road: Upsize 30"x50' culvert & repave	\$15000	2 weeks	Public Works	Town	Completed in 2008
Whiskeag Road: Upsize existing 14' culvert ass wingwalls 7 repave. Conduct h&h study	\$125000	10 weeks	Public Works	Town	Completed in 2008
Commercial St. Pump Station: Elevate electric panels and electric motors, hardware for generator connect. Flood proof building	\$35000	4 weeks	Public Works	Town	Estimated completion by 2011 or 2012 Completed in 2011
Pleasant St. Pump Station: Elevate electric panels and electric motors. Hardwire for generator connect. Flood proof building	\$35000	4 weeks	Public Works	Town	Estimated completion in 2011 or 2012 Completed in 2011

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Park Street: Install culvert 72'x6" with storm drain upgrade	\$2000000	16 weeks	Public Works	Town	<del>New</del> Completed in 2014
Harward Street Pump Station: Pipe upgrade and electrical	1200000	12 weeks	Public Works	Town	<del>New</del> Completed in 2012
Rose & Hunt Pump Station: Upgrade, elevate electrical equipment, and flood proof building	\$40,000	4 weeks	Public Works	Town	New
Willow Street: Correct on-going flooding, upgrade drainage structures	\$30,000	6 weeks	Public Works	Town	New- Planning Stage
Commercial Street: Correct flooding problem, improve drainage	\$35,000	4 weeks	Public Works	Town	New –Planning Stage
Lower Washington Street: Correct flooding problem, improve drainage	\$40,000	4 weeks	Public Works	Town	New- Planning stage
North Bath Road: Culvert at the Mill Pond is undersized and creates flooding, <b>upsized</b> culvert	\$55,000	6 weeks	Public Works	Town	New

**Bowdoin**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
West Burrough: Culvert Replacement	\$100,000	3 weeks	Road Commissioner	Town Grant	New- Planning
Dear River Road: Rip rap ditch line road shoulder 500'x 5"	\$7500	2 weeks	Road Commissioner	Town	Completed
Doughty Road, Rip rap ditch line shoulder 550'x5'	\$7500	2 weeks	Road Commissioner	Town	Completed
West Barrough Rd, Rip rap ditch line 200'	\$2500	2 weeks	Road Commissioner	Town	<del>New</del> Completed
The Wagg Road at the causeway, culvert needs to be upgraded	\$10000	6 weeks	Road Commissioner	Town	Completed in 2007

**Bowdoinham**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
Abbagadasset Road: New culverts and repaving	TBD	26 weeks	Road Commissioner	Town	Completed in 2015.
Millay Road: New culverts and repaving	TBD	26 weeks	Road Commissioner	Town	Completed in 2013
Fisher Road: Design and install debris catcher for 72: culvert at	\$15000	2 weeks	Road Commissioner	Town	<del>New</del> Deferred until funds are available

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Shinglemen's Creek					
12 identified roads for new culvert upgrades and repaving. Backhill St, Browns Point, Carding Machine ,Cemetery Rd, Dinsmore Crossing, Pork Pt, Preble Ridge Rd, School St, South pleasant, Spring St, and Wilde Rd.	\$152700	26 weeks each	Road Commissioner	Town	New Deferred until funds are available
There are 5 unpaved roads that need to be paved. Carding machine Rd, Dingley Rd, Blanchard Cross Rd, Nornbeck Rd	\$475000	52 weeks	Road Commissioner	Town	New- not FEMA eligible No work completed
Mallon Brook Bridge	\$125700	12 weeks	Road Commissioner	Town	New Not completed awaiting funds

**Georgetown**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
Bay Point Road: Elevate 250' x 3'x24'	\$22500	3 weeks	Road Commissioner	Town	Partially completed (culvert & repaving) No additional work completed
Indian Point Road: Elevate 150'x18"x24'	\$12000	3 weeks	Road Commissioner	Town	Partially completed (culvert & repaving) No additional work completed

**Phippsburg**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
Parker Head Rd; Mill Brook to Mill Pond, 6' culvert upgrade with twin 7 ft. culverts at present location	\$173000	6 weeks	Road Commissioner	Town	New
Sam Day Hill Rd/Bailey Rook to Mill brook	\$135000	24 weeks	Road Commissioner	Town	Continue to be Deferred; Sam day Hill road project revised and split into two parts. This part 1. Site visited; need additional traffic count and other information for competitive BCA
Sam Day Hill Road; Parker Head Swamp Brook to Bailey Brook	\$100000	12 weeks	Road Commissioner	Town	Continue to be Deferred; Sam day Hill Road project revised and split into two parts. This is part 2. Site visited; need additional

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					traffic count and other information for competitive BCA
Cranberry Point Road	\$400000	52 weeks	Road Commissioner	Town	Continue to be deferred; project revised and funding is being sought
Stoney Brook Road: Road flooding over a 1,000 foot section of the roadway, Raise the roadbed	\$225,000	12 weeks	Road Commissioner	Town	New- planning stage
Parker House Road: a flooding drainage problem near the 1774 Inn	\$20,000	4 weeks	Road Commissioner	Town	New

**Richmond**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
Upgrade storm water treatment system	1100000	52 weeks	Public Works	Grant	Completed 2007 \$1145000
Pitt Center Road: Upsize existing twin 6;x40' culverts with 12'6'x40' box culvert and riprap	\$55000	6 weeks	Public Works	Town	Completed 2007 \$63,972
Lincoln Street: Install additional 5'x60' culvert and riprap	\$9500	4 weeks	Public Works	Town	Completed 2007 \$10300
Stable Road: Install additional 5'40' and 3'x40 culverts and riprap	\$7500	4 weeks	Public Works	Town	Completed 2010 \$24255
Outer Lincoln Street: Install additional 5'x60' culvert, riprap and repave	\$6000	4 weeks	Public Works	Town	Partially completed 2007 culverts & rip only
Weeks Road: (beginning of the Abby Brook) Upsize the culvert, build up the road approx. 2 feet and repave	\$50000	6 weeks	Public Works	Town	New Not completed; lack of available funds
Langdon Road: (near Savage Road) upsize culvert, raise road approx. 2 feet in center and repave	\$35000	6 weeks	Public Works	Town	New
Langdon Road: (near Abby Brook) 2 very large box culverts, size to be determined by engineer and riprap and repave road	\$400000	12 weeks	Public Works	Town	New Not completed; lack of available funds, etc.
Brown Road: ( near ¼ mile from Alexander	\$65000	6 weeks	Public Works	Town	New Not completed

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/Reed Road heading north), replace metal culverts, size to be determined by engineer and riprap and repave road					
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**Topsham**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
Elm Street: Upsize old stone box culvert with 48' x 80' culvert	\$125000	52 weeks	Public Works	Town	Partially completed; still being worked on
Meadow Cross Road: Upsize existing three culverts with 3'x10'x40' box culvert & repave	\$40000	8 weeks	Public Works	Town	Completed in 2011
Bay park Subdivision: (Goldeneye Drive, Hunter lane and Elder lane) storm drain replacement and upgrade. Upgrade existing 8" underdrain system including new pipe, basins and paving. Construction of a new outlet and or upgrade of existing outlet	1.5 million	52 weeks`	Public Works	Town	New Project is in the planning phase and funding is being explored
Bridge and approaches on the Cathance Rd. location in N43 57.7132, W69 55.8058. reworking needed on the approaches and piers on the banking of the bridge	\$750000	52 weeks	Public Works	Town	New Completed in 2014
Pleasant Point Road: A 400 foot section of the road is subject to flooding and needs to be raised	\$75,000	8 weeks	Public Works	Town	New

**Unorganized**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
Upgrade drainage on county- owned roads. Upsize culverts, improve ditching	\$125000	52 weeks	County Public Works	County	New- pending due to lack of funding

**West Bath**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
Birch Point Road: Ditch 10,000' Blast 3,000 Cu Yd. install (12) 15' x 40' &(12) 18" x	\$425000	14 weeks	Road Commissioner	Town	Continue to be deferred until funding is available

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40' culverts and repave					
Mountain Road: Riprap 600' x10'x3', ditching and culverts	\$18000 \$750000	14 weeks	Road Commissioner	Town	Continue to be deferred until funding is available
Sabino Road: Dig up, geo-mesh installed to prevent any future sinking and then rebuild	\$350000	8 weeks	Road Commissioner	Town	New-Deferred until funding is available
Sanfords Crossing Road: Ditch, culverts and overlay	\$250000	8 weeks	Road Commissioner	Town	New-Deferred until funding is available
Hill Road: Rebuild and pave road surface to repair storm water damage.	\$150,000	16 weeks	Road Commissioner	Town	New

**Woolwich**

Project	Cost	Time Frame	Responsible Agency	Funds	Status
George Wright Road: Upsize 12'x50' box culvert & repave	\$65000	6 Weeks	Road Commissioner	Town	Deferred until funding is available
River Road: Elevate 100'x32'x2 upsize 8;x50' box culverts & repave( near knight Drive (Knights Farm) on route 128)	\$40000	5 Weeks	Road Commissioner	Town	Deferred MDOT Until funding is available
Old state road: (just north of Dana Mill road Intersection ) Elevate 300'x20'x2' replace existing 40'x5' with (2) 50'x4' poly Smooth Flow culvert pipes and repave	\$45000	4 Weeks	Road Commissioner	Town	New-Deferred until funding is available

**15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance**

**Requirement §201.6(c)(3)(ii):** (The mitigation strategy) must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

<b>Elements</b>	<b>A.</b> Does the new or updated plan describe the jurisdiction's participation in the
	<b>B.</b> Does the mitigation strategy identify, analyze and prioritize actions related to continued compliance with the NFIP?

**A. Participation in the NFIP**

All towns in Sagadahoc County are in the Flood Insurance Program, as shown in the Table below. The effective date is based on the Federal Emergency Management Agency's Community Status Book

Report. Please note that Bowdoin has joined the NFIP since publication of the 2006 **2011** Hazard Mitigation Plan. **All municipalities have adopted the updated FIRM maps in 2015.**

Sagadahoc County Communities Participating in the National Flood Insurance Program	
Town	Effective Date
Arrowsic	<del>5-15-91</del> 6/17/15
Bath	<del>1-17-86</del> 5/6/15
Bowdoin	<del>9-1-08</del> 6/29/15
Bowdoinham	<del>5-19-87</del> 7/15/15
Georgetown	<del>5-17-88</del> 6/13/15
Phippsburg	<del>8-5-86</del> 5/5/15
Richmond	<del>6-4-90</del> 6/2/15
Topsham	<del>10-16-87</del> 5/20/15
West Bath	<del>8-17-81</del> 6/17/15
Woolwich	<del>7-16-90</del> 5/13/15

Source: FEMA Community Status Book  
Maine Floodplain Management Program

**B. Actions Related to Continued Compliance with the NFIP**

Actions related to continued compliance with the NFIP are on pages 5-3 and 5-4, specifically:

**2.A. NFIP Participation** – this is the top ranked priority related to the flood insurance program because all communities participate in the program and it is likely that this high rate of participation will continue.

**2.B. Repetitive Loss Properties** – this is the third-ranked priority related to the NFIP. It is ranked third because the prospects for project application and funding are not assured.

**2.C. Ordinance Enforcement** – this is the second-ranked priority related to the NFIP. It is ranked second because effective enforcement of the floodplain management ordinance is critical to continued compliance with the requirements of the NFIP.

**2.E. Improved Maps** – this is the fourth-ranked priority related to the NFIP because **prior to 2015** many FIRM maps are obsolete and while there **is was** new LIDAR data for much of the coast, it **still needs to be was not** incorporated by FEMA **until the revised FIRM maps were updated and finally adopted by each of our municipalities in Sagadahoc County in 2015.** The new FIRM maps provide greater detail allow for better use and enforcement of the Floodplain management Requirements.  
**The Maine State Planning Office** administers the State’s Flood Insurance Program.

<b>16. Implementation of Mitigation Actions</b>	
<b>Requirement §201.6(c)(3)(iii):</b> (The mitigation strategy section shall include) an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented and administered at the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.	
<b>Elements</b>	<p><b>A.</b> Does the new or updated mitigation strategy include (a discussion about) how the actions are prioritized? (For example, is there a discussion of the process and the criteria used?)</p> <p><b>B.</b> Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the responsible department, existing and potential resources and the timeframe to complete each action?</p> <p><b>C.</b> Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?</p> <p><b>D.</b> Does the updated plan identify the completed, deleted or deferred mitigations as a benchmark for progress, and if actions are unchanged (i.e., deferred) does the updated plan describe why no changes occurred?</p>

**A. How the Actions are Prioritized (The 2011 actions priorities are still in effect)**

**County-wide Actions**

Long-range mitigation actions are important in developing a coherent strategy for mitigating hazards. The county-wide mitigation actions included on pages 5-3 through 5-7 are prioritized on pages 5-8 to 5-9 according to criteria described on page 5-8.

**Town-specific Projects**

Projects shown on pages 5-11 through 5-13, are subject to FEMA requirement #16. However, in a multi-jurisdiction plan involving many municipalities, it is not possible to compare projects across municipal boundaries because very few if any officials will have a detailed understanding of each project and how they compare to those in other communities. The preparation of detailed, cost benefit analyses is a complex, costly process that is beyond the scope and funding that is available to complete this Plan. The preparation of cost benefit analyses is part of the project funding application process and will be undertaken at the time municipalities decide to apply for grants. Instead of a formal process for prioritizing projects, each municipality is asked to prioritize its own projects. See introductory statements to Prioritized Mitigation Projects on page 5-10 for a discussion about how these projects were prioritized.

**B. How the Actions and Projects will be Implemented and Administered**

See county-wide goals, objectives and mitigation actions on pages 5-3 to 5-7 for a summary of who will be responsible for implementation as well as the current status of each action. See Prioritized Mitigation Projects beginning on page 5-11 for a project-by-project summary of costs, timeframe and responsible party.

**C. Use of a Cost-benefit Analysis**

MEMA will utilize the cost benefit analyses prepared by applicants when they apply for mitigation funding.

Many of the jurisdictions included in this Plan are small towns run by volunteers. They do not have staff, resources or funding to prepare cost-benefit analyses for the projects included in this Plan. However, in virtually all cases involving expenditure of local funds for implementation, there will be a very rigorous, line-by-line analysis of cost effectiveness during the local budget review process and subsequent public discussion. This review is at least equal to a formal benefit-cost calculation because each expenditure item will be carefully scrutinized rather than simply being plugged into a formula. Nevertheless, MEMA and the County EMA have made it clear to local officials that a cost benefit analysis will have to be prepared in the event they apply to MEMA for mitigation funding.

**D. Benchmarks for Progress**

- See the “Status/Rationale if No Action” column in General Goals, Objectives and Mitigation Actions beginning on page 5-3 of this Plan.
- See the “Status” column in Summary of Hazard Mitigation Projects by Municipality beginning on page 5-11 of this Plan.

<b>17. Multi-Jurisdictional Mitigation Actions</b>	
<b>Requirement §201.6(c)(3)(iv):</b> For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.	
<b>Elements</b>	<p><b>A.</b> Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?</p> <p><b>B.</b> Does the updated plan identify the completed, deleted or deferred mitigation actions as a benchmark for progress, and if activities are unchanged (i.e., deferred), does the updated plan describe why no changes occurred?</p>

**A. Identifiable Action Items Specific to Jurisdictions**

(See pages 5-11 to 5-13)

**B. Status of Mitigation Actions (SH note: Not sure if this was intended to be section B or listed under A)**

(See Status “Status” column on pages 5-11 to 5-13)

**SECTION 6. PLAN MAINTENANCE PROCEDURES**

<b>18. Monitoring, Evaluating and Updating the Plan</b>	
<b>Requirement §201.6(c)(4)(i):</b> (The plan maintenance process shall include a) section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year cycle.	
<b>Elements</b>	<b>A.</b> Does the new or updated plan describe the method and schedule for <b>monitoring</b> the plan, including the responsible department?
	<b>B.</b> Does the new or updated plan describe the method and schedule for <b>evaluating</b> the plan, including how, when and by whom (i.e. the responsible department)?
	<b>C.</b> Does the new or updated plan describe the method and schedule for <b>updating</b> the plan within the five-year cycle?

Part 201.6(c)(4) of the Federal Disaster Act Rule requires a formal maintenance process to take place to ensure that the Mitigation Plan remains an active and pertinent document. The plan maintenance process includes a schedule for monitoring and evaluating the plan at least every five years, and continued public participation throughout the plan maintenance process.

This section of the Plan includes an explanation of how Sagadahoc County and municipal governments intend to incorporate their mitigation strategies into existing planning mechanisms, such as comprehensive plans, capital improvement plans, or zoning and building codes.

**A. Monitoring the Plan**

Sagadahoc County has developed a method to ensure that regular review and update of the Hazard Mitigation Plan occurs. The Sagadahoc County Emergency Management Agency has formed a Hazard Mitigation Evaluation Team that consists of members from the County EMA office, Selectmen, City and Town Managers, and EMA directors from Sagadahoc County municipalities. The County EMA Office is responsible for contacting team members and organizing a meeting after every disaster and/or annually. The methodology for monitoring the plan will be to have the Team review the plan after every disaster in the County and/or annually to determine if changes are needed. This is the same method the County used in the prior Plan for monitoring the plan.

**B. Evaluating the Plan**

The County EMA Office is responsible for contacting the Hazard Mitigation Team members described in A, above, and organizing a meeting after every disaster in the County and/or annually. The Team will review each mitigation goal, objective and action to determine its continued relevance to changing situations and land developments in the County, as well as changes in State or Federal policy, and to ensure that each action is addressing current and expected conditions. The Team will also review the risk assessment portion of the Plan to determine if this information should be updated or modified. The parties responsible for the various implementation actions will report on the status of these actions, and, where applicable, will report on which actions worked well, whether difficulties have been encountered, how coordination efforts have been proceeding, and which actions should be revised. This is the same method the County used in the prior Plan for evaluating the plan.

**C. Updating the Plan**

Based on the annual or disaster-related reviews, **and the update schedule table shown below**, the County EMA Office will update and make appropriate changes to the Plan and submit it to the State Hazard Mitigation Officer in the fourth year of the planning period. If no changes are necessary, the County EMA Office will provide a written justification for this determination. The State Hazard Mitigation Officer will review the plan prior to submittal to FEMA for conditional approval. After the plan has been conditionally approved by both the State and FEMA, the municipalities will have one year to formally adopt the revised plan.

<b>Plan Update Schedule:</b>	
<b>Year</b>	<b>Task</b>
Year 1	Conduct disaster reviews as necessary Monitor progress on mitigation actions and projects
Year 2	Conduct disaster reviews as necessary Monitor progress on mitigation actions and projects
Year 3	Conduct disaster reviews as necessary Monitor progress on mitigation actions and progress
Year 4	Conduct disaster reviews as necessary Monitor progress on mitigation actions and progress Compile a draft list of changes or modifications in the hazard plan and submit to MEMA and FEMA
Year 5	Conduct disaster reviews as necessary Create the revised hazard plan and adopt

<b>19. Incorporation into Existing Planning Mechanisms</b>	
<b>Requirement §201.6(c)(4)(ii):</b> (The plan shall include a) process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, where appropriate.	
<b>Elements</b>	<p><b>A.</b> Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?</p> <p><b>B.</b> Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?</p> <p><b>C.</b> Does the updated plan explain how the local government incorporated the mitigation strategy and other information contained in the plan (e.g., risk assessment) into other planning mechanisms, when appropriate?</p>

**A. Identification of Local Planning Mechanisms**

County government is very limited in scope and authority in the State of Maine and does not have the staff, authority or fiscal capabilities to control development within the municipalities in Sagadahoc County. Within Maine, most government authority is derived from State statues and rules and with municipal “Home Rule” ordinances. There were very few ordinance-related mitigation measures identified by the Sagadahoc

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County Hazard Mitigation Teams. However, the municipalities in Sagadahoc County have a variety of planning and regulatory mechanisms for managing land use at the local level, thereby minimizing the exposure of future development to natural hazards. As shown in the table below, all of the municipalities have a comprehensive plan, a floodplain management ordinance, a shoreland zoning ordinance and subdivision regulations, and six municipalities have town-wide zoning.

In addition, the State has a new building code which became effective in December, 2010. This code addresses some hazards, such as heavy snow loads, although it does not govern the location of structures. **The municipalities of Bath and Topsham have adopted the building code because only municipalities with populations over 4,000 persons are required to adopt the building code.**

There were very few ordinance related measures identified by the Sagadahoc County Hazard Mitigation Planning Team. Most of the mitigation measures identified and selected by towns are structural projects, especially with regard to roads since they are the lifeline to employment, goods and services.

Sagadahoc County Summary of Municipal Planning and Regulatory Activity					
Town/City	Comprehensive Plan	Floodplain Management Ordinance	Shoreland Zoning Ordinance	Local Subdivision Regulations	Townwide Zoning Ordinance
Arrowsic	Yes	Yes	Yes	Yes	Yes
Bath	Yes	Yes	Yes	Yes	Yes
Bowdoin	Yes	Yes	Yes	Yes	No
Bowdoinham	Yes	Yes	Yes	Yes	Yes
Georgetown	Yes	Yes	Yes	Yes	No
Phippsburg	Yes	Yes	Yes	Yes	No
Richmond	Yes	Yes	Yes	Yes	Yes
Topsham	Yes	Yes	Yes	Yes	Yes
West Bath	Yes	Yes	Yes	Yes	Yes
Woolwich	Yes	Yes	Yes	Yes	No

Midcoast Council of Governments Survey of Municipal Planning Activity, 2014-2016.

**B. Process for Incorporating Mitigation Strategies and Related Information into Local Planning Mechanisms**

County government does not have the authority to control local planning mechanisms. However, the County EMA Director can provide information to local units of government, as well as technical assistance.

After adoption of the Hazard Mitigation Plan, **Since the last update**, the Sagadahoc County EMA Office **will** **has** assisted the municipal officers in implementing their selected mitigation measures – **see projects in the Strategy Section**. The County EMA Office will **continue** conduct periodic reviews and surveys with the municipal officers and local EMA directors to determine the status of their **current** measures. The County EMA Office will assist the municipalities with the completion of HMA grant applications.

**C. Explanation of How Local Governments Incorporated Strategies and Other Information**

There has been progress in some areas, but no known actions in other areas **since 2011**:

- Comprehensive Plans – No State money for new plans or updates **The municipalities of Bowdoinham and Richmond adopted revised plans using their own funds.**
- Road Maintenance Planning Efforts – Many towns in Sagadahoc County are now using MEMA’s Road Tracker to document annual repair costs
- Emergency Management and Mitigation Planning – Limited because of volunteer EMA directors and no budgets
- Ordinances –No State money for new plans or updates
- Grant Applications – A few of the County’s municipalities have been active in applying for grants to address mitigation issues. **Phippsburg and West Bath both submitted grant applications to the Maine Department of Environmental protection Culvert grant program but only the Phippsburg application was approved.**
- **Funding opportunities are very limited for mitigation projects and when funds become available they are very competitive and/or take a very long time to actually obtain. Municipal budgets are limited and are barely able to address routine maintenance issues so capital projects are often deferred.**

The County EMA and all municipal EMAs have continued to advise their respective jurisdictions on pending hazard events, such as winter storms, as well as posted public service announcements in public locations such as municipal offices.

The County EMA has notified municipal EMAs and local officials of hazard mitigation workshops such as those related to the Pre-Disaster and Hazard Mitigation Grant programs and workshops with hazard mitigation content such as those sponsored by Maine’s Local Roads Center that deal with the use of geotextiles.

Within each municipality, the party responsible for the implementation and completion of each mitigation measure will notify the County EMA Office whenever assistance is needed or whenever a measure is completed. Existing programs such as local comprehensive planning efforts, the municipal road maintenance plan, emergency management program and local fire prevention program will be utilized to their greatest extent to complete the community’s mitigation measures.

<b>20. Continued Public Involvement</b>	
<b>Requirement §201.6(c)(4)(iii):</b> (The plan maintenance process shall include a) discussion on how the community will continue public participation in the plan maintenance process.	
<b>Elements</b>	<b>A.</b> Does the new or updated plan explain how continued public participation will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)

Sagadahoc County is committed to involving the public directly in the continued reshaping and updating of the Hazard Mitigation Plan. The Hazard Mitigation Plan Evaluation Team is responsible for reviewing and updating the Plan. Although the members of the Committee represent the public to some extent, the public will also be given an opportunity to directly comment on and provide feedback about the plan.

Copies of the Plan will be issued to the municipal Emergency Management Directors and kept on hand at all municipal offices in the County. The County EMA Office will publicize the existence and locations of these plan copies. The Plan will include the address and phone number of the Sagadahoc County EMA

office that is responsible for keeping track of public comments on the Plan.

The Sagadahoc County EMA Office will also provide a public comment period at each meeting of the Hazard Mitigation Plan Evaluation Team. The purpose of the public comment period will be to provide the public a forum at which members of the public can express concerns, opinions or ideas about the Plan. The County EMA Office will be responsible for providing public notice for each meeting of the hazard Mitigation Plan Evaluation Team, and for including in the notice information about the public comment period. The County EMA Office will host this meeting.

In Sagadahoc County, hazard mitigation is far more than a written plan. It is a critical part of the overall mission of the Sagadahoc County Emergency Management Agency (EMA) and its municipalities and it is fully integrated into all aspects of planning, preparedness, training, response and recovery. A partial list of Sagadahoc County’s public outreach efforts includes:

- Maintaining and updating the EMA’s website including the following materials:
  - Press releases, such as one dated March 7, 2011, urging residents to purchase flood insurance
  - A list of town EMA directors with contact information
  - Guidelines for Local EMA Directors
  - Resources for Citizens (currently under construction)
- Communicating with the public on an on-going basis through press releases
- Maintaining emergency communications systems
- Holding meetings and training sessions with local EMA officials;
- Maintaining the list of Functional and Sensory Needs Population and ensuring that people on the list are contacted during storms and other emergencies;
- Participating in public outreach efforts such as the annual Maine Preparedness Conference, the most recent of which was attended by over 500 people.

<b>21. Plan Review</b>	
<b>Requirement §201.6(d)(3):</b> (A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grantfunding).	
<b>Elements</b>	<b>A.</b> Has the updated plan been reviewed and revised to reflect changes in development?
	<b>B.</b> Has the updated plan been reviewed and revised to reflect progress in local mitigation efforts?
	<b>C.</b> Has the updated plan been reviewed and revised to reflect changes in priorities?

**A. Changes in Development**

**Mitigation strategies/actions to address vulnerability to hazards.** This plan contains a number of Mitigation Actions that specifically address the vulnerability of future development to the hazards identified in this Plan. These strategies, which were previously enumerated under 14.B **are still accurate and relevant to Sagadahoc County.** on page 5-2, include:

**Flooding**

See 2C and 2E of the General Goals, **Objectives** and Mitigation Actions.

**Severe Winter and Severe Summer Storms**

There are no actions related to new structures because storm-related hazards such as roof collapses are adequately covered by the State’s new building code which became effective on December 15, 2010.

**Wildfires**

See 1B of the General Goals, Objectives and Mitigation Actions.

**Increase in development**

According to the U.S. Census, the number of year-round dwelling units increased from 14,796 units in the year 2000, to 16,459 in 2010, for a gain of 1,663 units. This is a yearly average of about 166 dwelling units per year for the whole County. **Between 2010 and 2013 the total number of dwelling units as reported in the U.S. Census has decreased by 1,437 units.** The distribution of residential growth is shown in the table below.

Distribution of Residential Growth					
	2000 Dwelling Units	2010 Dwelling units	2013 Dwelling Units	2000- 2010 Gain- Change	2010 – 2013 Change
Arrowsic	201	213	216	+ 12	-3
Bath	4,315	4,352	4,002	+ 37	-350
Bowdoin	1,025	1,193	1,151	+ 168	-42
Bowdoinham	1,073	1,237	1,140	+ 164	-97
Georgetown	456	518	435	+ 62	-83
Phippsburg	899	1,062	961	+ 163	-101
Richmond	1,377	1,546	1,436	+ 169	-110
Topsham	3,538	4,106	3,681	+568	-425
West Bath	776	898	781	+122	-117
Woolwich	1,136	1,334	1,219	+198	-115
Sagadahoc Co.	14,796	16,459	15,022	+1,663	-1,437

Residential development has tended to occur in rural, inland areas away from the coast, often along the existing road network. A similar magnitude of residential development can occur in the future, even though overall population growth is not expected to be large. As noted in this section of the Plan, there are a number of State laws and local ordinances that minimize the extent to which future structures will be vulnerable to the identified hazards. There is only one residential structure in the County (in the Town of Phippsburg) that has been classified as a repetitive loss property, as documented under #8, page 4-18.

There is no known source of data on the number of new non-residential structures. However, commercial and industrial developments tend to locate in existing commercial centers and along major thoroughfare such as Route 1. There are no known instances of non-residential structures being located in flood hazard areas. There are only ~~one~~ **two** non-residential structures in the County (in the City of Bath and Town of Bowdoinham) that have been classified as a repetitive loss property, as documented under #8, page 4-18.

See #9, Assessing Vulnerability, Identifying Structures on page 4-19, especially 9.B., Vulnerability of

Future Buildings, Infrastructure and Critical Facilities, page 4-21.

**Land Use Districts**

The following is a summary of land use districts in those communities that have town-wide zoning.

Summary of Local Zoning Districts	
Municipality	Zoning Districts
Arrowsic	Rural Residential 1, Rural Residential 2
Bath	Residential R-1, R-2, R-3; Waterfront R-4, R-5, R-6; Downtown Commercial, Mixed Commercial and Residential, Neighborhood Commercial, Business Park, Route 1 Commercial Contract, Marine Business, Industrial/Shipyard, Golf Course, Plant Home, Museum, Park and Open Space, Resource Protection, Trufant Marsh Contract, Shoreland Zone
Bowdoinham	Residential/Agricultural, Shoreland
Brunswick	Town Center, In-town Residential Neighborhoods, Extended Neighborhoods, College Use, Commercial, Mixed Use, Large Scale Business and Institutional, Rural, Coastal Protection, Aquifer Protection, Natural Resource Protection, Medical Use, Mobile Home Park, Telecommunications, BNAS Flight Path, Village Review, Rural Brunswick Smart Growth Overlay
Richmond	Village. Commercial and Industrial, Residential, Agricultural, Highway Commercial, Shoreland
Topsham	Mixed Use Limited, Village Residential, Commercial Corridor, Business Park, Commercial Corridor, Industrial, Limited Industrial
West Bath	High Density Shoreland, Residential, Rural Residential, Business and Commercial, Urban Development Park

The remaining four communities (Bowdoin, Georgetown, Phippsburg and Woolwich) have comprehensive plans, but the recommended land use districts in these plans are not relevant indicators of where future development may occur unless and until such time as these communities adopt town-wide zoning. However, these communities have shoreland zoning, floodplain management, and subdivision ordinances, all of which minimize the possibility that new structures will be located in flood hazard areas.

**B. Progress in Local Mitigation Efforts**

**Reduction in Vulnerability**

Since 2011 as noted in Section 5, Table 2, Hazard Mitigation Projects, page 5-11, a number of local projects were completed, thus reducing vulnerability, in Bath, Bowdoin, Bowdoinham, Richmond and Topsham.

**Comprehensive Plan Updates**

A number of comprehensive plans have been updated, but as far as is known, none have been updated to reflect mitigation issues and priorities.

**Public or Governmental Attitudes**

There have been no known studies or surveys of public and governmental attitudes about hazard mitigation that could be used to document any shifts in opinion. If hazard mitigation can be construed to include support for strong environmental State laws and local ordinances, then it can be assumed that

there is support for hazard mitigation as a by-product of these laws and ordinances.

**DEP Culvert Grants**

Phippsburg obtained a culvert grant in 2016 and West Bath missed the grant eligibility rating by only a few point in 2016 and plans to resubmit an application when additional funding is offered.

**Gateway 1 Study**

The Maine Department of Transportation has suspended the Gateway 1 planning initiative. The Gateway 1 study and planning effort was primarily concerned with growth and sprawl along the Route 1 corridor and maintaining the traffic-carrying capacity of Route 1. Hazard mitigation was not a focus of the study.

**C. Revisions in Priorities**

This plan has been revised to reflect changes in local priorities as reflected in Section 5, Table 2, Hazard Mitigation Projects, page 5-11. In addition, the General Goals, Objectives and Mitigation Actions, page 5-3, have been prioritized in 2011 and this priority system has been maintained in the 2016 plan. (see Rating of Actions and Establishment of Priorities, page 5-8).

The address and phone number of the Sagadahoc County EMA Office is:

Sagadahoc County Emergency Management Agency  
752 High Street  
P. O. Box 246  
Bath, ME 04530  
(207) 443-8210