MAINE STATE LEGISLATURE

Maine Prepares for Climate Change
2018 Update

Maine Interagency Climate Adaptation Work Group

Department of Agriculture, Conservation and Forestry

Department of Defense, veterans, and emergency management: Maine Emergency Management Agency

Department of Environmental Protection

Department of Health and Human Services:

Maine Center for Disease Control and Prevention

Department of Inland Fisheries & Wildlife

Department of Marine Resources

Department of Transportation

Governor's Energy Office

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Table of Contents

I. Executive Summary 1

II. Introduction 2

III. Key Terms 4

IV. Inventory of State Climate Activities 5

A. Mitigation 6

B. Research and Analysis 14

C. Adaptation 31

E. Raising Awareness 46

F. Grants & Loans 47

V. Future Work Group Activities 49

Appendix A: 2014 Recommendations & 2018 Updates 57

I. Executive Summary

This report was developed for the Commissioners of the agencies participating in the Maine Interagency Climate Adaptation work group (MICA), to document the information gathered by the work group and to create a guide for future activities of the work group for Commissioners' consideration. MICA is a voluntary group of staff representing State of Maine agencies, coordinated by the Department of Environmental Protection, to share information between agencies and work collaboratively on issues related to climate adaptation and resiliency. Each participating agency acts in accordance with their individual authorizing statutes, and fulfills any applicable mandates independently of MICA.

This report includes a summary of activities currently being taken by member agencies, and recommended future activities for MICA.

II. Introduction

The Environmental and Energy Resources Work Group (EERWG) was formed in 2013, at the request of Governor Paul LePage, to identify and coordinate climate change responses by Maine's state agencies. Members from the Departments of Agriculture, Conservation and Forestry (DACF), Environmental Protection (DEP), Inland Fisheries and Wildlife (DIFW), Marine Resources (DMR), Transportation (DOT), and from the Governor's Energy Office (GEO) participated. EERWG convened for several working group meetings, as well as three day-long public listening sessions to solicit input from stakeholders regarding current projects, programs, and activities at each participating state agency.

EERWG identified potential agency actions, approaches, and opportunities for climate adaptation measures in the future. One outcome of this process was the September 2014 report, *Monitoring, Mapping, Modeling, Mitigation and Messaging: Maine Prepares for Climate Change* ("Maine Prepares for Climate Change" report), which included 32 recommended future activities for state agencies.

Participating agencies agreed that a coordinated approach at the state level ensures agencies are apprised of available scientific research, communication is consistent among agencies, efficiency of actions is increased, and existing expertise is utilized to make work more effective. In 2016, the Commissioner of DEP invited the EERWG member agencies, along with the Department of Defense, Veterans, and Emergency Management (DVEM) and the Department of Health and Human Services (DHHS), to participate in a broader Maine Interagency Climate Adaptation Work Group (MICA) to:

- Provide a status update of each agency's relevant work undertaken since publication of the "Maine Prepares for Climate Change" report; and
- Continue interagency discussions and cooperative actions related to climate change adaptation, resilience and mitigation efforts.

The group is coordinated by the Maine DEP and participation by agencies is voluntary. Agencies currently participating in MICA include DACF; the Department of Defense, Veterans, and Emergency Management: Maine Emergency Management Agency (DVEM-MEMA); GEO; DEP; the Department of Health and Human Services: Maine Center for Disease Control and Prevention (DHHS-CDC); DIFW; DMR; and DOT. Agencies contribute in their areas of expertise, reducing duplication of efforts. Agency staff participate as authorized by their Commissioners, act as representatives for their respective agencies, and act as a resource for agency leadership.

MICA continues to address tasks assigned to EERWG, including meeting, discussing mechanisms for cross-agency partnerships, and sharing updates and information. The group consolidates resources for climate change adaptation, resilience, and mitigation, and collaborates on opportunities for cross-agency projects. The work group or its member agencies:

- Provide resources and technical assistance to the extent feasible, by cultivating lists of available resources and resources to be developed, such as those that relate to standards, best management practices, and policy;
- Manage resources contributed to the Maine Adaptation Toolkit and Clearinghouse;
- Maintain an inventory of climate change adaptation-related initiatives across State Government to maximize available resources and minimize duplication of efforts; and,
- Maintain a list of actionable items, priorities and next steps.

Information on climate trends, activities identified and initiated for greenhouse gas mitigation, and adapting and building resilience to climate change impacts is available on the Maine Clearinghouse and Adaptation Toolkit webpages.

- Climate Change: http://www.maine.gov/dep/sustainability/climate/index.html
- Adaptation Toolkit: http://www.maine.gov/dep/sustainability/climate/adaptation-toolkit/index.html
- Agency Partners: http://maine.gov/dep/sustainability/climate/adaptation-toolkit/partners.html

III. Key Terms

To improve communication across state agencies, MICA identified a need for the use of common terminology and definitions. MICA reviewed definitions used by the U.S Environmental Protection Agency, the U.S. Global Research Program, the National Oceanic and Atmospheric Administration, Housing and Urban Development, the Federal Emergency Management Agency, the Intergovernmental Panel on Climate Change, the United Nations Framework Convention on Climate Change, and the United Nations Office for Disaster Risk Reduction while developing the following definitions. These definitions are intended for use within the context of MICA discussions and this report:

Adaptation is an adjustment in natural or human systems that capitalizes on beneficial opportunities or reduces negative effects due to a changing climate.

Climate is the average weather condition at a given place over a period, for example, meteorologists often make comparisons against a 30-year period, called a climate normal. Long-term climate is usually defined as a century or more.

Climate Change is a difference in the climate over multiple decades or longer. Long-term variations in climate can result from both natural and human factors.

Greenhouse Gases are any gases that absorb heat in the atmosphere, including but not limited to water vapor, carbon dioxide, methane, nitrous oxide, and ozone.

(Climate) Mitigation is a human intervention intended to reduce the rate of climate change.

(Hazard) Mitigation is any sustained action taken intended to reduce or eliminate the long-term risk to human life and property from natural hazards.

Resilience is the capacity to prepare for, respond to, and rapidly recover from significant hazard events with minimal damage to social well-being, the economy, and the environment.

Weather is the atmospheric condition at any given time or place, measured from variables such as wind, temperature, humidity, air pressure, cloudiness, and precipitation. Weather can vary from hour-to-hour, day-to-day, and week-to-week.

IV. Inventory of State Climate Activities

The work group has produced an inventory of climate specific and related state activities. This inventory identifies activities undertaken by the natural resource and energy agencies in Maine's state government that address or respond to observed changes in the state's climate.

List of acronyms used in the report:

Entity	Acronym
Department of Agriculture, Conservation and Forestry	DACF
Department of Defense, Veterans, and Emergency Management – Maine Emergency Management Agency	DVEM-MEMA
Governors Energy Office	GEO
Department of Environmental Protection	DEP
Department of Health and Human Services – Maine Center for Disease Control	DHHS-CDC
Department of Inland Fisheries & Wildlife	DIFW
Department of Marine Resources	DMR
Department of Transportation	DOT
Efficiency Maine Trust	EMT
Public Utilities Commission	PUC

A. Mitigation

i. Planning, Monitoring, and Reporting

Maine Climate Action Plan **Lead Agency:** **DEP**

In 2003, Maine established goals for the reduction of Greenhouse Gas emissions statewide (38 MRS § 576). The Maine Climate Action Plan was adopted in 2004 to meet the reduction goals specified in Maine law. The action plan contains recommended options that will allow the state to meet the reduction goals through cost-effective strategies and actions, and that allow for sustainably managed forestry, agriculture, and other natural resources to sequester greenhouse gas emissions.

Status: Ongoing.

Carbon Emission Modeling **Lead Agency:** **DEP**

Through participation in the Regional Greenhouse Gas Initiative (RGGI), DEP also supports modeling of reductions in carbon emissions from power generating facilities, and shares the results with other states to enable more informed decisions regarding future GHG reductions through the RGGI program.

Status: Ongoing.

Carbon Emission Reporting **Lead Agency:** **DEP**

DEP is required to report annually (38 MRS § 575) on GHG emissions from larger licensed facilities permitted under the Department's Chapter 137, Emission Statements, which effects approximately 200 facilities statewide.

Status: Ongoing.

Link: http://www.maine.gov/dep/air/emissions/index.html

Biennial Report on Progress Towards Greenhouse Gas Emissions Reductions **Lead Agency:** **DEP**

Biennial reporting on progress toward greenhouse gas reduction goals is completed by statutory mandate under 38 MRS § 578 in response to the Climate Action Plan. Currently the state is on track to meet its statewide goals. Reported in the 6th Biennial Report on Progress toward Greenhouse Gas Reduction Goals, Maine has continued to decouple economic growth and emission reductions. The report shows that, "Since 1990, Maine's real Growth Domestic Product (GDP) grew from $37.1 billion to $50.9 billion in 2013. During the same period, energy consumption declined from 446,468 billion Btu to 400,990 billion Btu."

Status: Ongoing. Every two years.

Link: http://www.maine.gov/dep/sustainability/climate/reducing-impacts.html

Annual Reporting of Greenhouse Gas Emission Reductions / Efficiency Maine Trust Annual Report

Lead Agency: **EMT**

Partner Agencies: **DEP, PUC, GEO**

GEO, through its participation on the Efficiency Maine Trust (EMT) Board of Directors, guides the development and implementation of energy efficiency strategies across all sectors (residential, commercial, industrial), which reduce emissions of GHGs. Specific GHG reductions are measured in many of these programs and reported by Efficiency Maine in its annual report.

Status: Ongoing.

Link: http://www.efficiencymaine.com/docs/FY2016-Annual-Report.pdf

Annual Report on GHG Emission Reductions

Partner Agencies: **PUC, DEP, EMT**

The Public Utilities Commission (PUC), EMT, and the DEP, publish an annual report on GHG emissions reductions that occur due to Maine's participation in the RGGI. While the RGGI program was established to reduce emissions in the electric generation sector, the report also includes data on GHG emissions from all of Maine's economic sectors.

Status: Ongoing. 2017 update pending.

Link: http://www.maine.gov/mpuc/legislative/archive/2015-2016ReportstoLegislature.shtml

Comprehensive State Energy Plan

Lead Agency: **GEO**

Partner Agencies: **DEP**

Approximately 90% of the state's GHG emissions originate from energy consumption. The Maine Comprehensive State Energy Plan (2 MRS § 9) provides strategies for addressing the state's energy challenges, including reducing energy costs; encouraging cost-effective renewable energy production; reducing the state's oil dependence; and lowering greenhouse gas emissions. The plan is required to be updated biennially. It includes a status on wind energy development, as well as discussion of the interaction between energy planning and GHG reduction goals. DEP and GEO work together to assemble plan updates in the areas of wind energy development and GHG reductions. GEO is developing a stakeholder-driven update, using the Maine Energy Roadmap Steering Committee, which is funded by a separate U.S. Department of Energy grant; therefore, the 2017 update has been postponed until 2018.

Status: Ongoing.

Links:
http://www.maine.gov/energy/publications_information/index.html
http://legislature.maine.gov/legis/statutes/2/title2sec9.html

Maine Energy Roadmap Steering Committee

Lead Agency: **GEO**

Partner Agency: **DEP**

GEO is spearheading a two-year, stakeholder-driven, comprehensive energy planning process, called the Energy Planning Roadmap. The objectives of the Roadmap are: to achieve energy and cost savings in the residential, commercial, industrial, and transportation sectors; to reduce pollution and greenhouse gas emissions; and to support the growth of a robust state and regional energy market and workforce. The Maine Energy Roadmap Steering Committee, comprised of

energy industry experts, is providing overall strategic guidance for the project. In addition, the project team is facilitating numerous stakeholder and interagency discussions which will inform final policy recommendations. Two-year process scheduled for completion in early 2018: Statewide energy baseline almost complete; process currently underway to define methods to measure progress and success.

Status: Ongoing.

New England Governors and Eastern Canadian Premiers — **Lead Agency:** **DEP**; **Partner Agencies:** **DACF, DIFW, DOT, GEO**

Maine has several initiatives underway related to reducing GHG emissions, including in-state GHG reduction goals, and its work with the New England Governors/Eastern Canadian Premiers (NEG/ECP). Eleven states and provinces within the NEG/ECP developed a *Regional Climate Change Action Plan* in 2001. Each NEG/ECP jurisdiction participates in the process, but is responsible to govern its own outcomes from these regional initiatives. The 2017 *Regional Climate Change Action Plan* was created as an update to the 2001 plan.

Status: Ongoing.

Link: http://www.coneg.org/regional-climate-initiative

ii. Reducing Emissions from Energy Sources and Emitters

Regional Greenhouse Gas Initiative — **Lead Agency:** **DEP**

The RGGI is the first mandatory market-based program in the United States to reduce carbon dioxide emissions resulting from electric power generation. Nine northeastern states, including Maine, have cooperated since 2006 in implementing the program, which has resulted in a reduction in electric power sector emissions of over 45% through 2014.

Status: Ongoing.

Link: http://www.rggi.org/

Emission offset categories / Reducing Carbon Emissions from Licensed Sources — **Lead Agency:** **DEP**

A RGGI CO_2 offset allowance represents a project-based greenhouse gas emission reduction outside of the capped electric power generation sector. Offset categories in RGGI currently include landfill methane capture and destruction; reduction in emissions of sulfur hexafluoride (SF_6); sequestration of carbon due to reforestation; improved forest management or avoided conversion; reduction or avoidance of CO_2 emissions from natural gas, oil, or propane end-use combustion due to end-use energy efficiency; and avoided methane emissions from agricultural manure management operations. CO_2 offset allowances may be used to satisfy up to 3.3 percent of a regulated power plant's compliance obligation.

Status: Ongoing.

Link: https://www.rggi.org/market/offsets

Non-Transmission Alternatives — **Lead Agency:** **GEO**

Maine has a statutory requirement that the PUC consider non-transmission alternatives before approving certain infrastructure upgrades.

Status: Ongoing.

Link: http://legislature.maine.gov/legis/statutes/35-A/title35-Asec3132.html

Green Power Option **Lead Agency:** **PUC**

The Maine Green Power Program is a voluntary renewable energy option that allows electricity ratepayers to match their electricity usage with Maine made renewable energy. Administered as a premium on electric bill.

Status: Ongoing.

Link: http://www.maine.gov/mpuc/greenpower/

State/Ratepayer Financial Support for Reducing Energy Demand/Increasing Use of Low- or No-Carbon Energy Sources

Lead Agency: **GEO**

Partner Agencies: **EMT, PUC**

There are several state and/or ratepayer subsidy programs with goals to lower emissions from energy production and consumption, and/or to support economic development. These programs were established by the Legislature over several years. GEO monitors the legislative process pertaining to these programs, and participates on the Board of Directors at EMT. These programs include:

1) **Renewable Portfolio Standard (RPS)** **Lead Agency:** **PUC**

   Requirement that electricity suppliers obtain a percentage of their electricity supply from renewable sources.

   Status: Ongoing.

   Link: http://legislature.maine.gov/legis/statutes/35-A/title35-Asec3210.html

2) **Community Renewable Pilot Program** **Lead Agency:** **PUC**

   Provides ratepayer funded subsidies for certain community-based renewable electricity generation.

   Status: Program closed to new projects. Existing project ongoing.

   Link: http://legislature.maine.gov/legis/statutes/35-A/title35-Asec3604.html

3) **Long-term Contracts for renewable energy** **Lead Agency:** **PUC**

   The PUC has authority to enter into long-term contracts for selected renewable energy generation projects, provided they provide ratepayer benefits. Several types of renewable electricity generation could qualify for a long-term contract.

   Status: Ongoing.

   Link: http://legislature.maine.gov/statutes/35-A/title35-Asec3210-C.html

4) **Long-term, above-market energy contracts for tidal and offshore wind demonstration projects** — **Lead Agency:** **PUC**

Provides developers a long-term, ratepayer-funded subsidy to develop new tidal and offshore wind technology.

Status: Ongoing.

Link: http://www.mainelegislature.org/ros/LOM/LOM124th/124R2/PUBLIC615_ptA.asp

5) **Above-market financial support for biomass electric generation** — **Lead Agency:** **PUC**

State taxpayer support granted to selected generators for up to two years, through 2018.

Status: Contracts initiated.

Links:
http://legislature.maine.gov/legis/bills/bills_127th/chapters/PUBLIC483.asp
https://mpuc-cms.maine.gov/CQM.Public.WebUI/Common/CaseMaster.aspx?CaseNumber=2016-00084

6) **Net Energy Billing (NEB)** — **Lead Agency:** **PUC**

NEB, or net metering, provides a ratepayer-funded subsidy to electricity customers who generate their own renewably generated electricity. Customers must apply for the benefit.

Status: Ongoing.

Links:
http://legislaure.maine.gov/legis/statutes/35-A/title35-Asec3209-A.html
http://www.maine.gov/tools/whatsnew/index.php?topic=puc-pressreleases&id=729614&v=article08

iii. Efficiency and Conservation

Efficiency Maine Trust's Triennial Plan — **Lead Agency:** **EMT**; **Partner Agencies:** **PUC, GEO**

EMTs Triennial Plan (35-A MRS § 10104) implements strategies and programs that increase the installation of cost-effective energy efficiency improvements; increase deployment of more energy-efficient heating systems; and reduce energy costs for all Mainers. This plan is developed and executed on a three-year basis as approved by the PUC.

Status: Ongoing. Every three years.

Links: http://legislature.maine.gov/legis/statutes/35-A/title35-Ach97sec0.html
http://legislature.maine.gov/legis/statutes/35-A/title35-Asec10120.html

Limited Renewable Energy Programs **Lead Agency:** **EMT**
Partner Agencies: **GEO**

EMT administers limited renewable energy programs using a combination of electric and natural gas ratepayer funds, RGGI auction proceeds, and Forward Capacity Market revenues.

Status: Ongoing. Every three years.

Links:
http://legislature.maine.gov/legis/statutes/35-A/title35-Ach97sec0.html
http://legislature.maine.gov/legis/statutes/35-A/title35-Asec10120.html

Energy Efficiency Deployment Strategies for high-energy-cost areas **Lead Agency:** **GEO**

GEO in partnership with the Island Institute. Program goal is to increase energy efficiency in remote and island communities. This program is currently supported by the U.S. Department of Energy Grant for 2017-2018.

Status: Ongoing.

Link: http://www.islandinstitute.org/program/energy/energy-efficiency

Environmental Leader Program (Business) **Lead Agency:** **DEP**

DEP encourages various energy efficiency projects throughout its work. The Office of Innovation and Assistance administers the Environmental Leader Program, which recognizes voluntary efforts of lodging establishments, restaurants, and grocers in reducing their environmental footprint.

Status: Ongoing.

Link: http://www.maine.gov/dep/assistance/greencert/index.html

iv. Transportation

Electrifying Transportation **Lead Agency:** **GEO**
Partner Agencies: **DOT, DEP**

This effort began in 2016 as a partnership between Maine and Quebec to develop an electric vehicle charging corridor between the state and the province. The corridor was proposed to facilitate tourism considering Quebec's five-year transportation electrification strategy. An expansion of this effort, to include charging infrastructure along additional state highway corridors, is currently being considered as part of the Volkswagen emissions settlement. Funds will soon be available to all named beneficiaries for specific, eligible transportation sector emission reductions.

Status: Ongoing.

Links:
http://maine.gov/mdot/vw/
http://transportselectriques.gouv.qc.ca/wp-content/uploads/CIAO-050-LG2-MTQ-Rapport2016ENv2.1_.pdf

Alternative Fueled Freight **Lead Agencies:** **DEP, DOT, GEO**

In 2013 NEG/ECP tasked the Transportation Air Quality Committee to facilitate widespread adoption of alternative fuel vehicles (AFV) to reduce GHGs. DEP, DOT, and GEO support NEG/ECP's work through efforts to continue toward the 2020 goal of 5 percent AFV penetration; developing a proposal for a framework that will facilitate interoperability of AFV refueling and recharging; identifying corridors in the region that would facilitate AFV travel; and compiling a regional profile of the light-duty fleet. This is in the early stages of research and data collection, including identifying alternative fuel vehicle refueling and recharging stations.

Status: Ongoing.

EPAs SmartWay Program **Lead Agency:** **DEP**

The purpose of this voluntary program is to help businesses move goods in the cleanest and most efficient way possible. The Office of Innovation and Assistance provides in-person and online technical assistance in response to telephone and email requests from landowners, businesses, developers and others, encouraging improved fuel efficiency, reduced idling times, and other cost-effective options that reduce CO2 emissions.

Status: Ongoing.

Link: http://www.maine. gov/dep/assistance/SmartWay/index.html

Enhanced Motor Vehicle Inspection Program **Lead Agency:** **DEP**

The DEP administers the enhanced motor vehicles inspection program that took effect January 1, 1999. The program requires that gasoline-powered motor vehicles registered in Cumberland County undergo an enhanced inspection, including a gas cap pressure test and an Onboard Diagnostics inspection.

Status: Ongoing.

Link: http://www.maine.gov/dep/air/mobile/enhancedautoinsp.html

v. Natural Resources and Resource Recovery

Climate Mitigation through Forestry Management **Lead Agency:** **DACF**

The Bureau of Forestry provides guidance and technical assistance to landowners to encourage them to actively manage woodlands to maintain them in a healthy, resilient condition. Maine's Healthy Forests Program promotes active forest management by woodland owners in southern Maine; the Woodswise Incentives Program helps woodland owners practice long term stewardship of their forest land, primarily by cost sharing woodland management plans; Project Canopy supports healthy, well-managed urban and community forests by planting and maintaining trees in public spaces; managing town-owned woodlands; planting trees to mitigate storm-water overflow and retention; and encouraging installation of low impact development projects to increase green infrastructure as a viable alternative to grey infrastructure. The Bureau also assists woodland property owners in navigating the Tree Growth Tax Law, a current use

taxation program which encourages long term forest ownership and active management.

Status: Ongoing.

Links:
http://www.maine.gov/dacf/mfs/projects/healthy_forests/index.html
http://www.maine.gov/dacf/mfs/policy_management/woodswise/index.html
http://www.maine.gov/dacf/mfs/policy_management/project_canopy/
http://www.maine.gov/dacf/mfs/policy_management/woodswise/tree_growth_tax_law.html

Sustainable Materials Management **Lead Agency:** **DEP**

DEP's Materials Management Division provides a comprehensive and coordinated approach to environmental stewardship and management of the materials we utilize.

Status: Ongoing.

Links:
http://www.maine.gov/dep/sustainability/bottlebill/index.html
http://www.maine.gov/dep/homeowner/fluorescent.html
http://www.maine.gov/dep/waste/productstewardship/index.html
http://www.maine.gov/dep/waste/recycle/index.html
http://www.maine.gov/dep/sustainability/compost/index.html

B. Research and Analysis

i. Physical – Air, Land, Water (Freshwater and Saltwater)

Air Quality Modeling **Lead Agency:** **DEP**

DEP is currently modifying models used in air quality planning to incorporate updated meteorological parameters, such as increased average temperatures to better predict ozone levels in model projections. Using air quality planning models to incorporate updated meteorological parameters, such as increased average temperatures to better predict ozone levels.

Status: Ongoing.

Link: http://www.maine.gov/dep/air/ozone/

Atmospheric Deposition Mapping **Lead Agency:** **DEP**

DEP identifies and maps the locations where air pollutants such as acid rain and mercury are deposited, to enable monitoring of effects on activities and on the environment. The distribution of these pollutants can also be used to inform modeling of other airborne pollution, such as ozone.

Status: Ongoing.

Links:
http://www.maine.gov/dep/air/air_quality/ar_step01.php
http://nadp.isws.illinois.edu/data/sites/map/?net=MDN

Cooperative Snow Survey **Lead Agency:** **DACF**
Partner Agencies: **DEP**

The Maine Cooperative Snow Survey collects, interprets, and distributes information on the depth and water content of Maine's snowpack in the late Winter and early Spring, when the danger of flooding in Maine's rivers and streams is greatest. The data are analyzed by staff from the Maine Geological Survey and U.S. Geological Survey, and maps are prepared showing the water content in snowpack for the State, and comparison to long-term records for snowpack. These surveys are an important part of understanding climate-change impacts to snowpack.

Status: Ongoing.

Link: http://www.maine.gov/rfac/rfac_snow.shtml

Soil Water-Balance Project **Lead Agency:** **DACF**

Cooperative project with the U.S. Geological Survey to develop a soil water-balance model that can be used across the entire state to predict groundwater recharge from data on land use, soil types, and local climate data. Over time, the model can be used to analyze climate change impacts to groundwater recharge.

Status: Ongoing.

Groundwater Monitoring Networks **Lead Agency:** **DACF**
Partner Agency: **DEP**

DACF and DEP are cooperating with the U.S. Geological Survey to enhance the groundwater level monitoring network in Maine. Existing long-term monitoring wells in the DEP database that complement the existing USGS network in Maine in terms of geographic distribution and type are being vetted for inclusion in the national database. Long-term records will allow analysis of climate impacts to groundwater.

Status: Ongoing.

Links:
https://cida.usgs.gov/ngwmn/
http://www.maine.gov/dep/water/groundwater/
http://www.maine.gov/dep/water/monitoring/index.html
http://www.maine.gov/dep/gis/datamaps/index.html#blwq

Establishing A Long-Term Stream Temperature Monitoring Program **Lead Agency:** **DEP**

In 2017, DEP staff installed water temperature monitoring equipment in five streams in Maine. Establishing a long-term monitoring program will help track changes over time and can serve as a climate indicator. Staff additionally coordinate with U.S. Geological Survey and participate in a New England regional monitoring network as well as a statewide workgroup for continuous stream temperature monitoring. Information gathered through the DEP monitoring efforts could be shared with, and compliment, these other activities.

Status: Ongoing, begun in 2017.

On-line Coastal Sand Dunes Geology Maps **Lead Agency:** **DACF**

The Maine Geological Survey maintains an online catalog of maps of the state's dunes based on air photography, LiDAR imagery, and field surveys. Maps are complete for the entire coast. The maps delineate Erosion Hazard Areas (EHA) as well as existing extents of front and back dune areas. EHA designation includes consideration of climate related sea level rise and potential for inundation.

Status: Ongoing.

Link: http://www.maine.gov/dacf/mgs/pubs/online/dunes/dunes.htm

Beach Monitoring Program **Lead Agency:** **DACF**

The Maine Geological Survey conducts the Maine Beach Mapping Program which over decades of data collection shows the response of beaches to sea-level rise and changing frequency of coastal storms. The State of Maine Beach Profiling Project uses trained volunteers to collect monthly beach profiles from a designated starting point shore-perpendicular to roughly the low water line. SMBPP is funded and managed by the Maine Geological Survey, University of Maine, Maine Sea Grant, and Maine Coastal Program. These efforts are summarized at the biennial State of Maine Beaches Conference and the biennial update on Maine's beaches report.

Status: Ongoing.

Link: http://www.maine.gov/dacf/mgs/explore/marine/beaches15/2015beachesreport.pdf
Protecting Maine's Beaches for the Future: 2017 Update [PDF]

Coastal Hazards including Sea Lake and Overland Surge from Hurricanes Modeling **Lead Agency:** **DACF**

DACF has several GIS datasets related to climate change and coastal hazards such as for sea level rise, storm surge, impacts from hurricanes (CAT 1-4, Maine has experienced CAT 1-2), and for the highest annual tide (revised annually). Applications include determining inundation areas, and can show direct observations of change as well as analyzing various scenarios for flooding in coastal areas. Tools include links to currently available data related to coastal hazards and hazardous areas in Maine, and can be used to help inform communities of potential impacts, and begin conversations of how to prepare. Shoreline Change (under way), Living shoreline suitability (under way). Portal online.

Status: Ongoing.

Link: http://www.maine.gov/dacf/mgs/hazards/coastal/index.shtml

Coastal Resilience and Restoration **Lead Agency:** **DMR**

Partner Agencies: **DACF**

The Bureau of Ocean Energy Management (BOEM) and the State of Maine are evaluating offshore sand resources for coastal resilience and restoration planning. DMR and DACF are developing seafloor maps that identify and locate potential areas of sand resources and benthic habitat, both within state waters as well as portions of the Outer Continental Shelf managed by BOEM. Mapping data are available to the public online through the Maine Coastal Atlas. The overall goal is to have available geologic and benthic habitat resources data accessible for planners and managers. This research will help ensure that activities including offshore dredging and beach nourishment are conducted in a sustainable manner that is compatible with natural sediment transport and biological processes.

Status: Ongoing.

Links:
http://www.maine.gov/dacf/mcp/planning/mcmi/index.htm
http://www.maine.gov/dacf/mcp/coastalatlas/index.htm

Coastal Zone Data Acquisition **Lead Agency:** **MEGIS**

Partner Agencies: **DACF, DMR, DOT**

This effort is a consortium with the Maine Office of GIS, DOT, other state agencies, and federal agencies to acquire detailed elevation data in southern Maine coastal areas. The acquired LiDAR data facilitates modeling of sea-level rise, storm surge, tsunami impacts, and riverine flooding. While the intent is to acquire such detailed elevation datasets statewide, currently most coastal counties are completed. On-land coastal LiDAR complete, but seeking support for bathy-LiDAR for nearshore environment.

Status: Ongoing.

Link: http://www.maine.gov/megis/projects/lidar.shtml

Northeast Regional Association of Coastal Ocean Observing Systems (NERACOOS) **Lead Agency:** **DMR**

NERACOOS Climatologies resource shows real-time data from buoy network where users can review historical daily data and compare it to today which are helpful to track changes in temperature over time. Maine is observing increase in maximums, as well as changes of when warm periods are occurring within years and the rate of change is accelerating. Boothbay has temperatures back to 1905 and is oldest record in Gulf of Maine, 2012 was warmest on record, and in the last 12 years we have had 10 of the warmest years on record.

Status: Ongoing.

Link: http://www.neracoos.org/datatools/climatologies_display

Maine Ocean and Coastal Acidification (MOCA) Partnership **Partner Agencies:** **DEP**

DEP is a member of the voluntary Maine Ocean and Coastal Acidification (MOCA) partnership. The MOCA partnership teamed with the Regional Association for Research in the Gulf of Maine group to facilitate the annual science meeting's focus on OA Causes and Potential Consequences for Ecological and Sociological Systems in the Gulf of Maine in October, 2017.

Status: Ongoing.

Link: https://www.seagrant.umaine.edu/extension/maine-ocean-and-coastal-acidification-partnership

New England Coastal Acidification Network **Partner Agencies:** **DEP, DMR, DACF**

DEP participates in the New England Coastal Ocean Acidification Network (NECAN). The group developed a "state of the science" report that covered related OA key research and monitoring needs was published in 2015. EPA Office of Research and Development is currently developing a guidance document for OA parameter monitoring that could help standardize efforts by agencies that are collecting information related to OA.

Status: Ongoing.

Links:
http://www.necan.org/
http://www.necan.org/sites/default/files/Ocean%20and%20coastal%20acidification%20off%20New%20England%20and%20Nova%20Scotia_0.pdf

Ocean Acidification Monitoring and Research **Lead Agency:** **DEP**

DEP monitors and assesses marine waters of the state for attainment of designated uses, which include those directly linked to the impacts from ocean acidification (OA), such as the propagation of shellfish, and generally, protection of aquatic life. DEP continues to measure pH during discrete sonde sampling and by unattended sonde over the duration of weeks to months,

but none of these datasets enable detection of OA impacts. In 2014, 2015, and 2016 DEP funded nutrient analysis for the Maine Coastal Observing Alliance's estuarine water quality monitoring efforts, and as a pilot project in the summer of 2015, DEP staff field-tested pH monitors at several coastal mud flat locations in conjunction with Hancock County Soil and Water Conservation District (HCSWCD). The Marine Unit also continues to pursue monitoring efforts as related to eutrophication, with eelgrass as the currently most relevant biological indicator. This work has been focused in Casco Bay most recently but continues coastwide, as influenced by wastewater discharge permit renewals. Monitoring work may help understand relative differences between estuaries, data before, during and after rainfall events, and data from incoming tides when low pH waters from offshore are pushed up into estuaries. Pending the release of an EPA guidance document for OA parameter monitoring, DEP will determine feasibility of incorporating OA parameters into our seasonal monitoring efforts in the short (2018) and longer term.

Status: Intermittent. As funding allows.

Link: http://www.midcoastconservancy.org/wp-content/uploads/2017/01/MCOA-report-Final-small-vers.-17nov15.pdf

ii. Habitats and Species – Land and Water (Freshwater and Saltwater)

Climate Change and Biodiversity in Maine: Vulnerability of Habitats and Priority Species — **Lead Agency:** DIFW; **Partner Agencies:** DACF

Scientific staff from DIFW, DACF, conservation groups, land trusts, and U.S. Fish and Wildlife evaluated Maine's plants, animals, and habitats for vulnerability to climate change and reported these findings in Climate Change and Biodiversity in Maine. Researchers looked at 442 vulnerable species in Maine and found that climate variations could significantly impact 168 species. Results of this study were incorporated into Maine's 2015 Wildlife Action Plan in determining Maine's Species of Greatest Conservation Need most vulnerable to climate change. Results of this study were incorporated into Maine's 2015 Wildlife Action Plan in determining Maine's Species of Greatest Conservation Need most vulnerable to climate change.

Status: Complete.

Link:
https://www.manomet.org/sites/default/files/publications_and_tools/2013%20BwH%20Vulnerability%20Report%20CS5v7_0.pdf

Climate Maps for Vulnerable Habitats and Species — **Lead Agency:** DIFW

DIFW is currently developing a 'climate change' map to identify locations where climate-vulnerable habitats and important wildlife habitats overlap.

Status: Ongoing.

Identifying Priority Amphibian and Reptile Conservation Areas **Lead Agency:** **DIFW**

The Priority Amphibian and Reptile Conservation Area (PARCA) project is a national initiative to develop a network of focus areas that contain the specialized habitats required by these groups and that are also resilient to anticipated climate change impacts. As a member of a northeastern research team (including the University of Maine), the DIFW has helped to identify scientific criteria for identifying PARCAs, drawing on the concepts of species rarity, richness, and landscape integrity.

Status: Ongoing.

Links:
http://parcplace.org/
http://www.maine.gov/ifw/docs/2017%20Research%20and%20Management%20Report_FINAL_9-5-17.pdf

Priority Species Research **Lead Agency:** **DIFW**

DIFW actively conducts research on habitat relationships and limiting factors for priority fish and wildlife species. This ongoing research helps the Department anticipate the potential effects of climate change and adapt its management practices appropriately.

Status: Ongoing.

Links:
http://www.maine.gov/ifw/fish-wildlife/fisheries/reports-publications.html
http://www.maine.gov/ifw/fish-wildlife/wildlife/endangered-threatened-species/index.html

An Assessment of Maine's Endangered and Threatened Species **Lead Agency:** **DIFW**

A tool employed by DIFW to achieve its mandate for conserving all species of fish and wildlife found in Maine is a periodical review of the state's listings of Endangered and Threatened Species. DIFW considers species vulnerability to climate change as one of many potential threat factors when proposing revisions to the State Endangered and Threatened Species list.

Status: Ongoing.

Link:
http://www.maine.gov/ifw/fish-wildlife/wildlife/endangered-threatened-species/index.html

Moose **Lead Agency:** **DIFW**

Maine is home to the densest population of moose in the lower 48 states due to the availability of large tracts of forested habitat that produce a substantial forage base essential to moose productivity. While Maine's moose population remains strong, it is still important to understand adult female and calf survival rates considering potential effects of climate change, parasites, habitat, winter tick, and predation.

Status: Ongoing.

Link:
http://www.maine.gov/ifw/fish-wildlife/wildlife/species-information/mammals/moose.html

Canada Lynx **Lead Agency:** **DIFW**

Canada lynx are a northern boreal species adapted to living in areas with deep snow and abundant snowshoe hare. Over the last 14 years, DIFW, the U.S. Fish and Wildlife Service, and the University of Maine have been studying lynx habitat use and population status in Maine. Data collected will help inform management of lynx in a changing climate.

Status: Ongoing.

Link: http://www.maine.gov/ifw/fish-wildlife/wildlife/species-information/mammals/canada-lynx.html

Rusty Blackbird **Lead Agency:** **DIFW**

Rusty Blackbirds are the northernmost ranging of the blackbird species, reaching the southern edge of their boreal breeding range in Maine. Efforts by the DIFW staff, the University of Maine, and SUNY College of Environmental Sciences and Forestry are unraveling what drives populations of this rapidly declining species.

Status: Ongoing.

Link: http://www.maine.gov/ifw/fish-wildlife/wildlife/endangered-threatened-species/special-concern.html#birds

Dragonflies and Damselflies **Lead Agency:** **DIFW**

Insects in the Order Odonata, damselflies and dragonflies, are a conspicuous component of Maine's wildlife diversity and serve an important role in both aquatic and terrestrial ecosystems in Maine. This two-year assessment identified which of these species are most critical to consider for regional conservation actions, thereby helping Maine and other states strategically focus limited conservation resources on the most imperiled species.

Status: Ongoing. Species Atlas expected to be published in 2019.

Links:
http://mdds.umf.maine.edu/
http://www.maine.gov/ifw/fish-wildlife/wildlife/species-information/invertebrates/damselfly-dragonfly.html
http://www.maine.gov/ifw/docs/2017%20Research%20and%20Management%20Report_FINAL_9-5-17.pdf

Saltmarsh Birds **Lead Agency:** **DIFW**

With even moderate sea-level rise, habitat for saltmarsh birds is predicted to be greatly reduced, as most species nest just a few inches above the surface of the marsh and are inherently vulnerable to tidal flooding. DIFW has partnered with researchers at three universities (U. of Delaware, U. of Connecticut, and U. of Maine) for a range-wide (Maine to Virginia) survey of the abundance and distribution of saltmarsh bird species, as well as research focused on survival, fecundity, and population viability.

Status: Ongoing.

Link:
http://www.maine.gov/ifw/fish-wildlife/wildlife/species-information/birds/songbirds.html

Brook Trout **Lead Agency:** **DIFW**

Maine remains the last stronghold for wild Eastern Brook Trout in the United States. As a committed partner to the Eastern Brook Trout Joint Venture, the DIFW collaborates on multiple research and assessment projects, including identifying strategies to mitigate climate change impacts to brook trout habitat.

Status: Ongoing.

Link: http://www.maine.gov/ifw/fish-wildlife/fisheries/wild-brook-trout.html

Modeling the Effects of Sea-level Rise on Coastal Habitats

Lead Agency: **DACF**

Partner Agencies: **DIFW, DOT**

Maine's tidal marshes are important to commercial fishery interests and to a wide diversity of wildlife species, and are predicted to be negatively impacted by sea-level rise. Science and planning staff from DACF worked with the DIFW, using funding from NOAA to develop a LiDAR-based coast-wide dataset depicting the impacts of various sea-level rise scenarios on high and low coastal marshes. The towns of Bath, Bowdoinham, Georgetown, Phippsburg, Scarborough and Topsham are participating in the project. Project complete. Portal online.

Overall, information about marsh response to sea level rise lacks data about marsh elevation. DMR's Maine Coastal Program has initiated a statewide monitoring network of sediment elevation tables.

Status: Ongoing.

Link: http://www.maine.gov/dacf/mnap/assistance/coastal_resiliency.html

Lead Agency: **DOT**

Partner Agency: **DACF**

DOT received funding from the Federal Highway Administration (FHWA) to conduct a vulnerability and criticality assessment of the public transportation assets in the six participating communities. Effort will be integrated into the overall project and DOT will be using the local relationships and network developed through the DACF project to deliver the municipal outreach component of their grant. Project partners at the local level include farmers, fishermen, municipal officials, schools, and other interested citizens.

Status: Ongoing.

Eelgrass Mapping in Casco Bay and Piscataqua

Lead Agency: **DEP**

Partner Agency: **DIFW**

DEP has coordinated aerial mapping of seagrass in Casco Bay (2013) and smaller embayment's in 2014-2017, which would continue annually based on specific project needs and to document changes in eelgrass beds that are the sites of long term monitoring. Some of these data layers were shared with MEGIS and are now publicly available, others could be made available if requested. Similar mapping efforts are proposed in coming years including working with Casco Bay Estuary Partnership to put together a proposal this spring for mapping. Funding and participant dependent.

Status: Ongoing.

Link: http://www.cascobayestuary.org/responding-dramatic-declines-eelgrass/

Atlantic States Marine Fisheries Commission **Lead Agency: DMR**

For over 75 years, the Commission has served as a deliberative body of the Atlantic coastal states, coordinating the conservation and management of 27 nearshore fish species. Each state is represented on the Commission by three Commissioners: the director of the state's marine fisheries management agency, a state legislator, and an individual appointed by the state's governor to represent stakeholder interests. These Commissioners participate in deliberations in the Commission's main policy arenas: interstate fisheries management, fisheries science, habitat conservation, and law enforcement. Through these activities, the states collectively ensure the sound conservation and management of their shared coastal fishery resources and the resulting benefits to the fishing and non-fishing public.

Status: Ongoing.

Link: http://www.asmfc.org/

Northeast Regional Ocean Council **Lead Agency: DMR**

The Northeast Regional Ocean Council (NROC) and the Northeast Regional Association of Coastal and Ocean Observing Systems (NERACOOS) are developing a plan for integrated sentinel monitoring for climate change in the northeast. This effort involves reviewing existing data, and developing criteria for indicators and sentinel sites to monitor estuarine, benthic and pelagic organisms. Planning and science staff from DMR and DACF participate.

Status: Ongoing.

Maine-New Hampshire Trawl Survey **Lead Agency: DMR**

The Maine-New Hampshire Inshore Trawl Survey is a resource assessment survey performed along the coastal waters of Maine and New Hampshire. Bi-annual surveys, spring and fall, have been conducted since the fall of 2000. This survey is a collaborative research project using a commercial fishing vessel as the platform. The boat owner, captain, and crew have been actively involved in the design and implementation of this survey.
NOAA bottom trawl survey conducted since the 1960s shows a time series of abundance. There has been a dramatic change where abundance has moved from south to north. Landings have followed change in abundance. Landings have also move further offshore (20-30 miles) where lobsters were previously not found.

Status: Ongoing.

Link: http://www.maine.gov/dmr/science-research/projects/trawlsurvey/index.html

Summer Survey for Northern Shrimp **Lead Agency: DMR**

Maine is at southern limit of the Northern Shrimp distribution. Temperature is known to affect recruitment. For example, on a cold year, there would be strong recruitment, and on a warm year would have weak recruitment. A recruit is the larvae that settles from the water column to the surface and has an increase in survival rate. There has been weak recruitment in recent years.

Status: On hold. Shrimp fishery has been closed for the last three years.

Link: http://www.maine.gov/dmr/science-research/species/shrimp/index.html

Lobster Sea Sampling **Lead Agency:** **DMR**

DMR sea sampling program is the largest at-sea sampling program for lobster in the northeast. Time-series of catch rates and biological data have been used in numerous investigations of width/length relationships, fecundity, size-at-maturity, sex ratio, geographic variation, growth, V-notch composition, and selectivity. Data from the sea sampling program contribute directly to the Atlantic States Marine Fisheries Commission (ASMFC) American lobster stock assessment.

From the 1950s thru 1980s was relatively stable at 20 million pounds per year. In the last 25 years landings have risen exponentially, and the value ranks nationally in the top two or three every year. It employs more people directly harvesting than almost any other fishery in the U.S. The number of trips made by harvesters annually exceeds all the other fisheries from Georgia to Massachusetts combined. Many communities are inviting DMR to aid in their comprehensive plan development.

Status: Ongoing.

Link: http://www.maine.gov/dmr/science-research/species/lobster/seasampling.html

Lobster Settlement Survey **Lead Agency:** **DMR**

Surveys of the Maine juvenile lobster population were started in the Midcoast region (Zone E) in 1989 by researchers at the University of Maine and the Bigelow Laboratory for Ocean Sciences. In 2000, the settlement surveys were expanded to cover all seven of Maine's lobster management zones in order to create a statewide index of settlement. In 2005, DMR fully took over the monitoring effort in Maine. Settlement surveys using the same methodologies as Maine are conducted throughout New England and Maritime Canada. In 2012 data from these various groups was brought together in a single publicly accessible database called ALSI (American Lobster Settlement Index). This collaborative provides standardization in sampling methods and facilitates data analysis across all sampling programs. Using this type of fishery-independent survey, researchers at the University of Maine and the DMR hope to track juvenile populations and generate predictive models of future landings.

Status: Ongoing.

Link: http://www.maine.gov/dmr/science-research/species/lobster/settlement.html

iii. Working Landscapes – Agriculture and Forestry

Forest Service, Maine Healthy Forests Program **Lead Agency:** **DACF**

A healthy forest provides habitat for wildlife, clean water and air, recreational opportunities, and economic vitality to families. Healthy forests are important to our Maine way of life. This program looks at climate-related impacts to forests, and how to manage forests to address and adapt to the changing conditions.

Status: Ongoing.

Link: http://www.maine.gov/dacf/mfs/projects/healthy_forests/index.html

Forest Inventory Program **Lead Agency:** **DACF**

The Forest Inventory Program monitors current and changing forest landscapes and demonstrates changes at a landscape scale across time. The systematic survey of all Maine's forests allows comparison with surrounding jurisdictions. The data sets extend back to 1959 and to allow the long-term monitoring of changing abundance and relative growth rates of various species. Representative subsets of plots are used to track insect and disease syndromes/evidence of expansion of invasive and/or exotic plants.

Status: Ongoing.

Link: http://www.maine.gov/dacf/mfs/forest_health/index.htm

Insect & Disease Management Program **Lead Agency:** **DACF**

The Insect and Disease Management Program allows prediction of probable pest impacts beyond historic range; provides Maine's forest landowners and residents information for timely response to threats; and works with researchers at the University of Maine and the United States Forest Service to conduct research on new or intensifying pest problems, many of which have been exacerbated by changing weather patterns, such as warmer winter minimum temperatures and wetter spring weather.

Status: Ongoing.

Agriculture, Integrated Pest Management & Cooperative Agricultural Pest Survey (CAPS) **Lead Agency:** **DACF**

The Cooperative Agricultural Pest Survey (CAPS) program conducts science-based national and state surveys targeted at specific exotic plant pests, diseases, and weeds identified as threats to U.S. agriculture and/or the environment. These surveys represent a second line of defense against the entry of harmful plant pests and weeds. The number of exotic pests threatening the state has increased partly because of climate variability. New pests that have been introduced into the country, and into the state of Maine, e.g. hemlock woolly adelgid, are easily expanding their ranges due to favorable climate conditions allowing faster development times and reduced temperature-related mortality. The CAPS Program aids in tracking invasive species, and provides early detection of harmful exotic plant pests to minimize impacts on our agricultural and natural resources.

Status: Ongoing.

Link: http://www.maine.gov/dacf/php/caps/index.shtml

iv. Infrastructure

Stormwater Modeling and Guidance **Lead Agency:** **DEP**

In response to predictions of increasing frequency and intensity of storm events, DEP is considering the impacts of more frequent rainfalls (soils may be more moist/saturated more often prior to a storm event), as well as increased rainfall amounts and durations (increasing surface water flow), in its modeling to inform more appropriate criteria for designs, systems and options for stormwater and erosion control measures at various types of development, including land

development projects; operating facilities; road crossings; and hazardous and solid waste storage areas. DEP is developing improved guidance for the sizing of flow-through and hybrid storage/flow-through stormwater filtration systems that accurately reflects the distribution of rainfall intensity in recent years.

Status: Ongoing.

Links:
http://precip.eas.cornell.edu/
http://www.maine.gov/sos/cec/rules/06/096/096c500.docx

DEP Modeling Efforts **Lead Agency:** **DEP**

DEP models are used to help municipalities understand the potential effects of changes in Maine's climate as they plan management programs for local water supply and wastewater treatment.

Status: Ongoing.

Wastewater Utility Vulnerability Monitoring **Lead Agency:** **DEP**

DEP is reviewing wastewater treatment facilities' capacities and outfalls, in anticipation of increased rainfall and rising sea-levels. Model results will evaluate facility capacities, including their ability to handle storm events and stormwater, and aid in assessing the vulnerability of associated infrastructure, such as pipes in proximity to water bodies. DEP assists with Combined Sewer Outflow (CSO), which are required to include design considerations for flooding.

Status: Ongoing.

Improving Aquatic Connectivity **Lead Agency:** **DMR**
Partner Agencies: **DACF, DEP, DOT, DIFW**

The Stream Connectivity Working Group is a multi-agency consortium with the goal of encouraging statewide identification of priority aquatic resources for conservation and restoration activities that will benefit brook trout and other fish and aquatic wildlife. One product of this effort has been the field identification and mapping of in-stream barriers to aquatic organism passage due to poorly designed and/or malfunctioning stream crossings and impoundments. In addition to state agencies, this working group includes non-government organizations, non-profits, and federal agencies actively working on stream habitat restoration.

Status: Ongoing.

Link: http://mapserver.maine.gov/streamviewer/streamdocHome.html

Aquatic Resource Management Strategy **Partner Agencies:** **DACF, DEP, DIFW, DMR, DOT**

The Aquatic Resource Management Strategy (ARMS) was a joint effort between DACF, DEP, DIFW, DMR, and DOT as well as federal agencies, conservation organizations and municipal representatives to develop a statewide aquatic conservation and restoration strategy that aimed to maintain and restore the ecological health of aquatic ecosystems. The program developed a pocket

guide that contains best management practices (BMPs) and guidance for those installing new and replacement crossings where culverts are 6 feet or less in diameter; a master reference manual that incorporates the best of existing BMP documents and Stream Smart crossing principles; the identification of existing opportunities for partnerships and/or project funding sources and potential new initiatives that would better enable local actions that benefit statewide aquatic resource priorities; and the identification of further refinements and objectives for the Maine Stream Habitat Viewer, which is an on-line tool for data sharing and planning and assessing stream restoration projects that was developed by the Maine Stream Connectivity Working Group.

Status: Complete.

Link: https://www.maineaudubon.org/projects/stream-smart/

v. People and Communities

Nutrient Modeling in Land and Water Environments & Regional Monitoring Network — **Lead Agency:** **DEP**

DEP modeling of nutrients in land and water environments enables better understanding of phenomena such as algae blooms in lakes, "red tide" contamination of clam beds in the coastal wetland, and growth patterns in working forests across the state.

Status: In progress.

Cyanotoxin Research in Maine's Lakes — **Lead Agency:** **DEP**; **Partner Agencies:** **DHHS-CDC**

In 2008, DEP began a multiple-year targeted study of Maine lakes that regularly support algal blooms to gain insight into the scope cyanotoxin occurrence in Maine. Results indicated that lakes having the worst blooms indeed produced microcystin concentrations that exceeded World Health Organization criteria. Since 2014, the department has been conducting an ongoing probabilistic study on lakes > 150 acres in surface area in more populated counties to assess the risk for microcystin exposure to shoreline residents who use lake water for household use, animals that drink lake water, and, those recreating in and on Maine lakes. Lakes known to support algal blooms continue to be monitored to define worst case scenario conditions and characterize toxin production through the bloom. Extreme weather events result in more intense stormwater runoff that carries nutrients Maine lakes fueling the development of bloom conditions earlier in the growing season, and initiating blooms in previously clear lakes. The study will likely continue through 2020. These data are being shared with the Maine CDC with the goal being a statewide advisory.

Status: Ongoing.

Link: http://www.maine.gov/dep/water/lakes/cyanobacteria.htm

Cyanotoxin Study in Water Supplies from Maine's Lakes and Ponds — **Lead Agency:** **DHHS-CDC**

CDC Drinking Water Program staff are assessing the impacts of Harmful Algal Blooms on drinking water derived from lakes and ponds. A preliminary 2016 study indicated that the

cyanotoxins associated with these blooms are present at low levels in many source lakes and ponds in the state. A more in-depth study the presence and temporal evolution of cyanotoxins in raw and treated water began in June 2017 and will continue through the end of the calendar year.

Status: Ongoing. Anticipate project completion in spring 2018.

Link: Report will be posted on the Maine CDC Drinking Water Program website when completed

Harmful Algal Bloom Monitoring **Lead Agency:** **DMR**

The Marine Biotoxin Monitoring Program is administered by the Department's Bureau of Public Health. It uses the standards outlined in the National Shellfish Sanitation Program (NSSP) to monitor levels of PSP ("Red Tide") and other marine biotoxins in the shellfish of the State of Maine. Shellfish samples are collected statewide between March and October and evaluated at the PSP laboratory in Boothbay Harbor. Data are then interpreted and appropriate closures are made when necessary to protect public health. Monitoring informs closures to the harvest of shellfish areas when toxins are found at levels near or above where human illness may occur.

Status: Ongoing.

Link: http://www.maine.gov/dmr/shellfish-sanitation-management/programs/biotoxinmonitoring.html

Improving Water Use Information **Lead Agency:** **DACF**

Cooperative program with the U.S. Geological Survey to improve water use information for Maine over twelve categories and three tiers of detail. Improved information will allow water use trend analysis and potential impacts related to climate change.

Status: Ongoing.

Link: https://water.usgs.gov/watuse/

Source Water Risk Analysis **Lead Agency:** **DHHS-CDC**

In 2016, Source Water Risk Analysis Reports were created to identify potential sources of contamination to water supplies that have direct intakes in rivers or sand/gravel wells in close proximity to rivers. CDC Drinking Water Program staff are reviewing these reports to identify water utilities, with a high potential contamination risk, that would benefit from emergency spill response exercises.

Status: Ongoing.

Water Resource Investigations **Lead Agency:** **DACF**

Partner Agencies: **DHHS-CDC**

In collaboration with the DHHS Drinking Water Program, the U.S. Geological Survey, and the Kennebunk-Kennebunkport-Wells Water District, hydrogeologists at DACF investigated water resources in the Branch Brook watershed of southern Maine, which is a primary water supply for the Water District. The project developed a groundwater model that more realistically represents the supply of and demands on groundwater within the watershed. The model can assess the impacts of changes in water supply due to climate change or other factors, and changes in demand due to increased pumping.

Status: Complete.

Link: https://pubs.usgs.gov/sir/2014/5235/

Building Resilience Against Climate Effects from Vectorborne and Heat-Related Disease **Lead Agency:** **DHHS-CDC**

Since 2010, ME-CDC has used funding from the US Centers for Disease Control (CDC) Climate and Health Program to better understand the potential impact of climate change on public health, complete climate adaptation plans for both vectorborne diseases and extreme heat, and begin implementing vectorborne disease and heat illness intervention activities. ME-CDC has applied CDC's BRACE framework (Building Resilience Against Climate Effects) to address concerns about the increase in vectorborne diseases over the last decade. ME-CDC has applied CDC's BRACE framework (Building Resilience Against Climate Effects) to address concerns about the increase in vectorborne diseases over the last decade.

Status: Ongoing.

Mosquitoborne Illnesses Detection **Lead Agency:** **DHHS-CDC**

Mosquitoborne illnesses are becoming more common with the first locally acquired case of West Nile virus (WNV) in a Maine resident detected in 2012, and the first locally acquired case of Eastern Equine Encephalitis (EEE) in a Maine resident detected in 2014. Maine identified cases of both WNV and EEE in 2015 and experienced an EEE death. Detections of mosquitoborne viruses in non-human samples has also increased over the last several years. The potential emergence of Zika virus within the US is a concern as Maine is at the northernmost end of the range for the host vector, the *Aedes albopictus* mosquito, and is therefore at risk for local outbreaks. Further, Maine's climate models suggest that extreme precipitation events may become more common and create conditions that could result in larger mosquito populations, which in turn could lead to increases in mosquitoborne diseases.

Status: Ongoing.

Links:
WNV: http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/west-nile/index.shtml
EEE: http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/eee/index.shtml

Climate Forecast Predictions for the Lyme Disease Tick Vector **Lead Agency:** **DHHS-CDC**

Climate forecast predictions developed through a collaboration between Maine CDC, the University of Maine Climate Change Institute, and the Maine Medical Center Research Institute's Vectorborne Disease Laboratory (MMCRI) indicate that by 2050 virtually the entire state will have a sufficiently warm climate for the Lyme disease tick vector (*Ixodes scapularis*, or deer tick) to reproduce and complete its life cycle, and thus allow for the further expansion of tickborne diseases.

Status: Completed

Mapping Lyme Disease at the Town Level **Lead Agency: DHHS-CDC**

ME-CDC compiled and geo-coded Lyme disease incidence data at the town level to respond to frequent public records requests, provide actionable data for Lyme reduction and tick control activities at the local level, and to support modeling of projected future disease burden.

Status: Ongoing.

Link: https://data.mainepublichealth.gov/tracking/

Enhancing the Tickborne Disease Surveillance System **Lead Agency: DHHS-CDC**

ME-CDC evaluated its tickborne disease surveillance system, resulting in several system enhancements, as well as the identification of two high-risk groups for Lyme disease: children 5-14 years old, and adults 65 years and older.

Status: Completed.

Link: http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/publications/2015-Lyme-Surveillance-Report.pdf

Building Resilience Against Extreme Heat Events **Lead Agency: DHHS-CDC**

ME-CDC has applied CDC's BRACE framework to develop adaptation plans for extreme heat events. As part of this framework, modeling conducted by the University of Maine Climate Change Institute with funding support by MECDC indicates a significant increase in the number of high heat days by 2060. This research can be used to help communities plan for the future effects of high heat events. Results are included in UMO CCI's Maine's Climate Future report.

Status: Completed.

Link: http://cci.siteturbine.com/uploaded_files/climatechange.umaine.edu/files/Maines_Climate_Future_2015_UpdateFinal-1.pdf

Statistical Modeling to Evaluate the Heat-Morbidity/Mortality Response Curve for Maine **Lead Agency: DHHS-CDC**

ME-CDC has performed time-series meta-analysis modeling in collaboration with colleagues from Brown University and the state health agencies in New Hampshire and Rhode Island to identify more data-driven thresholds for issuing heat health advisories. These modeling results demonstrated that there are increases in heat-related morbidity and mortality at heat index levels below the National Weather Service (NWS) thresholds for issuing heat advisories. Results from this analysis were shared with the National Weather Service's Northeast Region office, and in response to the findings, the NWS Northeast Region in April 2017 lowered its threshold for issuing heat advisories to a level more consistent with the study findings. Results were published in the journal Environmental Research.

Status: Complete.

Link: http://www.sciencedirect.com/science/article/pii/S0013935116312609

Air Conditioning Prevalence Survey **Lead Agency:** **DHHS-CDC**

Maine CDC developed survey questions to elicit data on air conditioning prevalence documenting the low prevalence of AC in Maine relative to the northeast region. These questions are asked of Mainers every few years as part of Maine's Behavioral Risk Factors Surveillance Survey, a statewide survey of health and behavior. Air conditioning prevalence data available on the Maine Tracking Network data portal.

Status: Ongoing.

Link: https://data.mainepublichealth.gov/tracking/

Heat Illness and Heat-Related Morbidity Investigation **Lead Agency:** **DHHS-CDC**

Maine CDC investigated the current burden of heat illness and heat-related morbidity in Maine to identify high risk groups. Heat-related hospitalizations, emergency department visits, and deaths are summarized, and demographic, geographic, and occupational risk factors are identified. Heat illness data available on the Maine Tracking Network data portal,

Status: Ongoing.

Link: https://data.mainepublichealth.gov/tracking/

Syndromic Surveillance System for Heat Illness **Lead Agency:** **DHHS-CDC**

Maine CDC developed and implemented a syndrome for heat illness within our existing syndromic surveillance system to establish a near-real time monitoring system for outbreaks of heat illness during a heat event. This syndrome is monitored every summer during periods of high heat to identify and respond to significant increases in heat-related illnesses.

Status: Ongoing.

C. Adaptation

i. Natural Environment

Maine's 2015 State Wildlife Action Plan

Lead Agency: **DIFW**

Partner Agencies: **DACF, DOT, DMR, DEP**

The 2015 Maine State Wildlife Action Plan revision engaged over 100 conservation partners to identify Maine's 378 Species of Greatest Conservation Need (SGCN) and actions needed to prevent further species declines. Many of these actions focus on greater understanding of and reducing impacts of climate change to SGCN and their habitats and enhancing habitat connectivity to allow for species range shifts and movement. Revision completed, and now implementing the 2015 Maine Wildlife Action Plan.

Status: Ongoing.

Link: http://www.maine.gov/ifw/fish-wildlife/wildlife/wildlife-action-plan.html

Keeping the Public Trust and Informing Voluntary Habitat Conservation

Lead Agency: **DIFW**

Partner Agencies: **DEP, DACF**

The DIFW works with private landowners, businesses, local, state, and federal agencies, and other parties on a wide variety of land and water use proposals. The DIFW works cooperatively to accommodate both development and the needs of sensitive fish and wildlife resources, thereby helping to maintain resilient wildlife populations in the face of an uncertain climate.

Status: Ongoing.

Link: http://www.maine.gov/ifw/fish-wildlife/wildlife/environmental-review/index.html

Habitat Outreach

Lead Agency: **DIFW**

Partner Agencies: **DACF, DOT**

Habitat Outreach is a collaborative effort of federal, state and local agencies and non-governmental organizations, is a non-regulatory habitat and landscape-based approach to conserving wildlife and plant habitats. The effort provides users with the best available information on rare plants and animals, important habitats, riparian areas, and undeveloped habitat blocks. The goal of the effort is to voluntary maintain sufficient habitat to support all native plant and animal species currently breeding in Maine. Habitat Outreach compiles habitat information from multiple sources, integrates it into one package, and makes it accessible to towns, land trusts, conservation organizations and others to use proactively.

Status: Ongoing.

Link: Additional information about the effort can be found here http://www.maine.gov/ifw/fish-wildlife/wildlife/wildlife-action-plan.html

Staying Connected **Partner Agencies:** **DIFW, DOT**

This project focuses on restoring and enhancing areas of continuous, undeveloped and working forest habitat across New York, Massachusetts, Connecticut, Vermont, New Hampshire, Maine, Quebec, New Brunswick, and Nova Scotia to safeguard native wildlife and plants from the impacts of habitat fragmentation and climate change, such as from increasing temperatures and changes in weather patterns.

Status: Ongoing.

Link: http://stayingconnectedinitiative.org/

Invasive Pest Mitigation Strategy **Lead Agency:** **DACF**

DACF staff provides training for landowners in appropriate methods to address invasive species; and provides support for invasive pest preparedness and response efforts. Several other programs and areas of assistance are offered, including participating in advisory groups developing guidelines for town and land trust woodland management plans that are "climate smart."

Status: Ongoing

Links:
https://www1.maine.gov/dacf/mfs/archive/woodswise/invasive.html
http://www.maine.gov/dacf/mnap/features/invasive_plants/invasives.htm
http://www.maine.gov/dacf/mfs/forest_health/invasive_threats/index.htm
http://www.maine.gov/dacf/php/horticulture/invasiveplants.shtml

Soil and Water Conservation Program **Lead Agency:** **DACF**

DACF coordinates education and outreach on soil and water conservation practices by Maine's 16 local Soil & Water Conservation Districts. Conservation Districts provide ongoing technical assistance and education on soil health, nutrient management, erosion control, water conservation, invasive species management, sustainable agriculture and forestry, and other locally-identified natural resource management issues.

Status: Ongoing.

Link: http://www.maine.gov/dacf/about/commissioners/soil_water/index.shtml

Agricultural Water Management **Lead Agency:** **DACF**

The DACF Division of Agricultural Resource Development has utilized state and federal dollars to research the needs of farmers for water sources and irrigation. In the past, the Division has administered bonds to fund a water source development program to help farmers build water sources to mitigate drought. The Maine Legislature has approved four bond measures totaling $5.5 million dollars since 2001 to assist in new water source development. The Division has provided over $5.3 million to develop 179 projects for new water sources for farms. The program has protected over 11 thousand acres of farmland with crop value of over $33 million. Currently, there are no grant application requests for proposals for new water source developments for agricultural entities.

Status: Ongoing.

Link: http://www.maine.gov/dacf/ard/water_management/index.shtml

Nutrient Management **Lead Agency:** **DACF**

Partner Agency: **DEP**

The DACF Nutrient Management Program oversees the proper storage, management and utilization of farm nutrients through the development of Nutrient Management Plans, Livestock Operations Permits, and monitoring of Concentrated Animal Feeding Operations (CAFOs). The Program prohibits winter spreading of manure from December 1st through March 15th.

Status: Ongoing.

Link: http://www.maine.gov/dacf/php/nutrient_management/index.shtml

Sustainability Recognition Program **Lead Agency:** **DACF**

Program is for farmers and is currently being worked on, and will have a climate change component to it.

Status: Ongoing.

Water Resources Program **Lead Agency:** **DACF**

Bureau of Forestry staff provides trainings and assists in remediating water crossings on forest roads to handle predicted increases in storm flow and improve fish passage; oversees the chop and drop program, designed to improve cold-water fisheries habitat; conducts frequent workshops on Forestry Best Management Practices to protect water quality; and administers the Direct Link Loan Program, which provides reduced interest loans to loggers to purchase water quality-friendly harvesting equipment.

Status: Ongoing.

Link: http://www.maine.gov/dacf/mfs/policy_management/water_resources/index.html

Forest Climate Working Group **Lead Agency:** **DACF**

The Forest Climate Working Group is a consortium of various parties to ensure that the full potential of U.S. forests and forest products is realized to provide climate change solutions.

Status: Ongoing

Link: https://www.forestfoundation.org/forest-climate-working-group

Building Resiliency Along Maine's Bluff Coast in Casco Bay **Lead Agency:** **DACF**

Partner Agency: **DMR**

This project is currently underway along Casco Bay. A project goal is to understand the implications of storms and shoreline change on bluffs by using existing bluff stability and landslide hazard maps, historical erosion rates, accelerated erosion rates driven by sea-level rise. This project is a collaboration of DACF, DMR, the Casco Bay Estuary Project, and the Cumberland County Soil and Water Conservation District. Products will include a decision-tree for evaluating non-structural methods of slope stabilization, case studies of vulnerable eroding bluffs and a planting guide for landscaping solutions.

Status: Complete.

Link: Report available soon.
http://cumberlandswcd.org/site/2017/11/building-resiliency-along-maines-bluff-coast/

Adaptation Planning for Maine's Coastal State Parks **Lead Agency:** **DACF**

DACF Parks and Public Lands are subject to erosion, land loss, flooding from hurricanes and winter storms, and other hazards. This project is collaboration among several DACF programs to determine the vulnerability of infrastructure and habitats of Maine's most at-risk coastal state parks and historic sites to sea level rise and storm surge. The project identified sites for improving public safety, mitigating hazards, siting future development, and making lasting investments in park improvements. Study area includes Popham Beach State Park, Reid State Park, Crescent Beach State Park, Kettle Cove State Park, Fort Pemaquid, Fort Popham, and Popham Colony.

Status: Complete

Link: Report available soon

ii. Built Environment

Landscape-based Methodology for Inland Climate Resilience of Maine's Transportation Infrastructure **Lead Agency:** **DOT**

This research project, co-funded by the National Academies of Science and the 2nd Strategic Highway Research Program, established the basis for the decision support matrix that estimates the risk to project delivery posed by environmental factors, including extreme weather events. One outcome of this study was DOT's shift in design guidance from sizing stream crossings for 25-year storm flows to 100-year storm flows. Phase 1 study complete; Phase 2 study pending.

Status: Ongoing.

Link: http://mdotweb.state.me.us/ec/documents/CulvertSizing%20May2015.pdf

Coastal Maine Transportation Infrastructure Vulnerability to Projected Sea Level Rise and Storm Surge **Lead Agency:** **DOT**

This FHWA-funded research project overlaid GIS locations of DOT infrastructure located in coastal Maine towns with NOAA sea level rise and storm surge inundation projections for 2050 and 2100. This information will be used to inform funding, scheduling, and design decisions in future work plans, and allow DOT to codify its consideration of changing climate-based coastal conditions.

Next step for the project is to incorporate sea level rise and storm surge projections into the 2018-2019-2020 work plan candidate selection process, and determine influence of these considerations on project scopes, schedules and budgets. Data gathering, modeling, and mapping complete, final report submitted to DOT, final report to FHWA is pending

Status: Ongoing.

Link: https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/green_infrastructure/index.cfm

Risk-based Planning and Environmental Linkages **Lead Agency:** **DOT**

This State Transportation Innovation Council incentive program grant from FHWA builds on previous Coastal Resiliency and landscape-based risk assessments by establishing a "risk rating" for each DOT asset. This rating translates the complexity of the asset itself and its environmental setting into a numeric representation of risk to on-schedule and on-budget project delivery, two strategic performance measures for DOT. Risk-based asset management is required as part of federally-established MAP-21 and the FAST Act. Project outcomes will be tested as part of work plan development beginning in June 2017.

Status: Ongoing.

Link: https://www.fhwa.dot.gov/innovation/stic/edc4_stic_factsheet.pdf

Use of Green Infrastructure to Enhance Coastal Highway Resiliency in two New England States **Lead Agency:** **DOT**
Partner Agencies: **DACF, DEP**

Maine's DOT and the New Hampshire DOT are studying the feasibility of applying green infrastructure methodology along two highly vulnerable coastal highway sections. Working with UNH, multiple state and federal agencies, and non-profits, the two transportation agencies are building on existing information regarding sensitive habitats, structural conditions, ocean dynamics, social considerations, regulatory environments, and climate-based projections to determine the benefit-cost balance for green, green-gray, and gray stabilization methods in areas of active erosion. This project was selected for funding by FHWA as one of four pilots nationwide.

Status: Complete. Final report pending.

Cost-effective Stormwater Management **Lead Agency:** **DEP**
Partner Agency: **DOT**

Since 2007, DEP, DOT, and the Maine Turnpike Authority have had a Memorandum of Agreement (MOA) that streamlines the regulatory process with regard to stormwater management associated with state transportation infrastructure. Through this MOA, MaineDOT and MTA commit to meeting minimum standards for all soil disturbance associated with construction and reconstruction of transportation assets under their purviews. They also report all work falling under Chapter 500 to DEP annually along with work anticipated in the next construction season. DOT and MTA also operate in MS4s under a General Permit with DEP. These agreements are reviewed, modified and renewed regularly, with the most recent versions approved in 2017.

Status: Ongoing.

Link: http://www.maine.gov/mdot/env/documents/2013_Transportation_MS4_GP.pdf

Shoreland Zoning Management **Lead Agency:** **DEP**

The DEP administers the Shoreland Zoning Management program to protect, conserve and promote environmentally wise use of sensitive areas adjacent to the state's water resources.

Effective January 26, 2015 Chapter 1000 Guidelines for Municipal Shoreland Zoning Ordinances were amended to include, among other things, replacing *maximum spring tide* with *highest annual tide*. This change considers sea level rise as part of climate change by setting a standard for the setback of structures that is based on yearly estimates of the highest tides by NOAA.

Status: Ongoing.

Link: http://www.maine.gov/dep/land/slz/index.html

Brownfield Redevelopment **Lead Agency:** **DEP**

Sites receiving Brownfields Redevelopment funding from EPA are supposed to be evaluated for potential impacts from sea level rise in locations where it is an applicable hazard, and DEP encourages this evaluation if unevaluated. Outcomes of accounting for sea level rise can include increased setbacks from floodplains, restored floodplains, and can be part of larger downtown economic development planning work to reduce exposure of built environment to sea level rise and related hazards.

Status: Ongoing.

Nonpoint Source Training Center **Lead Agency:** **DEP**

The Office of Innovation and Assistance provides in-person and online technical assistance in response to telephone and email requests from landowners, businesses, developers, and others, including consideration of potential effects of changes in the climate. Within the Office, the Nonpoint Source Training Center works with contractors, landscapers, foresters, and code enforcement officers to bring technical assistance, certification, and new training for erosion control practices. Over 2,600 contractors have received erosion control certification.

Status: Ongoing.

Link: http://www.maine. gov/ dep/land/training/index.html

Low Impact Development **Lead Agency:** **DEP**

Low Impact Development (LID) practices are a set of site development strategies designed to mimic natural hydrologic function by reducing stormwater runoff and increasing groundwater recharge and pollutant treatment. LID practices are almost always small in scale and diffuse across a project site; they are generally surface vegetative systems that are integrated with the site development infrastructure. DEP encourages the use of LID practices on new developments. Effective August 12, 2015, Chapter 500 Stormwater Management rules were amended to include, among other things, an encouragement to utilize LID strategies by allowing a reduction of up to 20% in the amount of required treatment. Since becoming effective, most applicants have been using LID techniques as part of their stormwater management strategy

Status: Ongoing.

Links:
http://www.maine.gov/dep/land/training/index.html
http://www.maine.gov/dep/land/watershed/materials.html

Office of Innovation and Assistance at DEP **Lead Agency: DEP**

The Office of Innovation and Assistance provides in-person and online technical assistance in response to telephone and email requests from landowners, businesses, developers and others, including consideration of potential effects of changes in the climate. The Office houses the Environmental Leader (EL) program for industry sectors which provides resources and training to help businesses lessen their environmental impact.

Status: Ongoing.

Link: http://www.maine.gov/dep/assistance/greencert/lodging.html

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Industrial, Commercial, and Institutional Boilers (and Process Heaters) **Lead Agency: DEP**

EPA has promulgated regulations to reduce hazardous air pollutants from boilers and process heaters. DEP assists in outreach for these regulations and incorporates requirements into air licenses. These rules require tune-ups for almost all boilers, energy assessments for larger boilers, and promote the use of natural gas.

Status: Ongoing.

Links:
https://www.epa.gov/stationary-sources-air-pollution/compliance-industrial-commercial-and-institutional-area-source
https://www.epa.gov/stationary-sources-air-pollution/industrial-commercial-and-institutional-boilers-and-process-heaters

Tank Storage Siting **Lead Agency: DEP**

DEP identifies and integrates drinking water supplies when assisting with the siting of fuel storage facilities and associated services. Chapter 691, Rules for Underground Oil Storage Facilities, and Chapter 692, Siting of Oil Storage Facilities also include standards related to potential changes in climate on surface water or sea level as considerations when assisting with the siting of fuel storage facilities and associated facilities, including above ground storage tanks and terminals (ASTs); underground storage tank (UST) facilities near surface waters; and piping to dispensers on docks (e.g. marinas).

Status: Ongoing.

Links:
https://www1.maine.gov/sos/cec/rules/06/096/096c691.doc
https://www1.maine.gov/sos/cec/rules/06/096/096c692.doc

Source Water Emergency Spill Response Exercises **Lead Agency: DEP, DHHS-CDC**

CDC Drinking Water Program staff are reviewing Source Water Risk Analysis Reports to identify potential sources of contamination to water supplies that have direct intakes in rivers or sand/gravel wells near rivers, and are working with communities to simulate emergency spill response exercises. These exercises challenge utilities to respond to mock impacts to their water

supplies, under stressed conditions such as flooding or drought, with the goal of increasing resiliency of Maine's drinking water supplies.

Status: Ongoing.

iii. People and Communities

Municipal Guidance Series **Lead Agency:** **DACF**

Partner Agencies: **DEP, DMR, DOT**

Many local governments in Maine are looking for practical steps to help make their communities more resilient in the face of rising sea-levels and more frequent intense storm events. To help address this need, the Municipal Planning Assistance Program and nine of Maine's Regional Planning Organizations, with funding from the Maine Coastal Program, have collaborated on a series of guidance documents.

The guidance documents explain how to identify threats to community resources, and how to respond to those threats by integrating climate adaptation measures into existing local policies, practices and ordinances. Each of the ten documents in the series addresses a different area of municipal responsibility.

Status: Complete.

Link: http://www.maine.gov/dacf/municipalplanning/technical/climate.shtml

Maine Flood Resilience Checklist **Lead Agency:** **DACF**

The Maine Flood Resilience Checklist is a simple and practical self-assessment tool designed to assist communities evaluate how well positioned they are to prepare for, respond to, and recover from flooding events and sea level rise. It provides an integrated framework for examining local flood risk, assessing vulnerability of the natural, built, and social environments, and identifying specific opportunities, actions, and strategies to enhance community flood resilience. DACF has provided funds to Regional Planning Commissions to use the flood resiliency checklist with their member towns. A complete checklist is now available.

Status: Complete. Checklist available.

Links:
http://www.maine.gov/dacf/mgs/hazards/coastal/index.shtml
http://digitalmaine.com/mgs_publications/521
http://www.maine.gov/dacf/mgs/hazards/coastal/MaineFloodResilienceChecklistOverview.pdf

Coastal Hazards and Resiliency Tools Project (CHRT) **Lead Agency:** **DACF**

Science and planning staff worked with numerous regional and local partners on the CHRT project with the goal to promote coastal hazard resiliency at local and regional levels. The project focuses on developing vulnerability assessment datasets, engaging directly with interested communities through education and outreach, and aiding local partners in developing locally acceptable adaptation strategies for dealing with the potential impacts of storms and future sea-level rise. Part of these efforts included developing the required GIS datasets for assessing the potential impacts of various sea-level rise scenarios on both natural and built environments in

each partner community. These sea-level rise scenarios were superimposed onto the highest annual tide and the 100-year storm water elevation to assess potential impacts. On-going efforts to address resiliency in many coastal communities.

Status: Complete.

Links:
https://www1.maine.gov/dacf/municipalplanning/technical/climate.shtml
http://www.smrpc.org/index.php/programs/land-use-plainning/slawg

Vector-borne Working Group **Lead Agency:** **DHHS**
Partner Agencies: **DACF**

DACF staff have worked collaboratively with the Maine Center for Disease Control and Prevention (Maine CDC) to address the northward advance of diseases carried by ticks and mosquitoes. Climate variability has allowed the deer tick to flourish through most of the southern half of the state, and Lyme disease has followed. Department staff have participated in the multi-agency Vector Borne Working Group to develop and promote strategies to reduce the incidence of Lyme Disease. The Department has also developed a plan in collaboration with the Maine CDC to protect the public from mosquito-borne diseases which have also been migrating northward.

Status: Ongoing.

Link: http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/lyme/lyme-resource-educators.shtml

Developing a School-Based Curriculum Intervention to Reduce Lyme Rates in Children **Lead Agency:** **DHHS-CDC**

Until 2016, children 5-15 years of age had the highest rates of Lyme disease in the state, and children under age 15 are also thought to be at higher risk of acquiring mosquito-borne diseases. ME-CDC therefore developed a school-based curriculum for third through fifth graders that teaches students the biology and ecology of ticks and mosquitoes, the diseases they may carry, and methods for preventing these diseases. The curriculum aligns with Maine's state educational standards. In 2016, after several years of educational interventions with this age group, the rate of increase in Lyme disease among children 5-15 was somewhat lower than in other groups, and adults 65 and older surpassed children 5-15 as the most at-risk age group. The curriculum has recently been extended to middle-school grades. The curriculum has been piloted or presented 21 times over 3 years, in 14 elementary and 3 middle schools, with some elementary schools using the curriculum in multiple years.

Status: Ongoing.

Link: http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/school-curriculum/index.shtml

Developing a Vectorborne Disease Prevention Intervention for Older Adults (Tick Free ME Challenge) **Lead Agency:** **DHHS-CDC**

Adults over the age of 65 years have until 2016 had the second highest rate of Lyme disease among all age groups, along with relatively high rates of anaplasmosis and babesiosis. Through focus groups with people in this age group ME-CDC determined that prevention efforts should be focused on education and behavior change, and using findings from the focus groups developed the Tick Free ME challenge. The challenge is a collaboration with local libraries and other community-based organizations, providing education on ticks and tickborne diseases and then challenging participants to document their tick prevention behaviors during the month of July. ME-CDC piloted the challenge during July 2015, and expanded it and presented it during the months of July 2016 and July 2017. The Tick Free ME challenge has been piloted or presented in 33 libraries and 15 other community-based organizations.

Status: Completed.

Train-the-Trainer on Tick and Mosquito Topics **Lead Agency:** **DHHS-CDC**

Maine created 10 brief YouTube videos on tick and mosquito topics. Using these videos, Maine is currently piloting a train-the-trainer model to train individuals to become local experts and go out and teach others within their communities. Train-the-trainer events were pilot-tested at five events in 2016, and presented at four events in 2017.

Status: Ongoing.

Link: http://www.maine.gov/dhhs/mecdc/infectious-disease/epi/vector-borne/train-trainer/index.shtml

State Heat Response Planning **Lead Agency:** **DHHS-CDC**

Maine CDC created a heat response plan for inclusion in ME-CDC's all-hazards response plan.

Status: Completed.

Link:
http://www.maine.gov/dhhs/mecdc/public-health-systems/phep/documents/mainecdcallhazheat.doc

Community Heat Response Planning **Lead Agency:** **DHHS-CDC**

ME-CDC supported and facilitated the development of a heat response plan for the Cumberland Public Health District, the first such community-level effort in Maine. This heat response plan is included in the heat portion of Maine's Climate and Health Adaption Plan, and will serve as the template for other local heat response plans.

Status: Ongoing.

Link:
http://www.maine.gov/dhhs/mecdc/environmental-health/heat/documents/cumberlandplan_2015.pdf

Health Messaging During Heat Waves **Lead Agency:** **DHHS-CDC**

Maine CDC developed and continues to refine basic health messaging for health care providers and the public about heat-related illnesses, both for general use and for use during heat events. This messaging focuses on preventing, recognizing, and treating heat-related illnesses.

Status: Ongoing.

Link: http://www.maine.gov/dhhs/mecdc/environmental-health/heat/

Modify Heat Advisory Thresholds for the Northeast Forecast Region. **Lead Agency:** **DHHS-CDC**

Results of a study to estimate the heat-health relationship in the northeast were shared with the National Weather Service regional and local offices to encourage modifications to their heat advisory product. The National Weather Service has modified their heat advisory threshold for the northeast region effective the summer of 2017.

Status: Ongoing.

Link: http://www.nws.noaa.gov/os/notification/pns17-18heat_new_england.htm

D. Preparedness

State Energy Assurance and Emergency Management Plan **Lead Agency:** **GEO**

The GEO identifies potential vulnerabilities in energy infrastructure due to several factors, including damage due to climatic events. The Plan documents all the agencies responsible for responding to energy emergencies, and explains each agency's role in addressing fuel supply disruptions and damage to critical infrastructure.

Status: No update planned at present.

Link: http://www.maine.gov/energy/pdf/Maine_Energy_Assurance_Plan_6_1_11[1].pdf

State Hazard Mitigation Plan **Lead Agency:** **DVEM-MEMA**

Partner Agencies: **DACF, DEP, DHHS, DIFW**

The State of Maine Hazard Mitigation Plan identifies risks and vulnerabilities associated with natural disasters to develop strategies to reduce the long-term effects of natural hazards. The 2013 State Hazard Mitigation Plan profiled the following natural hazards in the risk assessment: flooding, winter storms, severe summer weather, hurricane, landslide, erosion, wildfire, drought, and earthquake. The risk assessment is the basis for the strategy, which provides the State's blueprint for reducing the losses identified in the risk assessment. The 2013 update describes the potential impacts of climate change on the hazards, which will likely increase the extent of natural hazard events. State Hazard Mitigation Plans must be updated every five years. The 2018 update will continue to include the effects of climate change on the profiled hazards and will include extreme heat under the 'severe summer weather' hazard profile.

Status: Ongoing.

Link: https://www.maine.gov/MEMA/mitigation/mema_mit_plans.shtml

Natural Hazards Incident Annexes **Lead Agency:** **DVEM-MEMA**

Partner Agencies: **Numerous state agencies and partners**

By statute, MEMA develops and maintains the State of Maine Emergency Operations Plan (EOP). The purpose of the EOP is to establish the overall framework for integration and coordination of the emergency response activities of all levels of government, volunteer organizations, and the private sector in the state of Maine. It is designed to provide a flexible framework through which the state of Maine may respond to emergencies. Incident annexes contain information needed to address specific emergency incidents that require a specialized application of the EOP. These natural hazards incident annexes include Hurricane and Drought. MEMA updated the Drought Annex over the course of the 2016 drought and formalized it in 2017. MEMA is in the process of updating the Hurricane Annex which is expected to be complete prior to the start of the 2018 hurricane season.

Status: Ongoing.

Link: http://www.maine.gov/mema/planning/index.shtml

River Flow Advisory Commission **Lead Agency:** **DVEM-MEMA**

Partner Agencies: **DACF, DEP, DHHS, DIFW**

The RFAC meets each March following the most extensive cooperative snow survey to facilitate communication of river flow data between dam operators, river basin managers, state agencies, the United States Geological Survey and the National Weather Service during floods and droughts. The RFAC leverages snowpack reports from the Maine Cooperative Snow Survey (see "Snow Survey" for more), ground and surface water reports from USGS, and meteorological outlooks from NWS to assess flood risk across Maine. The RFAC convenes each March at a minimum and continues to meet throughout the spring as necessary until flood risk returns to normal levels.

Status: Ongoing.

Link: http://www.maine.gov/rfac/

Drought Task Force **Lead Agency:** **DVEM-MEMA**

Partner Agencies: **DACF, DEP, DHHS, DIFW**

The Drought Task Force is comprised of the same core members of the RFAC. The Task Force convenes in response to drought conditions to present on surface and groundwater levels, to discuss observed drought impacts, and to determine available resources. While the Task Force is not regularly scheduled to convene, the RFAC co-chairs discuss hydrological conditions each spring which includes drought outlook if necessary. The Task Force met in 2016 for the first time since 2002 and again in 2017.

Status: Ongoing.

Link: http://www.maine.gov/rfac/

Hurricane Evacuation Study **Lead Agency:** **DVEM-MEMA**

Partner Agencies: **DOT, DACF**

Hurricane Evacuation Studies (HES) address hurricane planning and impact assessment for coastal regions. The HES used Maine Geological Survey's Sea, Lake, and Overland surges from Hurricanes (SLOSH) modeling to complete the Hazard Assessment to support the study's Vulnerability Assessment, which mapped populations susceptible to storm surge to guide evacuation planning (see "Coastal Hazards" for more). MEMA coordinated with 138 local jurisdictions in 10 counties over 18 months to create evacuation zones for areas vulnerable to storm surge to determine evacuating populations in the Vulnerability Analysis. In the Transportation Analysis, the Army Corps of Engineers coordinates with DOT to model the capacity of the evacuation network. These two analyses contribute to the key output of an HES, the evacuation clearance times matrix, which estimates the number of hours it takes to move the vulnerable population to safety under different circumstances. MEMA completed the last Hurricane Evacuation Study in 2007 and began work on the updated HES in 2016. The updated HES is expected to be complete by the start of the 2019 hurricane season.

Status: Ongoing.

Link: http://www.nae.usace.army.mil/Missions/Projects-Topics/Maine-Hurricane-Studies/

Critical Facilities Mapping **Lead Agency:** **DVEM-MEMA**

Partner Agencies: **DACF, MEGIS, DOT**

The Critical Infrastructure Program at MEMA maps critical infrastructure on top of hazard risk maps such as flood risk and potential storm surge inundation maps, to assess critical infrastructure sector's vulnerability to various natural hazards. Critical infrastructure, from an emergency management perspective, is defined as "sectors that compose the assets, systems, and networks, whether physical or virtual, so vital to the United States that their incapacitation or destruction would have a debilitating effect on security, national economic security, national public health or safety, or any combination thereof." Critical infrastructure mapping is a continuous process of updating the datasets of critical infrastructure assets as their locations change and overlaying them on risk maps that also change with technological advancements.

Status: Ongoing.

Anticipatory Spill Response Preparedness **Lead Agency:** **DEP**

With the changing climate, the DEP is anticipating and preparing for an increase in the number of emergency response requests related to hazardous material releases, including smaller-scale incidents such as spring blizzard damage to residential aboveground storage tanks, and larger-scale incidents involving material storage and transportation, either related to vessels in transit, or at terminal facilities.

Status: Ongoing.

Disaster Debris Management Planning **Lead Agency:** **DVEM-MEMA**

Partner Agency: **FEMA**

The state Debris Management Plan establishes the necessary framework to prepare for and respond to state and local disaster events which generate disaster debris to support debris removal operations. The Plan defines responsibility of state agencies and discusses the role of county and municipal government in debris management operations. MEMA wrote the Debris Management Plan in 2009 and revised it in 2014. MEMAs Training and Exercise Program hosts several FEMA Debris Management courses each year.

Status: Ongoing.

Link: http://www.maine.gov/mema/planning/debris_mgmt_plan.pdf

Municipal Guidance for Debris Management Siting **Lead Agency:** **DEP**

Partner Agency: **DVEM-MEMA**

DEP additionally created, and coordinated with MEMA on, municipal guidance for siting temporary debris management locations. DEP has presented its guidance to transfer station operators and municipal officials at Maine Resource Recovery Association (MRRA) conferences and at transfer station training sessions.

DEP received siting guidance for York and Sagadahoc Counties tailored for municipalities in those areas, and has recently been contacted about several possible sites in Androscoggin County as well. DEP is reaching out to interested parties to review their efforts.

Status: Ongoing.

Animal Health **Lead Agency:** **DACF**

The DACF Animal Health Program aims to prevent the introduction and spread of contagious diseases among poultry and livestock, to promote public health and food safety as it relates to zoonotic disease, to enhance the quality and health of livestock, and to maintain fair practices in the buying and selling of poultry and livestock. The Program would be involved in any incidents of excessive heat stress in cattle.

Status: Ongoing.

Link: http://www.maine.gov/dacf/ahw/animal_health/index.shtml

E. Raising Awareness

Maine Climate Clearinghouse **Lead Agency:** **DEP**

Partner Agencies: **DACF, DVEM-MEMA, DHHS-CDC, DIFW, DMR, DOT, GEO**

DEP's Sustainability Division houses a clearinghouse of information on climate change pertinent to Maine communities on mitigation and adaptation. The clearinghouse is intended to be a resource for the public to learn about information, services and capacities available through various providers, and to aid and solutions to problems related to climate change. The webpages are designed to provide relevant information, and to provide links to sites where more specific content and organizations can be reached. Version 1 added to the DEP website in 2012, and version 2 was updated in 2017.

Status: Ongoing.

Link: http://www.maine.gov/dep/sustainability/climate/index.html

Maine Adaptation Toolkit **Lead Agency:** **DEP**

Partner Agencies: **DACF, DVEM-MEMA, DHHS-CDC, DIFW, DMR, DOT, GEO**

The Maine Adaptation Toolkit was developed through interagency coordination to provide a centralized source for the information relevant for designing and implementing climate adaptation measures or strategies, as well as information on important regulations and standards that may affect project or planning processes. The toolkit also provides opportunities to connect with state agencies and other engaged practitioners for technical advice and expertise.

Status: The Toolkit will continue to be developed in coordination with other state agencies and with input from user groups, to enhance consideration of climate-related factors that may affect our communities, and to provide integrated best practices for design and the implementation of climate resilience activities. Version 1 added to the DEP website in 2015, and version 2 was updated in 2017.

Status: Ongoing.

Link: http://www.maine.gov/dep/sustainability/climate/adaptation-toolkit/index.html

Climate Work Group **Lead Agency:** **DEP**

DEP's Office of Communications and Education is coordinating an intra-agency workgroup to maintain regular connectivity across the Department on climate-related activities, and to identify programmatic or regulatory adjustments that would allow or encourage resiliency and adaptation efforts.

Status: Ongoing.

F. Grants & Loans

Coastal Community Grant **Lead Agency:** **DACF**
Partner Agencies: **DMR, DEP**

Coastal Community Grants are provided annually on a competitive basis to municipalities and regional planning commissions for a variety of coastal priority issues, including vulnerability assessments, adaptation planning, community education, and strategy development. Examples of past projects are Damariscotta downtown vulnerability analysis, Boothbay Harbor wastewater treatment plant study, Vinalhaven downtown study, Chebeague waterfront facilities study.

Status: Ongoing. Subject to available funding.

Link: http://www.maine.gov/dacf/mcp/grants/index.html

Shore and Harbor Grant **Lead Agency:** **DMR**
Partner Agencies: **DACF, DEP, DOT**

DMR's Shore and Harbor Grant program provides competitive awards to coastal municipalities to conduct waterfront planning; vulnerability assessments are eligible).

Status: Ongoing.

Link: http://www.maine.gov/dacf/mcp/grants/index.html

Wastewater Adaptation Planning **Lead Agency:** **DEP**

Climate Adaptation Plans (CAPs) for wastewater system projects have been supported by the United States congress through the State's Clean Water State Revolving Fund (CWSRF) for Maine communities. Maine DEP has made available up to $20,000 per project in loan principle forgiveness for wastewater utilities to assess their systems and develop Climate Adaptation Plans (CAP) for them. Additionally, through loan principle forgiveness, up to $50,000 per project is available for wastewater utilities to create Fiscal Sustainability Plans (FSP). In 2015 DEP allotted $80,000 in funding for four CAPs projects, and in 2016, DEP allotted $40,000 in funding for two CAPs. Two projects have now closed on their loans and all projects remain ongoing. The Congressional allotment for 2017 has not yet been announced.

Status: Ongoing.

Link: http://www.maine.gov/dep/water/grants/srfparag.html

Drinking Water State Revolving Fund Loans and Capacity Development Grants **Lead Agency:** **DHHS-CDC**

The Drinking Water Program provides low interest capital improvement loans and capacity development grants for public water system projects that, among other objectives, seek to bolster resilience to drought and flooding through infrastructure upgrades.

Status: Ongoing.

Links:
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/pws/srf.shtml
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/capacityDevelopment.shtml

Hazard Mitigation Grant Program **Lead Agency:** **DDVEM-MEMA**

MEMA administers the Hazard Mitigation Grant Program (HMGP) to fund projects identified in local hazard mitigation plans that are sustained actions taken to reduce or eliminate the long-term risk from natural hazards. HMGP funds are post-disaster and are thus only available following a Federally declared disaster. By mitigating the impacts of natural hazard events, HMGP projects increase resilience to natural hazard events that may have been exacerbated by climate change. No HMGP funds are currently available because Maine has not been part of a Federal disaster declaration since February of 2015. HMGP funding would become available should another Federally declared disaster occur in Maine.

Status: Ongoing.

Link: https://www.maine.gov/MEMA/mitigation/mema_mit_grants.shtml

Water Bond: Culvert Improvement Grant **Lead Agency:** **DEP**

The Maine Legislature passed a law (Public Law 2013, Chapter 589) to authorize a general fund bond to ensure clean water and safe communities. The law required that a referendum be passed by Maine voters. On November 4, 2014, voters passed Question 6, identified as the "Clean Water for Maine" bond. Using a Request for Proposal (RFP) process to disburse the funds for two portions of the bond, DEP awarded $5.4 million toward vital public improvement projects including stream crossing or culvert upgrades, and $400,000 to restore state wetlands. 72 towns, water districts, road associations and other entities across Maine completed projects for stream crossing infrastructure improvements. Climate resiliency was included in the RFP criteria consistent with the Stream Smart design criteria, and many projects replaced culverts with structures that offer greater hydraulic, ecological, and long term economic benefits than traditional, hydraulically only designed culverts. In 2016, 8 projects were completed. In 2017, 14 projects were completed. In 2018, 21 projects will be completed, and in 2019, 28 projects will be completed.

Status: Ongoing.

Link: http://www.maine.gov/dep/land/water_bond_rfp.html

V. Future Work Group Activities

In addition to identifying activities already underway, MICA revisited and updated the recommendations from the 2014 *Maine Prepares* report to create a guide for future MICA activities. Appendix A provides a companion list of the 2014 recommendations and the corresponding future activity found in this section.

A. Overall Interagency Coordination

1) To continue to strengthen interdepartmental cooperation, an interagency adaptation work group should continue to meet as outlined in this report and in these future activity areas:

   a. MICA could consider expanding membership to additional state agencies.

   b. MICA is envisioned as an ongoing commitment by the participating agencies, meeting periodically, and group membership should be periodically reviewed. Subgroups or subcommittees focused on specific topics, actions or practices may be established as needed and may include additional agency staff to provide expertise on issues.

Lead Agency	**Partner Agencies**
DEP	DVEM, DACF, DHHS, DIFW, DMR, DOT, GEO

2) Develop a way to share data on existing assistance efforts that individual agencies are providing to the same entity. This should bridge the gap to the municipal level and create more effective and efficient adaptation responses, including opportunities for transferable lessons from one locality to another.

Lead Agency(ies)	**Partner Agencies**
	All MICA Agencies

3) MICA should create basic, informative criteria to evaluate adaptation responses and measures that could be tailored to user needs and available upon request with accompanying assistance.

Lead Agency	**Partner Agencies**
DEP	All MICA Agencies

4) The work group produced an inventory of climate specific and related state activities, and will continue to maintain it. The inventory will include ongoing state projects, programs, and initiatives, including resources with a list of those involved, and links to this content.

Lead Agencies)	**Partner Agencies)**
All MICA Agencies	All MICA Agencies

5) DEP should continue to coordinate the state's climate activities through interagency adaptation group efforts, and continue to maintain the webpages to reflect ongoing work.

a. The state's web-based climate resources including the Climate Clearinghouse and Maine Adaptation Toolkit be maintained and further developed by MICA member agencies.

b. Efforts should be made to conduct outreach and assistance to assist municipalities in planning for resiliency using these online resources.

Lead Agencies	**Partner Agencies)**
DEP	All MICA Agencies

c. The clearinghouse should include a section specifically to provide guidance for municipalities, companies and individuals that helps them select the most appropriate GIS application or another tool for their situation. It should be in the form of a directory, or as a 'climate viewer', and include current GIS information to help local level adaptation efforts be informed about climate-related changes in their area.

Lead Agencies	**Partner Agencies**
DEP, MEGIS	All MICA Agencies

d. As part of the clearinghouse, DEP should create or provide information on a "planning toolkit" for municipal planners and developers to use in project design. The toolkit should enable and enhance consideration of climate-related factors that may affect developments now and in the future. This should include tools to evaluate a range of future climate scenarios such as, but not limited to, temperatures, water quality, water quantity, flood related water levels, changes occurring in the natural environment to organisms and habitats, and allow design characteristics based on regional or local goals. A list of topics to include 'tools' for should be consolidated by MICA members.

Lead Agency	**Partner Agencies**
DEP	All MICA Agencies

e. Resources to support interested entities on climate messaging should be provided as part of the adaptation toolkit.

Lead Agency	**Partner Agencies**
DEP	All MICA Agencies

B. Agency Level Activities

6) Continue all current monitoring, mapping, modeling, mitigation, messaging, along with all other activities related to climate change adaptation as time and resources allow.

Lead Agencies	**Partner Agencies**
All MICA Agencies	All MICA Agencies

C. Monitoring, Mapping, and Modeling

7) State agencies support the state geologists and USGS in identifying any existing gaps in stream and groundwater level monitoring gauge datasets, and add to the gauge network as necessary.

Lead Agency	Partner Agency
DACF	DEP

8) Tools used to model climate-related changes in water resources should be used or developed, specifically so that any impacts on surface, ground, and storm waters can be considered and used to inform any necessary adaptive responses as needed.

Lead Agencies	Partner Agency(ies)
DACF, DEP	

9) Sea-level and other coastal hazards analyses be accessible through web-based mapping tools, and be continually researched and updated to help municipalities, land managers, landowners, conservation planners, government agencies, and others in Maine better understand and integrate this information into their decision making.

Lead Agency(ies)	Partner Agency(ies)
DACF	

10) State agencies support the expansion and continued updating of LiDAR mapping as conditions and resources dictate. An inventory of LiDAR data already in existence based on National Oceanic and Atmospheric Administration and U.S. Army Corps of Engineers should be part of this effort since it is likely that several piecemeal surveys have been completed in the recent past along the Maine coastline and could be incorporated.

Lead Agency	Partner Agencies
MEGIS	All MICA Agencies

11) An interagency GIS group effort should identify any gaps in information to reveal anomalous or changing circumstances regarding climate-related effects on specific resources or infrastructure in Maine.

a. Existing data layers from state, federal, or others sources reflecting those changes be evaluated, or developed new where identified. Related data layers are recommended to be available singularly or as a collective web-based mapping tool, possibly on the Maine Library of Geographic Information (Geolibrary).

Lead Agency	Partner Agencies
MEGIS	All MICA Agencies

b. A summary should be developed of available climate-related data, as well as data that needs to be developed with a time frame and resources needed to establish any identified data gaps.

c. Current layers should be revisited for accuracy, up-to-date data, and consistency of the software being used.

d. Older 'historical' data that is often of high value should be kept available for use in trend analysis.

e. Online mapping programs should have a process for updates, monitoring usage, as well as a process for decommissioning them when they are no longer financially and scientifically updated and supported.

Lead Agencies	**Partner Agencies**
MEGIS, DEP	All MICA Agencies

D. Other Activities

12) DEP, DIFW, DACF and DVEM-MEMA should continue to support the development of local Debris Management Plans, focusing on provisions in existing rules and statutes that may currently impede emergency clean-up activities after damaging storm events, such as the federal requirement for town-by-town siting as opposed to regional siting between or among more than one locality.

a. Modeling efforts for major storm events should also be used to inform planning for, and the identification of, temporary 'holding sites' within which to better manage debris, and to co-establish avenues for reuse and recycling of those materials.

Lead Agencies	**Partner Agencies**
MEMA, DEP	DACF, DIFW, DOT

13) DOT, DVEM-MEMA, DIFW, and DEP should continue to identify critical points of vulnerability along supply and evacuation routes, where increases in runoff or changes in sea level may increase the risk of infrastructure failure. And, initiate efforts to minimize those risks. Characteristics of the environment adjacent to applicable vulnerable routes should also be considered as part of this effort, such as fresh and tidal waters or other protected habitats since they may contribute to the degree of vulnerability.

Lead Agencies	**Partner Agency**
DOT, DVEM-MEMA, DEP	DIFW

14) State-owned water crossing transportation infrastructure vulnerable to climate-related effects should continue to be identified so that adaptation can be part of planned and future rehab and replacement projects.

a. DOT should also identify key infrastructure elements for improvement such as those identified as critical to evacuation and supply routes.

Lead Agencies	Partner Agency
DOT, DDVEM-MEMA	DEP

15) DACF should explore opportunities for incorporating techniques into working forest management plans to help maximize carbon uptake, and to consider current and future habitat quality and health including to co-benefits such as to drinking water, and to maintain migration corridors.

Lead Agency	Partner Agency
DACF	DIFW

16) State agencies should take a watershed-scale flood prevention planning approach versus local site-by-site planning to support more effective regulation and management of stormwater for development, re-development, retrofits, and to better evaluate the adequacy of existing public infrastructure to properly manage stormwater including determining best practices to address those inadequacies.

Lead Agency	Partner Agencies
DEP	All MICA Agencies

17) DACF and DEP should create opportunities for better data collection of agricultural water needs, soil moisture conditions, and reported stresses or damages from inadequate water supplies.

Lead Agency	Partner Agency
DACF	DEP

18) DACF and DEP should increase focus of agricultural water management through promotion of more intensive use of soil health practices, improved irrigation efficiency, and water source development.

Lead Agency	Partner Agency
DACF	DEP

19) DACF and DIFW should conduct more intensive monitoring and management of invasive species that compete more effectively in warmer climates.

Lead Agency	Partner Agency
DACF	DIFW

20) DACF should identify new opportunities for potential shifts in crop selection and production techniques to reflect changes in growing seasons, soil temperatures, and precipitation patterns.

Lead Agency	Partner Agency(ies)
DACF	

21) DIFW should explore opportunities to incorporate climate vulnerable species needs and research into species planning and Wildlife Management Area management and conservation.

Lead Agency	Partner Agency(ies)
DIFW	

22) State agencies should coordinate with partner agencies to investigate potential effects of changing weather on nature-based tourism and recreation.

Lead Agency	Partner Agency(ies)
DIFW	To be determined

E. Funding

23) DEP, DMR and DHHS will continue to develop proposals and obtain funding for Wastewater, Septic, Overboard Discharge and Drinking Water infrastructure resiliency projects.

Lead Agency(ies)	Partner Agencies
	DEP, DMR, DHHS

24) As part of a resolve of LD 1254 "An Act to Implement and Fund Integrated Beach Management Program", DEP and DACF were directed to convene a working group to review and update the 2006, "Protecting Maine's Beaches for the Future". In the 2017 Update, a Beach Nourishment Program including a proposed RFP process was outlined. Pending any further actions, the work group recommends the program outlined in the report be revisited. Additionally, as part of any further efforts on a Beach Nourishment Program, MICA recommends that DECD and DIFW be included.

Lead Agencies	Partner Agencies
DEP, DACF	DIFW, DECD

25) State agencies should continue to allocate funding to facilitate resiliency assessment, planning and design implementation for wastewater and drinking water utilities, and to raise awareness of these opportunities.

Lead Agencies	Partner Agency(ies)
DEP, DHHS-CDC	

26) To the extent practicable, opportunities for public-private partnerships on adaptation projects should be identified, and efforts to cost-effectively and efficiently make use of public resources should be pursued.

Lead Agencies	Partner Agency(ies)
All MICA Agencies	

27) The state should identify ways to coordinate funding sources across agencies to consolidate separately-funded project segments into one larger fund or 'package', or through multiple funding sources, for a single larger project that addresses the totality of a problem, rather than having to approach a situation piecemeal.

Lead Agencies	Partner Agency(ies)
All MICA Agencies	

28) The work group should identify linear processes to integrate best practices that best position the state to apply and receive funding from federal partners to implement resilience practices, such as updating planning documents so they are consistent with federal requirements.

Lead Agency(ies)	Partner Agencies
	All MICA Agencies

F. Standards and Regulatory Considerations

29) DEP should evaluate and update rules delegated to the department to be responsive to climate-related impacts on Maine's lakes and freshwater resources, and work with EPA for approval on any revisions.

Lead Agency	Partner Agency
DEP	EPA

a. DEP should identify areas where climate-related changes impact base flow, and regulations pertaining to determining those levels. Any updated information that is warranted to create more resilient outcomes reflective of these climate-related changes should be integrated into determining base flow in the DEP rule Chapter 587, In-Stream Flows and Lake and Pond Water Levels.

Lead Agency	Partner Agency(ies)
DEP	

b. DEP should periodically revisit the rain event standards used for the design of stormwater control projects and keep the standards current in the DEP rule Chapter 500, Stormwater Management to accurately reflect more frequent high-volume rain events associated with climate change.

Lead Agency	Partner Agency(ies)
DEP	

30) State agencies should seek resolution of conflicts between development standards in flood areas, including in the Shoreland zone and in federal wildlife and wetland protection areas,

from any changes that have occurred since they were previously updated to current and future conditions from a changing climate.

Lead Agency	Partner Agencies
DEP	DACF, DIFW

a. DEP should identify and seek consistencies in application submission requirements that are impacted by sea level rise across departmental work areas.

Lead Agency	Partner Agencies
DEP	DACF, DIFW

31) State agencies should seek resolution of any conflicts between state and federal requirements and standards as they apply to adaptation and mitigation projects requiring state licensing.

Lead Agencies	Partner Agencies
DEP, DVEM-MEMA	DOT, DIFW

a. Existing state and federal regulations should be examined to identify any impediments to beneficial emergency and nonemergency responses to the types of impacts that have been observed or arise under a changing climate. This includes, where possible, efforts to streamline federal review process to increase more timely and adaptive responses can be taken.

Lead Agency	Partner Agencies
DDVEM-MEMA	All MICA Agencies

G. Cross Promotional Activities

32) GEO, DOT and DEP should continue to cross-promote opportunities for lower and zero emission-based transportation, efficiency-based technology adoption, and with a specific focus on freight.

Lead Agencies	Partner Agency(ies)
GEO, DOT, DEP	

33) Efforts should be made to preserve, and expand where possible, offset categories during RGGI program review periods.

Lead Agency	Partner Agency(ies)
DEP	

34) Efforts to support programs that provide more efficient energy consumption, including those that have the co-benefit of reducing particulate in the atmosphere, should be pursued such as ones available through Efficiency Maine.

Lead Agencies	Partner Agency
DEP, GEO	EMT

Appendix A: 2014 Recommendations & 2018 Updates

2014 *Maine Prepares* Recommendation	2018 Update
1) To strengthen the interdepartmental cooperation that the Working Group has initiated, the Working Group should continue. This would supplement discussions between and among agencies; building upon the relationships established in the Working Group, and provide a forum for discussion of shared needs related to climate adaptation activities. Representatives from the current member Departments and Office should participate in the continued Working Group, and develop working relationships with staff from other departments and agencies involved with climate adaptation work, which will facilitate and improve cross agency information sharing and maximize efficiencies to the benefit of state and municipal programs. Additionally, recognizing that the Environmental and Energy Resources Working Group was established with a selected group of Departments and Office, and given that efficient and effective implementation of climate change adaptation practices must include a more broad-based statewide approach to this issue, the Working Group recommends that the membership be expanded to include, at a minimum, the Maine Emergency Management Agency and the Maine Department of Health and Human Services.	Updated to Future Activity 1
2) The Working Group recommends that all current monitoring, mapping, modeling, mitigation, and messaging activities related to climate change adaptation be continued.	Updated to Future Activity 6
3) The Working Group recommends that DEP, DMR and DHHS work together to develop a bond proposal to provide funding for climate mitigation and adaptation projects for Wastewater, Septic, Overboard Discharge and Drinking Water infrastructure. Funding should be targeted for the Small Community Grant Program for the repair and replacement of failed septic systems; the Overboard Discharge Removal Program for residential and commercial systems; for Clean Water Matching Funds; and for Wastewater Infrastructure Grants, to provide a total of 26.9 million dollars in funding to address climate mitigation and adaptation projects in these areas.	LD 1510 introduced to 128th Legislature; Updated to Future Activity 23 and 25

4) The Working Group recommends that DEP and DACF work together with the Department of Economic and Community Development to develop a Beach Nourishment Program, targeting specific areas for nourishment and other forms of beach management. The program should present a systematic and planned approach that provides environmental and economic benefits for coastal communities; enhances public use and enjoyment of public beaches; protects private properties; and protects against beach erosion wherever possible.	Updated to Future Activity 24
5) The Working Group recommends that DEP, DIFW, DACF and MEMA work together to review Debris Management Plans, focusing on provisions in existing rules and statutes that may currently impede emergency clean - up activities after damaging storm events. Recommendations for corrective actions should be presented to the Working Group by winter of 2014/2015.	Updated to Future Activity 12
6) The Working Group recommends that crossings identified as critical to evacuation and supply routes and vulnerable to the effects of climate change be prioritized for proactive upgrading as part of planned and future DOT projects wherever practicable, and that DOT identify critical infrastructure elements worthy of proactive upgrading as stand - alone projects.	Updated to Future Activity 14
7) The Working Group recommends that the GEO, DOT and DEP continue to promote opportunities for alternative fuel vehicles, especially for freight. This effort should focus on private/public partnerships to create infrastructure corridors, propane refueling locations, and/or LNG refueling locations, especially for tractor - trailer vehicles.	Updated to Future Activity 32
8) The Working Group recommends that DEP develop additional offset categories in RGGI.	Updated to Future Activity 33
9) The Working Group recommends that state agencies develop more awareness of opportunities to build LID or resiliency into infrastructure funding. For example, changes should be made to the State Revolving Funds for wastewater and drinking water plants to facilitate these strategies.	Updated to Future Activity 23
10) The Working Group recommends the state create a web - based climate adaptation resource to assist municipalities in planning for resiliency with input and advice from stakeholders and user groups. This resource should be managed by DEP's Sustainability Division.	Updated to Future Activity 5

11) DMR and DACF should form a team to establish common goals and conduct all activities related to The Northeast Regional Ocean Council (NROC) and the Northeast Regional Association of Coastal and Ocean Observing Systems (NERACOOS), to minimize any duplication of effort.	Ongoing
12) By June of 2015, all state facilities located adjacent to a river, stream or brook, or adjacent to the ocean, should have an appropriate stream or tide gauge installed, and tide or water level and/or flow data from the gauge recorded at appropriate intervals. Data collected should be reported to DEP on a quarterly basis for assimilation and analysis.	Updated to Future Activity 7
13) The Working Group recommends that as ongoing monitoring and mapping efforts reveal anomalous or changing circumstances regarding climate - related effects on specific resources or infrastructure elements, the data reflecting those changes should be forwarded to the Maine Office of GIS for evaluation regarding its potential for inclusion in an existing GIS map layer, or creation of a new layer. The Working Group recommends that all GIS data be coordinated through the Maine Office of GIS or the Maine Library of Geographic Information (Geolibrary) for assemblage into statewide datasets.	Updated to Future Activity 11
14) DOT should work with DIFW, DEP and the Maine Emergency Management Agency (MEMA) to identify critical points of vulnerability along supply and evacuation routes, where increases in runoff or changes in sea level may increase the risk of infrastructure failure, and initiate mitigation efforts to minimize those risks.	Updated to Future Activity 13
15) The Working Group recommends that LiDAR mapping coverage be expanded to include the whole state, with the results publicly available. LiDAR mapping data should be updated regularly to accurately reflect local and regional changes.	Updated to Future Activity 10
16) The Working Group recommends that DMR investigate available resources for acquiring and assimilating bathymetric data for inclusion in the state's GIS database for areas near the coast as an aid to understanding potential effects of wave run - up and storm surge in sensitive areas.	Ongoing
17) The Working Group recommends that the multiple issues raised regarding data mapping and geographic information be considered a priority for resolution.	Updated to Future Activity 11

18) The Working Group recommends that a model be developed, as a joint effort of DIFW, DMR, DOT, and DEP, to predict local consequences of changes in sea level to both the natural and built environments, with the understanding that these consequences may be either detrimental or beneficial in nature.	Updated to Future Activity 9
19) The Working Group recommends investigating the possibility of developing a comprehensive water model for the state, to model the response of groundwater and aquifers as well as surface waters and stormwater flows to various changing climatic influences. This effort should be conducted jointly by the members of the Working Group as part of their ongoing mission.	Updated to Future Activity 8
20) The Working Group recommends that DEP and GEO develop a program to provide economic incentives to woodstove users to replace existing low - efficiency woodstoves with new high efficiency units. Funding for this program should come from money generated by Maine's participation in the Regional Greenhouse Gas Initiative.	Updated to Future Activity 34
21) The Working Group recommends that DEP's Watershed Management Division should work with the Federal Environmental Protection Agency to develop standards and establish goals responsive to climate change as related to impacts on Maine's lakes and freshwater resources.	Updated to Future Activity 29
22) The Working Group recommends that existing regulations be examined for impediments to emergency and nonemergency response to the types of damage that are predicted to arise under a more energetic climate, and that any such impediments be corrected as soon as possible.	Updated to Future Activity 31
23) The Working Group recommends that DEP's Sustainability Division should develop a "clearinghouse" for environmental and energy concerns as they relate to climate adaptation. This should be a resource for the public to learn about information, services and capacities available through state environmental agencies. The clearinghouse should provide guidance for municipalities, companies and individuals to help them select the most appropriate GIS application or other tool for their situation. It should be in the form of a sortable/filterable resource guide for homeowners as well as municipal and business planners. GIS information must be kept current, in order to accurately reflect and track changes at the local level.	Updated to Future Activity 5

24) The Working Group recommends that, as part of the clearinghouse, the DEP's Sustainability Division should create a "planning tool kit" for municipal planners and developers to use in project design. The tool kit should enable and enhance consideration of climate - related factors that may affect developments in the future. This should include tools to evaluate a range of scenarios including varying rainfall amounts, water levels and temperature ranges. The tool kit should also help users to understand the significance of differences in the results given by use of alternative parameters in multiple model runs and should be flexible to allow municipalities to design stormwater management projects based on characteristics of individual watersheds rather than a one - size - fits - all approach.	Updated to Future Activity 1 and 5
25) The Working Group recommends that DEP's Sustainability Division should continue to house and coordinate the state's climate change activities and keep the website updated to reflect ongoing work. All departments and agencies should work with infrastructure and municipal stakeholders to have consistent outreach messages. The Sustainability Division should have messaging as part of the toolkit.	Updated to Future Activity 10
26) The Working Group recommends that DEP should develop guidance for resolving the conflicts between the USGS method and the Chapter 387 method for determining base aquatic flows. State agencies should aggressively seek resolution of conflicts between state development standards and FEMA rules; conflicts between state Shoreland Zoning rules and federal wildlife/wetland protection rules; and other conflicts between state and federal requirements and standards, as they apply to climate change adaptation and mitigation projects requiring state licensing.	Updated to Future Activity 29
27) The Working Group recommends that DMR develop messaging and, if necessary, licensing programs to assist fishermen in adapting to changes in species distribution and abundance as a result of climate - induced environmental variations. Information regarding changes to fishing gear and changes to markets should be researched and made available.	Ongoing
28) The Working Group recommends that DIFW develop management practices that incorporate mitigation techniques into working forest management plans to help maximize carbon uptake and to establish and maintain migration corridors.	Updated to Future Activity 15
29) The Working Group recommends that DEP revisit the rain event standards used for the design of stormwater control projects and redefine the standards in Chapter 500 to more accurately reflect the more frequent high - volume rain events associated with climate change.	Updated to Future Activity 29

30) The Working Group recommends that DEP develop application submission requirements to address sea level rise as a consideration in design and review for all projects within 250 feet of a coastal wetland, that are subject to DEP licensing under the Natural Resources Protection Act or the Site Location of Development Act.	Updated to Future Activity 30
31) The Working Group recommends that to the extent practicable, the area around privately funded projects should be examined for opportunities to cost - effectively upgrade public infrastructure to provide climate adaptation measures while minimizing repeat impacts due to multiple mobilizations in the same vicinity.	Updated to Future Activity 26
32) The Working Group recommends that the state should work with funding agencies to develop ways to coordinate funding and consolidate separately - funded project segments into one larger fund for a single larger project that addresses the totality of a problem, rather than having to approach a situation piecemeal.	Updated to Future Activity 27