Maine Coastal Program

STRATEGIC OUTLOOK 2021 – 2025

Assessment and Strategy under Section 309 of the Coastal Zone Management Act

DRAFT RELEASED FOR PUBLIC COMMENT AND FOR REVIEW BY NOAA

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Introduction

The Maine Coastal Program and The National Coastal Zone Management Program

Maine is one of 36 states and territories that participate in the National Coastal Zone Management Program. The program is a voluntary partnership between the federal government and U.S. coastal and Great Lakes states and territories authorized by the Coastal Zone Management Act (CZMA) of 1972 to address national coastal issues. The program is administered by the National Oceanic and Atmospheric Administration's (NOAA) Office for Coastal Management.

Maine's Coastal Program (MCP) was approved by NOAA in 1978. Maine's coastal zone includes:
• 5,408 miles of coastline;
• All municipalities with tidal waters in their jurisdiction; and
• State-owned submerged lands and islands out to three nautical miles.

MCP is a partnership among local, regional, and state agencies for the purpose of managing Maine's coastal resources for the public benefit. Formerly a program of the Maine Department of Agriculture, Conservation and Forestry, the Maine Coastal Program is now a Division of the Maine Department of Marine Resources. MCP distributes Federal funds matched by state and local sources—to enable on-the-ground projects that benefit Maine's coastal communities. Whether remediating coastal pollution, mapping our coastal benthic habitat, promoting smarter municipal planning, or engaging local coastal citizens in stewardship of their resources, the Coastal Program constantly seeks ways to improve the quality of life on Maine's coast.

NOAA's Coastal Zone Enhancement Program To foster innovation and continuous improvement in state coastal programs, NOAA administers the Coastal Zone Enhancement Program also referred to as "Section 309 of the CZMA". The program provides incentives to states to enhance their coastal programs in nine key topic areas of national concern as follows:

- Aquaculture – facilitating farming/cultivation of aquatic organisms such as fish, shellfish and plants.
- Coastal Hazards – eliminating or reducing threats to public health, safety and welfare from storms, climate change, erosion, etc.
- Cumulative and Secondary Impacts of Development – addressing impacts associated with land development and other stressors.
- Energy and Government Facilities Siting – facilitating sound siting of large-scale essential services.
- Marine Debris – eliminating or reducing trash and other refuse in coastal waters or on shorelines.
- Ocean Resources – planning for existing and potential new uses in coastal waters, including consideration of marine resources (species and habitats), cultural/historic resources, water quality, sand and gravel deposits, dredging, etc.
- Public Access – facilitating public access to the shore.
- Special Area Management Plans – planning for resources or geographic areas of concern.
- Wetlands – protecting, restoring or enhancing wetlands.

Strategic Outlook (Section 309 Assessment and Strategy)

Every five years, the Maine Coastal Program develops a Strategic Outlook (also known as the CZMA Section 309 Assessment and Strategy), assessing the status of the topics above, reviewing our past performance, and meeting with partner organizations, stakeholders and other state agencies to develop priorities and strategies for program innovation and improvement. Initiatives outlined in this document provide a general blueprint to guide MCP's work over the next five years (2021-2025). The document is also intended for use by others to assess opportunities for potential partnerships and joint efforts.

How this Document was Prepared

NOAA requires each state participating in the Section 309 Enhancement Program to develop cursory "Phase I "Assessments for each of the topic areas above. For issue areas that are chosen as priorities, a "Phase II" more detailed assessment. Finally, for those areas chosen as high priority, states develop strategies for projects for the next five-year period. Interagency teams led by MCP staff developed this draft Strategic Outlook. Draft 309 plans are reviewed by NOAA's Maine project specialist, reviewed by stakeholders, and an interdisciplinary NOAA team, prior to NOAA approval. States are also required to respond to public comments on the draft document.

Public Outreach in 2020 (THIS SECTION WILL BE COMPLETED IN FALL 2020)

MCP's plans for outreach in 2020 were stifled by the Covid-19 pandemic. To obtain feedback, MCP posted a survey for the 30-day period ending _____, analyzed comments and responded to them. In addition to the web-posting, MCP sent the survey directly to more than _____ people and organizations on MCP's mailing lists. A summary of the survey results and MCP feedback is provided in Appendix __

How Priorities were Established

Section 309 Enhancement Area funds are intended for states to improve their programs in ways specifically prescribed by NOAA, including new or revised state statutes and rules, new or revised municipal plans and ordinances, guidance, agreements, and creation of new funding sources, procedures, policies and agreements. Section 309 priorities cannot address ongoing MCP programming or cover ongoing staffing needs.

Given the effects of flooding, storm surge and sea-level rise, NOAA requires that each participating state award a high priority to Coastal Hazards. Each state develops both cursory and in-depth characterizations, and strategies for Coastal Hazards. Other priorities are developed by MCP (with a variety of input).

MCP's high-priority issue areas in this 2021-2025 assessment are Coastal Hazards, Wetlands and Ocean Resources. Other issue areas are still considering to be high priority for the state as a whole, but not for Section 309 funding.

Notably, MCP's priorities for the 2021-2025 cycle closely tracks the recommendations submitted to the Maine Climate Council (MCC) by the MCC's Coastal and Marine Working Group, its Natural and Working Lands Working Group and its Energy Working Group. The MCP can submit changes

The following table lists the nine issues of national significant identified in the Coastal Zone Management Act and the corresponding priority ratings of the Maine Coastal Program in 2015 and 2020.

CZMA Enhancement Area	2015 Priority Rating for Section 309	2020 Priority Rating for Section 309
Aquaculture	Low	Low
Marine Debris	Low	Low
Wetlands	High	High
Coastal Hazards	High	High
Cumulative Impacts	High	High
Special Areas Management Planning	High	Low
Public Access	Medium	Medium
Ocean Resources	High	High
Energy and Government Facility Siting	Medium	Medium

Some of the priority ratings for the 2015 and 2020 assessment cycles have stayed the same as and some have changed. Aquaculture and Marine Debris were rated "low" in both planning cycles. While these issues are important in Maine, MCP's work on these issues is supported by our base program funding and not Section 309. With respect to 309, Aquaculture *is* addressed under the high priority Ocean Resources section, with a focus on user conflicts.

Changes to Maine's Coastal "Core Laws" 2015-2020

Over the last five years, MCP has fostered improvement to the state's coastal laws, policies and guidance as described in this section.

NOAA's approval of the Maine Coastal Program in 1978 was based, in part, on Maine's ability to balance the development and conservation of coastal resources through state land use and environmental laws (sometimes referred to as the program's "core laws") which provide the "enforceable policies" of Maine's coastal zone management program. In Maine, the core laws are comprised primarily of statutes and rules administered and enforced by the Maine DEP.[1]

The CZMA requires that changes to the core laws of a state coastal zone management program must be approved by NOAA. After each session of the Maine Legislature, the Coastal Program submits changes to core law statutes along with changes to core law rules adopted by DEP and other administrative agencies to NOAA for its review and approval. NOAA-approved changes to the Maine Coastal Program over the last five years are summarized below. The summary does not include minor, technical changes or changes not directly related to the assessment categories listed.

[1] A complete list of Maine's coastal core law can be found at - https://www.maine.gov/dmr/mcp/downloads/Final_Maine_Guide-Federal_Consistency_Review_5thed_update1_8.18.pdf

Coastal Hazards

The following changes to state laws concerning coastal hazards were submitted to and approved by NOAA for inclusion in the Maine Coastal Program:

Coastal Hazards Program Changes	**Submittal to OCM[2] (Y/N) and if (Y), Date of OCM approval**
CMR 06-96, ch. 355(6)(6) (DEP rules ch. 355), as amended effective 10.10.14 – Amends the state sand dune rules to allow relocation of a residential structure located on a back dune to the adjoining frontal dune under specified, limited circumstances	Y – 12.21.15
CMR 06-096, ch. 310, section 5(A)(1-2) (DEP rules ch. 310), as amended effective 11.11.18 – amends state wetlands management rules (see Wetlands section below) to add "shoreline stabilization" to the types of projects for which an alternatives analysis is required, but for which an alternative is not presumed, if proposed in, on, or over wetlands of special significance	Y – 11.22.19

Coastal Hazards – Anticipated Future Program Changes

Several primarily planning-oriented bills have been introduced in recent legislative sessions to improve the state's ability to address sea-level rise and storm surge issues and the resiliency of its coast. The Maine Climate Task Force, which was established in 2019, is expected to make wide-ranging policy recommendations which may include proposed coastal resiliency-related statutory and rules changes. DMR intends to include pertinent provisions, if any, in an upcoming RPC submission(s).

Cumulative and Secondary Impacts of Development

The following changes to state laws concerning cumulative impacts were submitted to and approved by NOAA for inclusion in the Maine Coastal Program:

Cumulative Impacts Program Changes	**Submittal to OCM (Y/N) and if (Y), Date of OCM approval**
PL 2015 c. 83(2, 4, and 5) - Amends state law regarding collection and recycling of mercury-added thermostats	Y – 12.21.15
PL 2015 c. 190(4) - amends provision regarding scenic impact assessment of a proposed grid-scale wind energy development to clarify that it includes consideration of primary and cumulative effects during both day and night and to address how sequential observation-related effects must be	Y- 12.21.15

[2] OCM is NOAA's Office of Coastal Management

considered. See Energy and Government Facilities Siting section below.	
PL 2015 c. 11(1) - Provides a limited exemption from Shoreland Zoning Act setback requirements for certain pedestrian walkways or trails adjacent to a river within the boundaries of a "downtown revitalization project"	Y – 12.21.15
PL 2015 c. 75(1) - Prohibits application of fertilizer within 25 feet of the normal high-water line of a great pond, with allowance for certain applications no closer than 10 feet	Y – 12.21.15
CMR 06-96, ch. 500 (multiple provisions), as amended effective 8.12.15) **-** These amendments to DEP's stormwater management rules involve the following elements: • revision of general standards regarding stormwater treatment levels to allow alternative approaches under circumstances where the standard treatment requirements are impracticable or would be ineffective; • establishment of a voluntary Low Impact Development (LID) credit that reduces the volume of stormwater which a permittee who uses LID techniques must treat; • establishment of scaled treatment requirements for redevelopment projects; updates to the rules' appendices to reflect current best management practices for addressing stormwater; • and minor, technical clarifications and corrections.	Y- 12.21.15
CMR 06-96, ch. 501, as adopted effective January 13, 2015) **-** establishes a program to allow applicants to undertake a compensation project or pay a compensation fee in lieu of meeting certain stormwater control requirements and a related compensation fee schedule and earned mitigation	Y – 12.21.15

credits for projects required to meet the general stormwater and phosphorous control standards.	
CMR 06-96, ch. 1000 (multiple provisions), as amended effective January 26, 2015 – Changes to Chapter 1000 of DEP's rules providing guidelines for municipal shoreland zoning ordinances to address changes to the Shoreland Zoning Act in the prior three years; and clarify the model ordinance and better reflect DEP's interpretations of the rule and related statutory provisions. Notable changes, which include those addressing stakeholder recommendations include: • conforming the model ordinance's provisions regarding commercial fisheries and maritime activities districts to P.L. 2013, ch. 320, including the law's exemption of certain brownfields projects from vegetative clearing-related requirements; • combining two differing rule provisions regarding expansions and changing footprint and height restrictions as applied to a nonconforming expansion in accordance with P.L. 2013, c. 320; • specifying that the rules' vegetative clearing restriction does not apply to removal of non-native invasive plants; • exempting natural rock and ledge outcrops from the calculation of a lot's non-vegetated surface area; and • using the total project "footprint" to determine the applicability of special permit exemptions in accordance with P.L. 2013, c. 320.	Y – 12.21.15
PL 2015 c. 423(1-2) - consolidates and replaces prior provisions in the Maine Endangered Species Act regarding education and research-related and incidental take authorization and adds a new section which allows for development and approval of an incidental take plan that covers a "widespread activity", subject to conditions to safeguard listed species' prospects of recovery	Y – 8.2.16
CMR 06-096, ch. 501, section 3(A), Table 2, as amended effective 5.22.16 - Amends DEP's rules (ch.	Y – 8.2.16

501) regarding stormwater management compensation fees and mitigation credits to clarify mitigation credits applicable to certain activities involving landscaped areas, parking lots, and rooftops	
CMR 01-137, ch. 8.06, changes effective 4.8.17 – establishes protection guidelines and exemptions for certain activities as they related to bat species listed as threatened or endangered under the Maine Endangered Species Act	Y – 12.5.17
CMR 06-096, ch. 502 (DEP rules ch. 502), as amended effective 2.18.18 - Implementing the Storm Water Management Act and Site Location of Development Act, in pertinent part, Chapter 502 details criteria used to identify the direct watersheds of lakes most at risk from new development and urban impaired streams, and lists those waterbodies. These changes update the rule to reflect current water quality conditions and identify the lakes now most at risk from development activities and urban impaired streams	Y – 7.31.18
PL 2019 c. 40(5) - Requires local shoreland zoning ordinances to require submission of a pre-development and a post-development photograph	Y – 11.22.19

Cumulative and Secondary Impacts of Development – Anticipated Future Program Changes

Various core laws, such as those regarding stormwater management and shoreland zoning, serve to address the cumulative effects of development on water quality and other natural resources. Amendments to these laws over the next five years, e.g., to improve their efficacy or address changes in technology, are reasonably foreseeable. DMR intends to include statutory and rule changes to such core laws enacted during the next five years in an upcoming RPC submission(s).

Energy and Government Facilities Siting

The following changes to state laws concerning energy and government facilities siting were submitted to and approved by NOAA for inclusion in the Maine Coastal Program:

Energy and Government Facilities Siting Program Changes	**Submittal to OCM (Y/N) and if (Y), Date of OCM approval**
P.L. 2015 c. 190(1-4) - This law makes changes to how DEP must consider a proposed grid-scale wind energy development's effects on scenic resources of state or national significance under state wind power siting laws. These changes serve to clarify how DEP must consider a proposed project's "cumulative scenic impact or effect" on such scenic resources when it's	Y – 12.21.15

proposed in a location whose viewshed includes other grid-scale wind energy facilities and thus presents potential for "combined observation" of more than one project, "sequential observation" of a proposed project along a national scenic trail designated for pedestrian use, and "successive observation" of more than one group of wind energy facilities, in accordance with those terms as defined in the law. The law clarifies that such a viewshed is limited to the area within eight miles of the proposed development.	
P.L. 2015 c. 265(1-6) – Amends law governing siting of grid-scale wind energy development in the state's unorganized area to clarify that the Land Use Planning Commission (LUPC) may remove as well as add places to the expedited area within which specific procedures and standards apply to review of proposed grid-scale wind energy development projects; and that LUPC may not certify that a proposed grid-scale wind energy development is an allowable use in the district or subdistrict in which it's proposed to be located if the proposed location is included in a pending petition to remove it from the expedited area; and to make technical, clarifying corrections related to new provision for removal of places from the expedited area.	Y – 12.21.15
PL 2015 c. 264(1-3) - Replaces provision on process for DEP's consideration of public comment on an application for a permit for a grid-scale wind energy development; adds requirement that a small-scale wind energy development that requires DEP certification under 35 M.R.S. §3456 must obtain a Natural Resources Protection Act (NRPA) permit; and establishes NRPA permit requirements for a small-scale wind energy development that requires DEP certification	Y – 12.21.15
CMR 06-096, ch. 382 (DEP rules ch. 382) – as adopted effective 4.30.18 - Regulations implementing standards of approval under the Maine's Wind Energy Act (WEA), 35-A M.R.S. §§3451-59. These regulations clarify and provide further guidance on the review process for permit applications for wind energy projects under the WEA and elaborate on the licensing standards for	Y – 7.31.18

wind energy projects, including those regarding impacts to scenic character, tangible benefits, decommissioning, public safety, and shadow flicker	
CMR 06-096, ch. 450 (DEP rules ch. 450) and CMR 01-672, ch. 11 (LUPC rules ch. 11), as adopted effective 11.2.17 **-** Regulations implementing the Maine Waterway Development and Conservation Act (MWDCA), a long-standing core law which applies to new construction, relicensing, and certain renovations to hydroelectric power facilities	Y – 7.31.18
CMR 01-672, ch. 10, sections 10.2(199 and 200); 10.21 (various provisions) (LUPC districts and standards), as amended effective 3.15.18 **-** Amendments to various provisions in the LUPC's land use districts and standards to allow development of grid-scale solar energy generation facilities in the Commercial Industrial Development Subdistrict (D-CI), subject to LUPC permitting by establishing criteria for locations eligible for redistricting to D-CI for the purpose of developing a grid-scale solar energy generation facility, providing for automatic reversion to the prior subdistrict designation if the facility is not developed within a reasonable period of time or if built, when it's decommissioned, and limiting such development in areas with prime agricultural soil.	Y – 7.31.18
PL 2019 c. 124(3) - Clarifies and replaces existing NRPA permitting exemption regarding dam maintenance or repair by specifying its applicability to "non-hydropower" dams only and providing more detailed, objective, natural resources-related criteria on the types of projects to which the exemption applies	Y- 11.22.19
PL 2019 c. 294(2) - Prohibits any person from performing or causing to be performed or the DEP from authorizing any oil or natural gas "exploration", "development" or "production" in, on or under the waters of the State	Y; OCM did not approve this program change

Energy and Government Facilities Siting - Anticipated Future Program Changes

Energy policy remains a significant topic for Maine's lawmakers and regulators, due in part to its close connection to climate change-related issues. Recent changes in state law call for Maine to generate 80% its electric power demand by 2030 and 100% by 2050 and reduce greenhouse gas emissions by 45%

by 2030 and 80% by 2050. It is reasonably foreseeable that the Maine Climate Task Force's recommendations will address state energy policy including that regarding renewable ocean energy. Accordingly, bills which address the statutory framework for renewable ocean energy and related energy policy issues and related changes to agency rules are reasonably foreseeable. DMR intends to include pertinent provisions of any such law or rules changes, if any, in an upcoming RPC submission(s).

Marine Debris

No marine debris-specific changes were made to coastal core laws in the last five years.

Marine Debris - Anticipated Future Program Changes

In recent years the Maine Legislature considered but did not enact bills to facilitate cleanup of lost fishing gear. 2015 Resolves c. 76(1) directed the Departments of Marine Resources, Environmental Protection, Inland Fisheries and Wildlife, and Agriculture, Conservation and Forestry to consider the marine debris and related effects that may result from their actions and how that potential marine debris may be managed and mitigated. In 2019, the State enacted laws which, with exceptions, ban single-use plastic bags and foam food containers, partly due to concerns about plastics which make their way and persist in the marine environment. DMR intends to monitor foreseeable legislative efforts over the next five years to address marine debris issues and propose related program changes if and as appropriate.

Ocean Resources

Changes to state laws concerning ocean resources were submitted to and approved by NOAA for inclusion in the Maine Coastal Program as follows:

Ocean Resources Program Changes	**Submittal to OCM (Y/N) and if (Y), Date of OCM approval**
PL 2015 c. 80(1) - Repeals and replaces the provision which defined the circumstances under which the commissioner of the Department of Marine Resources may adopt or amend emergency rules	Y – 12.21.15
PL 2015 c. 201 (1-2) - Clarifies that the DMR commissioner may require a marine resources wholesale or retail license holder to purchase equipment needed to comply with electronic reporting requirements; and commissioner may refuse to renew or issue a marine resources wholesale or retail license to a person who fails to pay for or returns to DMR in poor condition equipment needed to comply with electronic reporting requirements	Y – 12.21.15
PL 2017 c. 146(1) - Amends provision prohibiting use of offal as bait for lobster or crab fishing	Y – 12.5.17
PL 2017 c. 350(1-2) – Clarifies that the geographic scope of a municipal shellfish management	Y- 7.31.18

ordinance is limited to the "intertidal zone" as defined this law	

Wetlands

The following changes to state laws concerning ocean resources were submitted to and approved by NOAA for inclusion in the Maine Coastal Program:

Wetlands Program Changes	**Submittal to OCM (Y/N) and if (Y), Date of OCM approval**
CMR 06-096, ch. 310, sections 3(G), 3(P), and 5(A)(1-2) (DEP rules ch. 310), as amended effective 11.11.18 - Amends the definitions of "emergent marsh vegetation" and "peatland" to implement NRPA provisions regarding management of wetlands and waterbodies; and adds "shoreline stabilization" to the types of projects for which an alternatives analysis is required, but for which an alternative is not presumed, if proposed in, on, or over wetlands of special significance	Y – 11.22.19

Wetlands - Anticipated Future Program Changes

Although Maine has a longstanding, well-established wetlands management program, changes to build on and improve that program are not uncommon; accordingly, it's reasonably foreseeable that changes to wetlands-related core laws and rules may be enacted and subsequently submitted as proposed program changes during the next five-year 309 planning period. The efficacy of the state in-lieu fee program as applied to mitigation of impacts to subtidal habitat defined as wetlands under the NRPA is an issue currently under discussion which has potential to generate proposed core law changes.

Phase I (High Level, Cursory) Assessments

Wetlands

CZMA Section 309 Enhancement Objective: *Protection, restoration, or enhancement of the existing coastal wetlands base, or creation of new coastal wetlands. §309(a)(1)*

> *Note: For the purposes of the Wetlands Assessment, wetlands are "those areas that are inundated or saturated at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." [33 CFR 328.3(b)]. See also pg. 174 of the CZMA Performance Measurement Guidance[3] for a more in-depth discussion of what should be considered a wetland.*

PHASE I (HIGH-LEVEL) ASSESSMENT:
Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

Resource Characterization:

1. *Using provided reports from NOAA's Land Cover Atlas,[4] please indicate the extent, status, and trends of wetlands in the state's coastal counties. You can provide additional or alternative information or use graphs or other visuals to help illustrate or replace the table entirely if better data are available. Note that the data available for the islands may be for a different time frame than the time periods reflected below. In that case, please specify the time period the data represents. Also note that Puerto Rico currently only has data for one time point so will not be able to report trend data. Instead, Puerto Rico should just report current land use cover for all wetlands and each wetlands type.*

Table 1. Current wetland acres in the Coastal Zone. Wetland acres are from National Wetland Inventory (NWI) and the National Wetlands Inventory 2007 update. The 2007 NWI update covers the majority of the Maine coast and is considered supplemental to the original NWI data, however the 2007 mapping ends within the town of Cutler. Therefore, the original NWI data remain the best available wetlands mapping data for the rest of the Downeast Coast east of Cutler. Impervious surface data are from the Maine Department of Inland Fisheries and Wildlife (IFW) (2014) and represent impervious surface area at varying resolutions (1-5m), compiled primarily from leaf-off imagery from 2001-04 (T1) and leaf-on imagery collected in 2007 (T2) through the National Agriculture Imagery Program (NAIP). The percent change in this table includes creation, restoration, and enhancement totals for gain, and altered or filled totals for loss. It does not include acres preserved, since that is a status change that does not indicate a gain. **Please note: There has not been any updates to C-CAP, NWI or IFW since the last assessment. This table, used in the last assessment, is the most recent data available.**

[3] https://coast.noaa.gov/czm/media/czmapmsguide2018.pdf
[4] https://coast.noaa.gov/digitalcoast/tools/lca.html. Note that the 2016 data will not be available for all states until later Summer 2019. NOAA OCM will be providing summary reports compiling each state's coastal county data. The reports will be available after all of the 2016 data is available.

Coastal Wetlands Status and Trends						
Current state of wetlands in coastal zone in 2014 (acres, according to NWI)	NWI wetlands acres		Impervious surface acres in NWI wetlands		Current wetland acres (2014)	
	Tidal	1,600,911	Tidal	167	Tidal	1,600,744
	Non-tidal	428,926	Non-tidal	1,789	Non-tidal	427,137
	Total	2,029,838	Total	1,956	Total	2,027,882
Percent net change in total wetlands (% gained or lost)*	from 2004-2014		from 2010-2014			
	-.018%		-.007%			
Percent net change in non-tidal) (% gained or lost)*	from 2004-2014		from 2010-2014			
	-.087%		-.036%			
Percent net change in tidal wetlands (% gained or lost)*	from 2004-2014		from 2010-2014			
	-.00046%		-.00019%			

Current state of wetlands in 2016 (acres): _____2,027,882 as of 2014_____

Table 2. Square miles of wetlands land cover that has been transformed to other land cover types, according to C-CAP data (2006-2010 change detection)**. Please note: C-CAP data has not been updated since 2010. This table, used in the last assessment, is the most recent data available.**

How Wetlands Are Changing*	
Land Cover Type	Area of Wetlands Transformed to Another Type of Land Cover between 2006-2010 (Sq. Miles)
Development	.572
Agriculture	.018
Barren Land	.128
Water	.147
Total Area CZM	4,300.738

Table 3. Impacts and Compensation to Coastal Wetlands and Freshwater Wetlands in 2018. Overall program debits (impacts) and credits (compensation) are carefully tracked to ensure the timely and effective compensation of functions and values that have been lost.

	Debits (impact)	Credits (Compensation)	Balance
Coastal Wetland	12.454	3.846	8.608
Freshwater Wetland	203.857	133.962	69.895
Total Wetlands	216.311	137.808	78.503

According to 2018 data provided by Maine Natural Resource Conservation Program, impacts to freshwater wetlands overall totaled approximately 72.1% of total impacted area. Coastal wetland impacts accounts for approximately 1.5% of the total impacts. In 2018, 9 projects were awarded

funded which included freshwater wetland restoration, wetland preservation and salt marsh enhancement. Awards totaled $1,469,350 and contributed to the restoration and enhancement of 28.9 acres of wetland resources.

2. *If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends of coastal wetlands since the last assessment to augment the national data sets.*

Marsh Monitoring and Coastal Resilience Tools:

- Salt marsh surveys: Coast-wide mapping and ground truthing of tidal marshes, to create a comprehensive tidal marsh map for Maine. As part of this effort the Maine Coastal Program began establishing Sentinel Marsh Monitoring Sites at eleven marshes spanning the entire coastline from York to Lubec. At these marshes, Maine Coastal Program and statewide partners installed and have installed 33 rod surface elevation tables (3 at each marsh), taken preliminary measurements of salt marsh elevation starting in 2018, piloted water level monitoring to determine local tide height and marsh flooding duration and depth, and piloted vegetation change monitoring based on established regional protocols. This long-term monitoring information will be used to document whether marshes in Maine are keeping pace with sea level rise and if marshes "migrate" inland in response to rising water levels.

- Tidal Restriction Atlas: Roads, dams, and other structures crossing through estuaries often restrict tidal flow. Sufficiently restrictive conditions can alter and impair the physical, chemical, and biological conditions necessary for these systems to persist and thrive. Knowing the locations and condition of tidal restrictions provides an opportunity to reverse or alleviate these impacts and is a key element in efforts to apply the most effective allocation of restoration resources to affected sites. After several stakeholder meetings to discuss the needs and preferences of our statewide group of project partners, Maine Coastal Program, with the work of a NOAA Coastal Management Fellow, developed a desktop assessment method allowing rapid identification of tidal restrictions along Maine's coast by using readily available data. This information has been developed into an online Tidal Restriction Atlas Viewer that will be a resource for communities, restoration practitioners, land trusts, and others to identify priority crossings for replacement and to assess the potential for wetland restoration. The Viewer shows information for over 1000 current tidal crossings as well as crossings projected to be tidal by 2100 based on sea level rise scenarios.

- Compensation Planning Framework – This document was created by the Maine Natural Areas Program and The Nature Conservancy as an essential part of Maine's In-Lieu Fee Instrument (Maine DEP 2011). The Compensation Planning Framework (CPF) is used to provide guidance in the selection and implementation of aquatic resource restoration, enhancement, preservation, or creation. The CPF addresses 10 elements, including a delineation of service areas. In Maine the service areas are broken out by biophysical region. Additional elements of the framework address threats to aquatic resources, an analysis of historic aquatic resource loss, an analysis of current aquatic resource condition, and a statement of aquatic resource goals and objectives for each biophysical region. Other elements of the framework address strategy and progress reports. The Coastal Zone intersects with at least three of the biophysical regions delineated in

the CPF. Maps and tables in the CPF outline the threats (projected development), aquatic resource loss (permitted impacts), and current condition (extent of wetlands, acres of wetlands in conservation, and water quality).

- Eco-Regional Surveys – The Maine Natural Areas Program annually surveys rare natural communities and ecosystems and rare plant populations on a site-by-site basis, but does not identify trends or summarize conditions across the coast. In 2019, the Maine Natural Areas Program piloted an Ecological Integrity Assessment of several of Maine's tidal marshes to gather information on vegetation communities.

- CoastWise Tidal Road Crossing Design: For several years, MCP and project partners contributed to the successful development and deployment of Stream Smart (non-tidal) road crossing design principles in Maine. While engaged in the project, we began exploring development of a coastally focused analog to Stream Smart. We quickly found that there were no examples of comprehensive and detailed guidance for designing tidal road crossings that integrate ecological, cultural, and public safety considerations, all in the context of climate change. In response, in 2019 we engaged a diverse group of partners to develop the CoastWise Approach. CoastWise will deliver a set of voluntary best practices for climate resilient tidal road crossing design, while supporting the needs of coastal communities and ecological systems. After development of guidance materials in 2020, we will focus on the Outreach Phase.

Management Characterization:

1. *Indicate if there have been any significant changes at the state or territory level (positive or negative) that could impact the future protection, restoration, enhancement, or creation of coastal wetlands since the last assessment.*

Significant Changes in Wetland Management

Management Category	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y
Wetlands programs (e.g., regulatory, mitigation, restoration, acquisition)	Y

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

State Wildlife Action Plan

The Maine Coastal Program (MCP), in collaboration with the Maine Department of Marine Resources (DMR), worked with the Maine Department of Inland Fisheries and Wildlife (MDIFW) to complete the 2015 State Wildlife Action Plan (SWAP) that was accepted by USFWS in 2016. The 2015 plan incorporates a greater awareness and recognition of the potential impacts of climate change and sea level rise on Species of Greatest Conservation Need (SGCN) as well as their associated habitats. Tidal Marshes were associated with 36 SGCN and their species-specific conservation actions. A further 26 conservation actions were developed specific to tidal marsh habitat. In a 2020 re-assessment of these tidal marsh habitat specific conservation actions, nine have been initiated, one has been completed under the leadership of Maine Coastal Program ("Find ways to support culvert replacement in or near intertidal, subtidal, and tidal marsh habitats using best management practices"), and 16 are ongoing.

Coastal Focus Areas

Beginning with Habitat (BwH) Focus Areas are landscape scale areas that contain exceptionally rich concentrations of at-risk species and natural communities and high quality common natural communities, significant wildlife habitats, and their intersection with large blocks of undeveloped habitat. These non-regulatory areas are intended as a planning tool for landowners, conservation entities, and towns. BwH Focus Areas, unlike some other habitat values, are tied to specific environmental settings and are not geographically transferable. Thus, they warrant place-specific conservation attention through a variety of methods ranging from conservation acquisition to focused implementation of best management practices. It is hoped that identification of BwH Focus Areas will help to build regional awareness and concentrate conservation initiatives in those areas of the landscape with the greatest biodiversity significance. Biologists from the Maine Natural Areas Program (MNAP), Maine Department of Inland Fisheries and Wildlife (MDIFW), Maine Department of Marine Resources (DMR), U.S. Fish and Wildlife Service (USFWS), The Nature Conservancy (TNC), Maine Audubon, and Maine Coast Heritage Trust (MCHT) completed review of these designations after the 2015 State Wildlife Action Plan revision in order to ensure that Focus Areas along the coast are adequately incorporating coastal and marine features. Over 75% of Maine's tidal marshes are identified within the updated BwH Focus Areas.

Stream Crossing Upgrade Grant Program: One of the chronic hindrances to habitat restoration in Maine is the relative lack of funding at the state level for restoration projects. Most of these projects require funds to address faulty road crossings, like those that are undersized, perched, or otherwise unsatisfactory. Starting in 2015, Maine voters were offered and approved bond packages of up to $5 million dollars annually for municipal road-stream crossing upgrades. This funding supports a competitive grant program administered by Maine Department of Environmental Protection. The program is designed to match local funding for the upgrade of municipal culverts at stream crossings to improve fish and wildlife habitats and increase community safety. It achieves this by guiding road owners to various guidelines and mapping resources, such as Stream Smart, Maine Stream Habitat Viewer, and Beginning with Habitat, among others. Forty-six projects in the coastal zone have been funded for a total of $3,876,056, leveraging $4,254,840.32.

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

   High __X___
   Medium _____
   Low _____

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

   Nearly 20,000 acres of tidal wetlands are scattered along Maine's coast, comprising 20% of the state's coastline. Spanning the entire coast, tidal marshes support a diverse range of highly valued goods and services to local communities including storm surge reduction, floodwater attenuation, maintenance of fish and wildlife, local fisheries production, pollutant filtering, and carbon sequestration. These important ecosystems are threatened by sea level rise, coastal development, and structures such as undersized culverts that restrict natural tidal flow. Tidal wetlands have tremendous recreational and educational value, from serving as hands-on field laboratories to providing opportunities for boating, kayaking, fishing, and hunting. With 5,408 miles of coastline, Maine recognizes the need to protect and conserve salt marsh ecosystems.

   Maine Coastal Program leads several efforts of tidal marsh conservation and restoration throughout the state including marsh elevation and Sentinel Site monitoring, development of the CoastWise Approach to improve or re-establish tidal flow at restrictions, and creation of the state's first Tidal Restriction Atlas. Our partners in these efforts include the Maine Natural Areas Program, Maine Department of Inland Fisheries and Wildlife, U.S. Fish and Wildlife Service, The Nature Conservancy, Maine Audubon, Maine Coast Heritage Trust, Casco Bay Estuary Trust, and numerous local land trusts and municipalities. These partners also support that monitoring, protecting, and restoring tidal wetlands is a high priority in the state and that the Maine Coastal Program should continue these efforts and build upon them to further. The Maine Coastal Program collaborates with each of these partners on tidal wetland programs they are leading, for example the BwH Focus Area work led by Maine Inland Fisheries and Wildlife and advising project selection for the MNRCP wetland restoration program. Maine Coastal Program and our partners have identified multiple next steps to current projects that will greatly enhance tidal wetland management over the next five years.

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Coastal Hazards

CZMA Section 309 Enhancement Objective: *Prevent or significantly reduce threats to life and property by eliminating development and redevelopment in high-hazard areas, managing development in other hazard areas, and anticipating and managing the effects of potential sea level rise and Great Lakes level change. §309(a)(2)*

> *Note: For purposes of the Hazards Assessment, coastal hazards include the following traditional hazards and those identified in the CZMA: flooding; coastal storms (including associated storm surge); geological hazards (e.g., tsunamis, earthquakes); shoreline erosion (including bluff and dune erosion); sea level rise; Great Lake level change; land subsidence; and saltwater intrusion.*

PHASE I (HIGH-LEVEL) ASSESSMENT:

Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

Resource Characterization:

1. *In the table below, indicate the general level of risk in the coastal zone for each of the coastal hazards. The following resources may help assess the level of risk for each hazard. Your state may also have other state-specific resources and tools to consult. Additional information and links to these resources can be found in the "Resources" section at the end of the Coastal Hazards Phase I Assessment Template:*

    - *The state's multi-hazard mitigation plan.*
    - *Coastal County Snapshots: Flood Exposure*
    - *Coastal Flood Exposure Mapper*
    - *Sea Level Rise Viewer/Great Lakes Lake Level Change Viewer*
    - *National Climate Assessment*

General Level of Hazard Risk in the Coastal Zone

Type of Hazard	General Level of Risk[5] (H, M, L)
Flooding (riverine, stormwater)	M
Coastal storms (including storm surge)	H
Geological hazards (e.g., tsunamis, earthquakes)	L
Shoreline erosion	H
Sea level rise	H
Great Lakes level change	N/A
Land subsidence	L
Saltwater intrusion	M
Other (superstorm assessment)	H

[5] Risk is defined as "the estimated impact that a hazard would have on people, services, facilities and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage." *Understanding Your Risks: Identifying Hazards and Estimating Losses. FEMA 386-2. August 2001*

2. *If available, briefly list and summarize the results of any additional data or reports on the level of risk and vulnerability to coastal hazards within your state since the last assessment. The state's multi-hazard mitigation plan or climate change risk assessment or plan may be a good resource to help respond to this question.*

   Overall risk levels have not changed significantly from the last assessment. Many beaches, dunes, and bluffs in Maine are experiencing more acute erosion and flooding problems than in the last assessment (FFY2017-2021).

   While Superstorm Sandy in 2012 did not have a significant impact to Maine, a slightly different storm track might have resulted in coastal hazards and damage beyond that ever experienced in Maine. MGS analysis of historical storm surges and tides indicated that Maine could experience superstorm conditions with coastal flooding about 2 feet higher than the Blizzard of February 1978, the "100-year storm" on the Maine coast. The extent of flooding (without quantification of wave damage) could result in up to 28,000 acres of inundation of coastal lowlands.

   Maine continues to hold the biennial State of Maine's Beaches Conference (2015, 2017, and 2019 in conjunction with the State of NH) on regional coastal erosion issues. This conference brings together over 200 coastal stakeholders from across the New England region. The Maine Geological Survey (MGS) coincides the release of the State of Maine's Beaches reports in conjunction with the conference. These reports detail observed shoreline changes from volunteer beach profile data collected by the State of Maine Beach Profiling Program (SMBPP), now in its 20th year, and the Maine Beach Mapping Program (MBMAP). MBMAP collects shore-parallel shoreline change data using RTK-GPS on an annual basis.

   Beaches reports since the last assessment include:
   State of Maine's Beaches in 2015 (Slovinsky et al., 2015);
   State of Maine's Beaches in 2017 (Slovinsky et al., 2017);
   State of Maine's Beaches in 2019 (Slovinsky et al., 2019); and
   2019 Beaches Conference: Maine Beach Profiling Program Posters (Corney et al., 2019).

   Annually, MGS continues to support the State of Maine Beach Profiling Program in conjunction with Maine Sea Grant. This program monitors vertical changes at set beach profile transect locations at 14 southern Maine beaches in 10 different communities. In 2019 and 2020, MGS has been working with Maine Sea Grant to transfer the administration and collection of beach profile monitoring data from Maine Sea Grant to MGS via the MGS Collect website.

   MGS continues to map shoreline erosion along sandy beaches in southern and mid-coast Maine as part of the Maine Beach Mapping Program (MBMAP). This program maps key shoreline change features annually at 33 beaches in 15 different coastal communities including dune change, beach change, and dry beach width change. Data is made available to the public and local and regional decision-makers via the MBMAP website which was released in 2016.

   In the last assessment, MGS began investigating sea level trends, storm tide, storm surge, and "nuisance" tidal flooding at Portland, Bar Harbor, and Eastport NOAA tide gauge datasets. These investigations have continued and become more focused through this assessment period. MGS constructed several different databases which automatically query NOAA tide gauge data (as it becomes available) and allows for quick analysis of storm surge, water level, and sea level rise

statistics. Initial analyses indicate that 2019 had several of the highest monthly sea level averages since the three gauges were installed. Information will be provided in Phase II assessment.

In 2015, MGS and the Maine Natural Areas Program (MNAP) created and released a viewer detailing potential marsh migration areas for the coast of Maine. This dataset built on previously created sea level rise data (scenarios of 1, 2, 3.3 and 6 feet by the year 2100) created by MGS.
Since the last assessment, MGS created a new viewer detailing newer potential sea level rise scenarios (ranging from low to extreme) for the coast of Maine following work by Sweet et al. (2017) and from the U.S. Army Corps of Engineers Sea Level Change Curve Calculator. This information has been made available to the public and decision-makers via the Sea Level Rise/Storm Surge viewer.

In the last assessment, MGS completed statewide Potential Hurricane Inundation Maps (PHIMs) for Category 1 and 2 events making landfall at mean high tide and mean tide. Since then, working with the U.S. Army Corps of Engineers and FEMA, MGS updated its Sea Lake and Overland Surges from Hurricanes (SLOSH) viewer to incorporate new mapping results for Category 1-4 events hitting at mean high tide to support hurricane evacuation planning.

In support of Maine's Shoreland Zoning regulations, MGS created a viewer depicting the extent of the highest astronomical tide (HAT) along the Maine coastline. Maine's Land Use Planning Commission (LUPC) has already adopted use of the HAT, though Maine DEP currently still references the highest annual tide for each year. DEP is investigating switching to HAT as part of rulemaking in 2020. Switching to the highest astronomical tide for a tidal datum epoch provides a slightly higher yet stable (for 20-25 years) planning number which can be used for an extended period instead of a single year. This helps create consistency in local regulatory processes.

Also, in support of Shoreland Zoning, MGS added the Coastal Bluff Map viewer to allow analysis and overlays with shaded relief Lidar data, parcel boundaries, surficial geology, well depths, and base orthophotographs. This system is designed for map updates and easy download by municipalities for SZ mapping. The map database preserves earlier versions, adds legacy annotation about changes that were made, and allows for timely updates to Digital Maine with new 1:24,000 scale digital maps in PDF format.

The MCP team have completed several different NOAA Projects of Special Merit (POSM) during the assessment period. These included an analysis of the vulnerability of several of Maine's Coastal State Parks (Slovinsky et al., 2016) to sea level rise, coastal flooding, and coastal erosion, including the built and natural environments and resources. Adaptation strategies were developed and presented to the DACF Bureau of Parks and Lands for consideration.

In conjunction with the University of Maine and Cumberland County Soil and Water Conservation District (CCSWCD), the Maine Coastal Program Team completed a project focusing on bluff vulnerability and management at several demonstration locations in Casco Bay. Outcomes from this effort included the creation of an MGS living shoreline decision support tool, several different CCSWCD bluff assessment analysis and decision-tree support tools, several analysis case studies, a Coastal Planting Guide for bluff stabilization, and several stakeholder workshops. Many of these products are available from the CCSWCD coastal bluffs page and the MGS living shorelines page. A final report, Building Resiliency Along Maine's Bluff Coast, describes the full scope and accomplishments by the Team (Dickson, 2017).

Another POSM effort, titled Assessing Sediment Budgets in Support of Beach Nourishment and Coastal Community Resiliency, includes partners from MCP, MGS, and a UAS contractor. The Team has been mapping nearshore beach bathymetry using a UAS, the MGS Nearshore Survey System (NSS), and Maine Coastal Mapping Initiative's (MCMI) multibeam research vessel to better understand sediment movement adjacent to ongoing beach nourishment projects (Slovinsky et al., 2019). Study areas include beaches adjacent to locations of beach nourishment in Wells, Saco, and Scarborough. At these sites, the U.S. Army Corps of Engineers regularly dredges river channels and beneficially places material as either beach nourishment or nearshore disposal. Monitoring will determine optimal nearshore and berm placement and analyze the depth of closure or seaward most extent of the subtidal beach.

MCP and MGS also partnered with NH, MA, RI, and CT on a regional (New England-wide) NOAA Regional Resiliency Grant in order to understand the regulatory challenges associated with implementing green infrastructure (living shoreline) approaches. As part of this effort, each state researched existing local, state, and federal regulatory mechanisms for furthering living shoreline applications. This effort determined that there were not enough demonstration living shoreline projects in New England to understand their efficacy. This grant was completed in conjunction with NERACOOS and The Nature Conservancy.

A subsequent regional grant was sought and received in order to build on the findings of the previous effort. This ongoing effort works to install demonstration living shoreline treatments in conjunction with municipal partners in Casco Bay, ME. Maine is also working with the other New England states – in addition to TNC – to develop a regionalized monitoring approach which can be implemented at all demonstration treatments. Three sites in Casco Bay, Maine have received permits for living shoreline installations in spring 2020 and are described on the MGS Living Shorelines web site. The Maine Team is also working with Maine regulators at the state and federal levels in order to potentially implement regulatory changes to further living shoreline approaches. This project is ongoing.

Since the last assessment, the Maine Team continues to work with coastal communities on various aspects of coastal resiliency efforts. MCP and the Municipal Planning Assistance Program (MPAP) continues to fund municipal resiliency efforts through the issuance of Coastal Community Grants. MGS continues to provide technical assistance to partner municipalities as part of CCG efforts. Since 2015, MGS helped support efforts which furthered wastewater treatment plant resiliency to sea level rise (Wiscasset and Boothbay Harbor), working waterfront resiliency (Boothbay Harbor, Stonington, Islesboro and Vinalhaven), resiliency of drinking water supplies to sea level rise (Monhegan Island), inclusion of sea level rise in comprehensive plans (York, Bowdoinham, Saco and Scarborough), and climate resiliency/action plan efforts (Belfast, Camden, Georgetown, South Portland, and Portland). Case studies related to coastal hazards and planning guidance for climate change are available on the MPAP web site.

MGS also continues to participate in other completed and ongoing efforts to increase understanding of coastal hazards and resiliency in Maine. This includes participation on the steering committee for the Gulf of Maine Research Institute (GMRI) C-RISE sea level rise education efforts, which to-date has reached over 1000 adults and over 4000 students. MGS also serves on a steering committee for the University of Southern Maine/Environmental Finance Center-led effort to understand vulnerability and develop adaptation strategies for wastewater facilities in the Saco Bay area. MGS also participates with the Maine Math and Science Alliance WeatherBlur project, a NSF-funded

cyberlearning investigation on place-based student and community learning focused on a STEM curriculum and interaction with scientists.

MGS also participates on the Maine Silver Jackets Team along with federal agencies and the Floodplain Management Program. In 2017-2019, the Team successfully implemented a "high water marks" initiative with the communities of York and Portland to raise community awareness regarding historic and potential future coastal flooding. After the February 1978 historic storm event (which caused over $20M in damages in Maine), USGS established high water "marks" along the Maine coastline. For the most part, these marks have been lost over the years. Working with partner communities, marks were re-established and converted into the NAVD88 datum, and elevations translated to publicly owned and accessible locations. The Team worked with the communities to develop signage associated with the new marks that also documented potential low to extreme (by 2050) sea level rise scenarios on top of the historic storm of 1978. Since completion of this effort in 2019, the SJ Team decided to expand the high-water marks initiative to include several additional communities including South Portland, Scarborough, and Belfast. Work with these communities is ongoing.

Since the last assessment, the Maine Emergency Management Agency added information on tsunamis and meteotsunamis to its preparedness library. In March 2016, with technical assistance from MGS and the National Weather Service, MEMA held the LANTEX Tsunami Table Top Exercise focused on Maine. This effort led to inclusion of a Tsunami Incident Annex to the State Emergency Operations Base Plan. The State Hazard Mitigation Plan was updated in 2019 for tsunami risk and response.

Salt water intrusion from sea level rise of a meter (3.3 feet) was investigated in the POSM Parks project described above. This study at Popham Beach State Park addressed vulnerability of a sand aquifer in coastal dunes to sea level rise. The analysis included susceptibility of the leach field to a rising freshwater table as sea level rises. Numerical modeling of salt water intrusion from rising seas was the first of its kind in Maine (Gordon and Dickson, 2016).

Management Characterization:

1. *In the tables below, indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred that could impact the CMP's ability to prevent or significantly reduce coastal hazards risk since the last assessment.*

Significant Changes in Hazards Statutes, Regulations, Policies, or Case Law

Topic Addressed	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Elimination of development/redevelopment in high-hazard areas[6]	Y	Y	N
Management of development/redevelopment in other hazard areas	Y	Y	N
climate change impacts, including sea level rise or Great Lakes level change	Y	Y	Y

Significant Changes in Hazards Planning Programs or Initiatives

Topic Addressed	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Hazard mitigation	Y	Y	Y
Climate change impacts, including sea level rise or Great Lakes level change	Y	Y	Y

Significant Changes in Hazards Mapping or Modeling Programs or Initiatives

Topic Addressed	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Sea level rise or Great Lakes level change	Y	Y	Y
Other hazards	Y	Y	Y

2. *Briefly state how "high-hazard areas" are defined in your coastal zone*.

Maine does not have a specific state-wide definition of "high hazard area". For beach and dune systems, Maine regulates activities through the Coastal Sand Dune Rules (Chapter 355 of the NRPA), which use a geologic definition of frontal dune and back dunes. Higher hazard areas are considered to be velocity zone (V-zone) areas and areas of the frontal dune. New construction and reconstruction are limited in these areas. High hazard areas also include areas of back dunes that are defined as Erosion Hazard Areas, or EHAs (all frontal dunes are EHAs). EHAs are defined as:

> *Any portion of the coastal sand dune system that can reasonably be expected to become part of a coastal wetland in the next 100 years due to cumulative and collective changes in the shoreline from:*

[6] Use state's definition of high-hazard areas.

(1) Historical long-term erosion;
(2) Short-term erosion resulting from a 100-year storm; or
(3) Flooding in a 100-year storm after a two-foot rise in sea level,

or any portion of the coastal sand dune system that is mapped as an AO flood zone by the effective FEMA Flood Insurance Rate Map, which is presumed to be located in an Erosion Hazard Area unless the applicant demonstrates based upon site-specific information, as determined by the department, that a coastal wetland will not result from either (1), (2), or (3) occurring on an applicant's lot given the expectation that an AO-Zone, particularly if located immediately behind a frontal dune, is likely to become a V-Zone after 2 feet of sea level rise in 100 years.

Additionally, Maine has classified its bluff shorelines as Stable, Unstable, or Highly Unstable. Per Maine's Mandatory Shoreland Zoning Act (Ch. 1000), areas of the coastline defined as Unstable or Highly Unstable require that development be set back 75 feet from the top of a bluff, instead of 75 feet from the highest annual tide line (which is the standard for stable bluff areas). Some communities (e.g., Brunswick) have increased this required setback to 125 feet.

3. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:
    a. Describe the significance of the changes;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

Significant Changes in Hazards Statutes, Regulations, Policies, or Case Law

As described in the previous 2015 assessment, the Maine Legislature passed *An Act Regarding Reconstruction of Residential Structures on Sand Dunes* (P.L. 2013, Ch. 277) authorizing DEP to enact a rule that allows a reconstructed building, whose entire footprint is in the back dune of the coastal sand dune system, to be moved seaward into the frontal dune if certain specific standards are met (Ch. 355 Section 6(B)(6)). Based on MGS's analysis, this rule revision only affects a small number of properties. This 2013 law also repeals a prior version of a comparable rulemaking directive (P.L. 2011, Ch. 538, Section 15) and directs DEP to repeal the rule enacted under that prior provision. This change was not driven by 309 or CZM but rather by Maine DEP to provide consistency with Ch. 355, Section 6(B)(5). The likely outcome is that one or two back dune residential structures will be reconstructed in a frontal dune.

Significant Changes in Hazards Planning Programs or Initiatives

Hazard Mitigation: As described previously, MCP (along with various partners) completed two NOAA Projects of Special Merit (POSM) during this assessment period. This included work to understand vulnerability of several coastal state parks to coastal hazards and sea level rise and develop transferable adaptation strategies for other local, regional and state parks. Another effort focused on developing resiliency of Maine's bluff coastline, working with a Soil and Water Conservation District along with several partner communities to develop transferable adaptation strategies and products for bluff

management. Maine's current Beaches POSM is assessing sediment movement in the vicinity of larger federal dredge/beach nourishment efforts in three communities in order to help inform the development of beach/sediment management plans.

Maine also completed a Regional Resiliency Grant (RRG) in conjunction with TNC and four other New England states in order to understand the regulatory challenges and opportunities associated with implementing green infrastructure approaches in New England. This led to the current RRG, which seeks to permit, construct and monitor living shoreline demonstration treatments in order to minimize coastal hazards, better understand living shoreline efficacy in the challenging New England climate, and develop required monitoring information for regulatory reform.

Climate Change Impacts:

In September 2019, Maine began work of the Maine Climate Council through the Governor's Office of Policy Innovation and the Future (OPIF) under *An Act to Promote Clean Energy Jobs and To Establish the Maine Climate Council (*LD 1679). The Council is made up of stakeholders from a variety of backgrounds and its work is being informed by a Science and Technical Subcommittee, along with 6 different working groups (Energy, Transportation, Buildings and Infrastructure, Coastal and Marine, Natural and Working Lands, and Community Resilience, Public Health and Emergency Management). The working groups (and council) are tasked with creating a 4-year State Climate Action Plan, due in December 2020. Goals of the Plan are to reach bold emissions reductions (45% reduction below 1990 levels by 2030 and 80% by 205), develop mitigation and resilience strategies, and transition to a low carbon economy (through jobs and protecting rural, low-income, and elderly populations). Various members on different working groups are either MCP staff or are funded through CZM. Likely outcomes include recommendations on how to achieve Maine's climate goals, suggested governmental organizational changes at state, regional and local levels in order to help support climate resiliency at the local level, policy and regulatory changes (such as a state-wide sea level rise policy), and funding needs/sources.

In addition, the projects of special merit and RRG described under hazard mitigation are relevant under climate change impacts, as well. The two projects of special merit focused on vulnerability, coastal hazards and sea level rise and the RRG, which focuses on living shorelines, are all in effort to understand and mitigate the effects of climate change.

Significant Changes in Hazards Mapping or Modeling Programs or Initiatives

Highest Annual Tide (2015): MGS completed coast-wide mapping of the predicted 2015 highest annual tide to inform Shoreland Zoning. This data was superseded by the mapping of the highest astronomical tide, below. This was a NOAA 309 effort.

Highest Astronomical Tide (HAT): MGS completed coast-wide mapping of the predicted HAT using tide prediction station data along with NOAA's VDATUM software. This data helps inform Shoreland Zoning boundaries and setbacks and was completed under a NOAA 309 effort.

Sea Level Rise Mapping: MGS completed coast-wide mapping of the HAT plus scenarios of 1.1, 1.6, 3.9, 6.1, 8.8 and 10.9 feet of sea level rise or storm surge (regionalized numbers from Sweet et al. (2017) and the US Army Corps of Engineers Curve Calculator). This was a NOAA 309 effort.

Hurricane Inundation: Working with USACE and FEMA, MGS also completed coast-wide mapping of inundation associated with Category 1-4 landfalling hurricanes in order to inform emergency response

efforts. This was a NOAA 309 effort and superseded previously completed Potential Hurricane Inundation Maps (PHIMs), completed as part of the last assessment.

Maine Beach Mapping Program: MGS continued mapping of shoreline features (vegetation line and mean high water contour) using RTK-GPS at southern and mid-coast Maine's larger beach systems. The MBMAP viewer allows for analysis of shoreline change of dunes, beaches, and dry beach width. The data supports local, regional, and state decision-making on shoreline erosion and beach nourishment. This was funded through Section 309.

<u>Coastal Community grants</u>

2016

- Chebeague Island/Greater Portland Council of Governments- Coastal Hazards and Adaptation Study
- Islesboro - Resilience Planning for the Future with the Threat of Flooding from Storm Surge & SLR
- Lincoln County Regional Planning Commission - Boothbay Harbor Waste Water Treatment Plant Coastal Hazard Resilience Project (Boothbay Harbor, Boothbay & Southport)
- Wiscasset - Waste Water Treatment Plant Coastal Hazard Resilience Project
- Hancock County Planning Commission - Orland Waterfront Revitalization Plan

2017

- Lincoln County Regional Planning Commission - Downtown Boothbay Harbor Adaptation Options for Increased Storm Surge Resiliency
- Lincoln County Regional Planning Commission - Coastal Hazards Resiliency Tools Phase III- SLR overlay zone in Floodplain Management Ordinances
- Vinalhaven - Coastal Flooding Vulnerability Study of Downstreet Business District

2018

- Harpswell - Coastal Flooding: Plan for Basin Point Road and its Wetlands
- Machias Waterfront Resilience and Renewal

2019

- Bowdoinham - Re-Development of Public Works Waterfront Property
- South Portland - Vulnerability Assessment Mapping
- Stonington - Flood Vulnerability Assessment and Adaptation Plan for Municipally Owned Infrastructure
- Washington County Council of Governments - Washington County Resilience (Eastport, Jonesport, Lubec, Machias, Machiasport, Milbridge)

2020

- Bustins Island Village Corporation/Cumberland County Soil & Water Conservation District: Green Infrastructure- 2020
- Camden - Harbor Park Seawall and Montgomery Dam Redesign
- Monhegan Plantation: Monhegan Island Alternative Domestic Water Supply Feasibility Study – 2020
- Southern Maine Planning and Development Commission: Tides, Taxes and New Tactics-2020

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High ___X__
Medium _____
Low _____

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

Coastal hazards continue to be a high priority for the Maine Coastal Program. A series of coastal storms in March 2018 (three storms during the month) and January 2019 (2nd highest observed water level since 1912 in Portland) resulted in extensive coastal flooding and beach, dune, and bluff erosion in Maine's coastal municipalities. In addition, monitoring of sea levels around the state indicate that sea levels continue to rise at or slightly above global averages.

Maine continues to increase hazard resiliency of its coastal communities by engaging at the local and regional levels of governance. To date, over 60 coastal communities have been engaged with MCP or its partners in hazard adaptation planning and implementation. Participation has been through interlocal agreements, county-wide regional planning efforts, county emergency management efforts and municipal planning grants and efforts. With the work being forwarded by the Maine Climate Council, MCP expects that coastal hazard, floodplain, and sea level rise adaptation and resiliency efforts will continue to have a high priority.

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Public Access

CZMA Section 309 Enhancement Objective: *Attain increased opportunities for public access, taking into account current and future public access needs, to coastal areas of recreational, historical, aesthetic, ecological, or cultural value. §309(a)(3)*

PHASE I (HIGH-LEVEL) ASSESSMENT:

Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

Resource Characterization:

1. *Use the table below to provide data on public access availability within the coastal zone.* ***Please note: This table may be updated with more recent data before the final draft is submitted***

Public Access Status and Trends

Type of Access	Current number[7]	Changes or Trends Since Last Assessment[8] (unknown)	Cite data source
Beach access sites	178	Has not been updated since the last assessment	MCPAG database
Shoreline (other than beach) access sites	539	Has not been updated since the last assessment	MCPAG database
Recreational boat (power or nonmotorized) access sites	292	⍰	**Department of Agriculture, Conservation and Forestry** https://www.maine.gov/dacf/parks/water_activities/boating/public_boat_launches/boat_sites.shtml
Number of designated scenic vistas or overlook points	206.5 miles of scenic byway in the coastal region		Department of Transportation

[7] Be as specific as possible. For example, if you have data on many access sites but know it is not an exhaustive list, note "more than" before the number. If information is unknown, note that and use the narrative section below to provide a brief qualitative description based on the best information available.

[8] If you know specific numbers, please provide. However, if specific numbers are unknown but you know that the general trend was increasing or decreasing or relatively stable or unchanged since the last assessment, note that with a ↑ (increased), ↓ (decreased), – (unchanged). If the trend is completely unknown, simply put "unkwn."

Type of Access	Current number[7]	Changes or Trends Since Last Assessment[8] (unknown)	Cite data source
Number of fishing access points (i.e. piers, jetties)	645	Has not been updated since last assessment	MCPAG Database
Coastal trails/ boardwalks *(Please indicate number of trails/boardwalks and mileage)*	No. of Trails/boardwalks 218	Has not been updated since last assessment	**MCPAG**
Number of acres parkland/open space	1,324 miles conserved lands with permanent protection 29,843 acres of conserved land with permanent protection within 250 ft of coastline **Please note: this data refers to coastline and does not represent the entire coastal zone**		Data is from an assessment completed by Maine Natural Areas Program and is based on LiDAR based HAT data from Maine Geological Survey.
Access sites that are Americans with Disabilities Act (ADA) compliant[9]	**21** 16 of these sites have limited (some features are accessible, some are not). 5 sites have good access (most features are accessible)	Unknown- This figure is not an indicator that was tracked in the past.	Maine Bureau of Parks and Rec https://www.maine.gov/dacf/parks/visitor_accessibility/access_guide.pdf
Other (please specify)			

[9] For more information on ADA see *www.ada.gov*.

2. *Briefly characterize the demand for coastal public access and the process for periodically assessing demand. Include a statement on the projected population increase for your coastal counties. There are several additional sources of statewide information that may help inform this response, such as the Statewide Comprehensive Outdoor Recreation Plan,[10] the National Survey on Fishing, Hunting, and Wildlife Associated Recreation,[11] and your state's tourism office.*

The Maine Coastal Program does not have an established process for accessing the demand for public access. Thus far, this has not been a high priority given limited resources and staff time. It can be inferred, that some locations, access is inadequate to meet demand- usually in the form of limited parking. However, other data can be used as indicators of the demand for public access to the coast.

Coastal populations:
The overall population of the State of Maine is projected to increase by .8% from 2016 to the year 2026. While some coastal counties are expected to see loss in population, seven of the twelve coastal counties are expected to increase (Androscoggin, Cumberland, Hancock, Penobscot, Sagadahoc, Waldo, York). (data from Maine State Economist of the Department of Administrative and Financial Services)

Tourism:
Tourism is one of Maine's largest industries and most of this tourism occurs along the coast. According to the Maine Office of Tourism, Maine saw 20.52 million overnight visitors and 24.79 million day visitors in 2018. The Maine Office of Tourism divides the state up in eight tourism regions with four being along the coast. The highest proportion of overnight visitors reported that the Maine Beaches region was the primary destination at 24%, followed by 18% in Downeast & Acadia. Three of four coastal regions either saw the same percentage of visitors as or saw an increase in visitors from 2017. According to the 2018 data, Maine beaches region also saw the highest day visitors at 35%. Other coastal region percentages are: Downeast & Acadia-14%, Greater Portland- 10%, Midcoast- 9%. While tourism growth fluctuates with national economic conditions, overall visitation has increased steadily in the past 5 years and it is expected to remain strong.
https://motpartners.com/wp-content/uploads/2019/06/2018-Annual-Report.pdf

Kayaking:
Maine's long coastline and 4,600 islands are a huge attraction for resident and non- resident kayak and canoe paddlers. In 2019, Maine Island Trail Association had 234 island and mainland sites with 6,500 members. Since reporting in 2015, this is a 2,500 increase in memberships and 22 increase in acquired sites.
https://mita.org/

Fishing:
According to data provided by the Department of Marine Resources, 2,497 licenses were sold in the state of Maine while 2,466 were sold in in 2019. These numbers include the Recreational Saltwater

[10] Most states routinely develop "Statewide Comprehensive Outdoor Recreation Plans", or SCROPs, that include an assessment of demand for public recreational opportunities. Although not focused on coastal public access, SCORPs could be useful to get some sense of public outdoor recreation preferences and demand. Download state SCROPs at*www.recpro.org/scorp-library*.
[11] The National Survey on Fishing, Hunting, and Wildlife Associated Recreation produces state-specific reports on fishing, hunting, and wildlife associated recreational use for each state. While not focused on coastal areas, the reports do include information on saltwater and Great Lakes fishing, and some coastal wildlife viewing that may be informative and compares 2016 data to 2011, 2006 and 2001 information to understand how usage has changed. See www.wsfrprograms.fws.gov/subpages/nationalsurvey/national_survey.htm

Registry and non-commercial lobster/crab licenses. While fishing growth fluctuates from year to year with national economic conditions, fishing and the need for public access is expected to remain strong.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if there have been any significant state- or territory-level management changes (positive or negative) that could impact the future provision of public access to coastal areas of recreational, historical, aesthetic, ecological, or cultural value.*

Significant Changes in Public Access Management

Management Category	**Employed by State or Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y		Y
Operation/maintenance of existing facilities			
Acquisition/enhancement programs			

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

Notable Law Court Decisions re: public access to the coast, 2015-19

In 2019, Maine's state supreme court issued a decision in its line of cases interpreting the public trust doctrine which has implications for public access to and utilization of marine resources. In *Ross v. Acadian Seaplants, Ltd, 2019 ME 45 (March 28, 2019)*, ("Ross"), a majority of the Law Court upheld a lower court's ruling that "rockweed [a commercially-valuable type of marine algae] growing in the intertidal zone is the private property of the upland property owners" and not "property that is held in trust by the State through the *jus publicum* for the public to harvest." The majority explained its ruling as follows:

> "…we conclude that, pursuant to both of the differing legal constructs our opinions have articulated to define the scope of the public's intertidal property rights, rockweed attached to and growing in the intertidal zone is the private property of the adjacent upland landowner. Harvesting rockweed from the intertidal land is therefore not within the collection of rights held in trust by the State, and members of the public are not entitled to engage in that activity as a matter of right. And because neither view of the

> public's right to use the intertidal zone accommodates the activity at issue here, we determine—contrary to the position of the concurring justices— that this case does not present us with the occasion to consider the vitality of the holding in Bell II."

As the above quote illustrates, a majority of the Law Court has yet to agree on whether the nature and scope of the public easement over Maine's intertidal zone should be interpreted as common law with specific allowable uses evolving over time with societal changes or strictly by the terms of the 17th century colonial ordinance which specified the rights of "fishing, fowling, and navigation." In "Bell II", *Bell v. Town of Wells, 557 A. 2d 168 (Me. 1989)*, the Law Court held that the public's rights in the intertidal zone are limited to "fishing, fowling, and navigation" for commercial or recreational purposes and declared unconstitutional on takings grounds a state law that recognized broader public recreational rights.

A minority of the Court concurred with the result reached by the majority in *Ross* but not with its reasoning. The minority opined that the Law Court's decision in Bell II is "a regrettable error, limiting public access to the intertidal zones on Maine's beaches", emphasizing that "[s]ince that time, a member of the public has been allowed to stroll along the wet sands of Maine's intertidal zone holding a gun or a fishing rod, but not holding the hand of a child." The minority indicated it would have used the *Ross* case to "clarify the applicable law and set aside the holding in Bell II." Had it done so, the minority explained, it would also have concluded as the majority had that "even according to the public's common law access rights to the intertidal zone, the public does not have the right to take attached plant life from that property in contradiction to the fee owner's wishes—not because such activity falls outside of the constrictive trilogy, but because the taking of attached flora from fee owners was not within the reasonable access contemplated when the *jus publicum* was established."

DMR manages the harvest of rockweed pursuant to licenses issued to harvesters. Legislation introduced during the 129th Maine Legislature, First Regular Session proposed to clarify that rockweed is a public not private resource. L.D. 1323, An Act to Revise the Laws Regarding the Public Trust in Intertidal Lands, would have amended the statute declared unconstitutional in Bell II to reflect the broader view of the public's rights in the intertidal zone as evolving common law that has been articulated by some members of the Law Court. Deliberations on the bill, which was not enacted, included discussion of options to clarify by statute that rockweed is a public trust resource and not private property.

In a 2019 beach access-related decision, *Almeder v. Town of Kennebunkport, 2019 ME 151 (October 3, 2019)*, the Law Court did not reach the public trust doctrine issue that had been addressed by the trial court at an earlier stage in the litigation. The case concerned ownership of the dry sand and intertidal area in front of numerous house lots along Goose Rocks Beach. The Law Court determined that "on the record before us, and in the absence of any evidence suggesting that the disputed land was conveyed into private ownership, we affirm the holding of the trial court that in the unique circumstances of this case, legal title to the disputed land seaward of the seawall, including the beach, is held by the Town of Kennebunkport for the benefit of the public."

In a 2016 beach access case, *Cedar Beach/Cedar Island Supporters, Inc., et al. v. Gables Real Estate, LLC, 2016 ME 114 (July 19, 2016)*, the Law Court vacated the lower court's ruling and held that the adversity and non-acquiescence necessary to establish a prescriptive easement over privately-owned lands for public recreational access to Cedar Beach in Harpswell had not been shown. In making its decision, the Law Court referenced its ruling at a prior stage of the *Alemder* case discussed above that in Maine

"public recreational use of private uncultivated lands is presumed to be permissive." This legal principle makes proof of a public prescriptive easement based on long-term use of coastal property difficult.

Coastal Community Grants

2016

- Cutler Harbor Public Access Project Part II-construction materials (supplements MaineDOT SHIP grant)
- Belfast - Rangeway Management Plan Project- Phase I & II
- Wells - Marsh Walk Design

3. *Indicate if your state or territory has a publicly available public access guide. How current is the publication and how frequently it is updated?*[12]

Publicly Available Access Guide

Public Access Guide	Printed	Online	Mobile App
State or territory has? (Y or N)	Y	N	N
Web address (if applicable)	https://www10.informe.org/webshop_ifw/index.php?c=&p=6896&storeID=8	N/A	N
Date of last update	2012	N/A	N/A
Frequency of update	Periodic- have not made updates		

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High _____
Medium __X__
Low _____

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

Access to the shore is a traditional and way of life for Maine residents who value the coast for its scenic beauty, recreational opportunities and cultural heritage. The biggest industries in Maine depend on access to the water and tourism is a primary contributor to that state's economy. The state has several programs in place that can acquire easements and fee interest in coastal conservation and working lands.

[12] Note some states may have regional or local guides in addition to state public access guides. Unless you want to list all local guides as well, there is no need to list additional guides beyond the state access guide. You may choose to note that the local guides do exist and may provide additional information that expands upon the state guides.

MCP considers public access to be an issue of medium priority concern at this time. Other enhancement issue areas were more pressing and provided more opportunities for MCP-led enhancement project

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Marine Debris

CZMA Section 309 Enhancement Objective: *Reducing marine debris entering the nation's coastal and ocean environment by managing uses and activities that contribute to the entry of such debris. §309(a)(4)*

PHASE I (HIGH-LEVEL) ASSESSMENT:
Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

Resource Characterization:

1. *In the table below, characterize the existing status and trends of marine debris in the state's coastal zone based on the best-available data.*

Existing Status and Trends of Marine Debris in Coastal Zone

Source of Marine Debris	**Significance of Source** (H, M, L, unknown)	**Type of Impact**[13] (aesthetic, resource damage, user conflicts, other)	**Change Since Last Assessment** (unknown)
Beach/shore litter	M	Aesthetic, potential harm to marine life and birds	We collect a similar amount each year.
Land-based dumping	L		Not a noticeable problem
Storm drains and runoff	unknown		
Land-based fishing (e.g., fishing line, gear)	L	Potential harm to marine life and birds	We collect very little each year.
Ocean/Great Lakes-based fishing (e.g., derelict fishing gear)	H	Derelict gear can have impacts on habitat, harmful to species through ghost fishing impacts	Derelict gear is very challenging, and we are working on finding meaningful ways to reduce the impact.
Derelict vessels	L	Unknown	Unknown
Vessel-based (e.g., cruise ship, cargo ship, general vessel)	L	Unknown	Unknown
Hurricane/Storm	L	Resource damage,	Very dependent on the severity of the storm event, there has been some increased impact.
Tsunami	L	Unknown	Unknown
Other (please specify)			

[13] You can select more than one, if applicable.

2. *If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends or potential impacts from marine debris in the coastal zone since the last assessment.*

We submit all our data to Ocean Conservancy's trash index which is available on-line.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if there has been any significant state- or territory-level management changes (positive or negative) for how marine debris is managed in the coastal zone.*

Significant Changes in Marine Debris Management

Management Category	**Employed by State/Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Marine debris statutes, regulations, policies, or case law interpreting these	Y	N	N
Marine debris removal programs	Y	Y	N

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes and likely future outcomes of the changes.*

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High _____
Medium _____
Low __X__

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

While marine debris is an important issue to address, it is not one of the most urgent problems for Maine. We have ranked this enhancement area as low priority for Maine Coastal Program. Derelict fishing gear remains a medium-high priority issue, but Maine Department of Marine Resources, and

more specifically Marine Patrol, is leading the effort to modify laws to make gear collection easier. Maine Coastal Program will continue assisting Marine Patrol in this process, as well as continue educating the public about marine debris through outreach and the annual Coastal Cleanup.

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Cumulative and Secondary Impacts

CZMA Section 309 Enhancement Objective: *Development and adoption of procedures to assess, consider, and control cumulative and secondary impacts of coastal growth and development, including the collective effect on various individual uses or activities on coastal resources, such as coastal wetlands and fishery resources. §309(a)(5)*

PHASE I (HIGH-LEVEL) ASSESSMENT:
Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

Resource Characterization:

1. *Using National Ocean Economics Program Data on population and housing,[14] please indicate the change in population and housing units in the state's coastal counties between 2012 and 2017. You may wish to add additional trend comparisons to look at longer time horizons as well (data available back to 1970), but at a minimum, please show change over the most recent five-year period data is available (2012-2017) to approximate current assessment period.*

Trends in Coastal Population and Housing Units

	2012	2017	Percent Change (2012-2017)
Number of people	992,256	1,005,395	1.32%
Number of housing units	533,889	547,284	2.51%

2. *Using provided reports from NOAA's Land Cover Atlas,[15] please indicate the status and trends for various land uses in the state's coastal counties between 1996 and 2016. You may use other information and include graphs and figures, as appropriate, to help illustrate the information. Note that the data available for the islands may be for a different time frame than the time periods reflected below. In that case, please specify the time period that the data represent. Also note that Puerto Rico currently only has data for one time point so will not be able to report trend data. Instead, Puerto Rico should just report current land use cover for developed areas and impervious surfaces.*

[14] *www.oceaneconomics.org/Demographics/PHresults.aspx*. Enter "Population and Housing" section and select "Data Search" (near the top of the left sidebar). From the drop-down boxes, select your state, and "all counties." Select the year (2012) and the year to compare it to (2017). Then select "coastal zone counties."

[15] *www.coast.noaa.gov/digitalcoast/tools/lca.html*. Note that the 2016 data will not be available for all states until later Summer 2019. NOAA OCM will be providing summary reports compiling each state's coastal county data. The reports will be available after all of the 2016 data is available.

Distribution of Land Cover Types in Coastal Counties

Land Cover Type	Land Area Coverage in 2010 (Acres)	Gain/Loss Since 1996 (Acres)
Developed, High Intensity	81,824	9,830.40
Developed, Low Intensity	183,040	12,038.40
Developed, Open Space	67,200	8,761.60
Grassland	139,520	58,624
Scrub/Shrub	577,292.8	140,160
Barren Land	85,760	24,307.20
Open Water	2,310,598.4	-1,785.60
Agriculture	464,832	947.2
Forested	6,382,419.2	-242,272
Woody Wetland	1,204,684.8	-2,195.20
Emergent Wetland	210,073.6	1,126.4

3. *Using provided reports from NOAA's Land Cover Atlas,[16] please indicate the status and trends for developed areas in the state's coastal counties between 1996 and 2016 in the two tables below. You may use other information and include graphs and figures, as appropriate, to help illustrate the information. Note that the data available for the islands may be for a different time frame than the time periods reflected below. In that case, please specify the time period the data represents. Also note that Puerto Rico currently only has data for one time point so will not be able to report trend data. Unless Puerto Rico has similar trend data to report on changes in land use type, it should just report current land use cover for developed areas and impervious surfaces.*

Development Status and Trends for Coastal Counties

	1996	2010	Percent Net Change
Percent land area developed	3.297	3.631	0.09199
Percent impervious surface area	1.12	1.236	0.09385

** Note: Islands likely have data for another time period and may only have one time interval to report. If so, only report the change in development and impervious surface area for the time period for which data are available. Puerto Rico does not need to report trend data.*

Note: most recent data is from 2010, not 2016 as requested

[16] www.coast.noaa.gov/digitalcoast/tools/lca.html. Note that the 2016 data will not be available for all states until later Summer 2019. NOAA OCM will be providing summary reports compiling each state's coastal county data. The reports will be available after all of the 2016 data is available.

How Land Use Is Changing in Coastal Counties

Land Cover Type	**Areas Lost to Development Between 1996-2010** (Acres)
Barren Land	7,756.80
Emergent Wetland	307.2
Woody Wetland	3392
Open Water	17,824
Agriculture	864
Scrub/Shrub	2,860.80
Grassland	1,216
Forested	249.6

** Note: Islands likely have data for another time period and may only have one time interval to report. If so, only report the change in land use for the time period for which high-resolution C-CAP data are available. Puerto Rico and the Northern Mariana Islands do not report.*

4. *Briefly characterize how the coastal shoreline has changed in the past five years due to development, including potential changes to shoreline structures such as groins, bulkheads and other shoreline stabilization structures, and docks and piers. If available, include quantitative data that may be available from permitting databases or other resources about changes in shoreline structures.*

   According to data provided by Maine Geological Survey, 116 miles of coastal engineering structures in York, Cumberland and Sagadohoc counties. Data is not readily available for the entire coasts nor previous years, so it is unknown how these have changed over the last 5 years.

5. *Briefly summarize the results of any additional state- or territory-specific data or reports on the cumulative and secondary impacts of coastal growth and development, such as water quality, shoreline hardening, and habitat fragmentation, since the last assessment.*

   State of Maine Department of Environmental Protection, 2016 Integrated Water Quality Monitoring and Assessment Report

   This document fulfills biennial reporting requirements on both a federal and state level. The federal requirement arises from the Clean Water Act (CWA), particularly Section 305(b) (report on the state of waters), Section 303(d) (list of impaired waters), and Section 314 (Clean Lakes Program). Updates to water quality assessments for the 2016 Integrated Report were primarily based on monitoring data collected in 2013 and 2014, although more recent data was consulted where appropriate

   State Wildlife Action Plan

   Maine's 2015-2025 Wildlife Action Plan addresses the state's full array of wildlife and their habitats including vertebrates and invertebrates in aquatic (freshwater, estuarine, and marine) and terrestrial habitats. The Plan targets Species of Greatest Conservation Need (SGCN) and covers the entire state. The Department of Marine Resources and Maine Department of Inland Fisheries and Wildlife worked to form the wildlife plan to encourage agencies and partners to prioritize, monitor, collaborate and respond to the threats to wildlife and in turn. Fish and wildlife play an enormous role in the lives in Maine people as they provide recreation, employment and enjoyment. Protecting wildlife also protects the culture of Maine.

(https://www.maine.gov/ifw/docs/2015%20ME%20WAP%20All_DRAFT.pdf)

2018 Report on Casco Bay eelgrass distribution and percent cover changes are available here..

2020

1/15/2020 Air Emissions from Marine Vessels [PDF]

2019

4/30/2019 Maine Combined Sewer Overflow 2018 Status Report [PDF]

5/3/2019 Surface Water Ambient Toxics Monitoring Program 2017/2018 [PDF]

6/26/2019 Status of Licensed Discharges [PDF]

2018

4/1/2018 Maine Combined Sewer Overflow 2017 Status Report [PDF]

2017

2/1/2017 Protecting Maine's Beaches for the Future: 2017 Update [PDF]

4/1/2017 Maine Combined Sewer Overflow 2016 Status Report [PDF]

7/5/2017 Status of Licensed Discharges [PDF]

10/30/2017 Surface Water Ambient Toxics Monitoring Program 2015/2016 [PDF]

2016

1/1/2016 2016 Integrated Water Quality Monitoring and Assessment Report [PDF]

5/1/2016 Maine Combined Sewer Overflow 2015 Status Report [PDF]

Impact of Deicing Salt on Maine Streams - This Issue Profile is a summary of Maine DEP findings about how salt use in developed areas has adversely impacted aquatic life in some streams in Maine, and provides some strategies to keep in mind to help address this issue.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if there have been any significant state-level changes (positive or negative) in the development and adoption of procedures to assess,*

consider, and control cumulative and secondary impacts of coastal growth and development, including the collective effect on various individual uses or activities on coastal resources, such as coastal wetlands and fishery resources, since the last assessment.

Significant Changes in Management of Cumulative and Secondary Impacts of Development

Management Category	**Employed by State or Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y	Y	
Guidance documents	Y	Y	
Management plans (including SAMPs)	Y	Y	

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

Statutes Regulations and Policies

See Changes to Maine's Coastal "Core Laws" 2015-2019 section of this document

Management Plans

Maine Non-Point Source Management Plan 2020-2024

Goosefare Brook Watershed Management Plan Saco May 2016
http://www.sacomaine.org/residents/news_and_agendas/goosefare_brook.php

Phillips Brook Scarborough Feb 2018 Feb 2028 Scarborough, Town of Not available online

Guidance Documents

The Stormwater BMP Manual

Volume I. Stormwater Management Manual

Volume II. Phosphorus Control in Lake Watersheds: A Technical Guide to Evaluating New Development

Volume III. BMP Technical Design Manual

Best Management Practices for Forestry: Protecting Maine's Water Quality - Third Edition 2017

Coastal Community Grants

2016

- Rockport- Addressing the Effects of Land Use on Water Quality
- Washington County Council of Governments - Rain Gauges and Shellfish Closure Outreach Project (Steuben, Milbridge, Harrington, Columbia Falls, Jonesport, Jonesboro, East Machias, Lubec, Pleasant Point, Cutler, Dennysville and Pembroke)
- Ogunquit - Addressing the Effects of Land Use on Water Quality in Ogunquit Watershed (in partnership with Wells, York and South Berwick)
- Brunswick - Mare Brook Watershed and Community Engagement Project
- Hancock County Planning Commission - Orland Waterfront Revitalization Plan

2017

- Washington County Council of Governments- Downeast Sustainability Project River Herring Restoration
- Gardiner - Stormwater Management Study
- Bath - Downtown Stormwater Management Study

2018

- Southern Maine Planning and Development Commission - York River Watershed Analysis (York, Kittery, Eliot and South Berwick)
- Boothbay Harbor - West Harbor Pond Water Quality Restoration
- Cape Elizabeth - Culvert and Habitat Assessment
- South Portland - Trout Brook Culvert Improvements

2019

- Greater Portland Council of Governments/Falmouth - Proactive Watershed Management in Falmouth
- Town of Lamoine/Hancock County Soil & Water Conservation District - Eastern Bay Watershed-Based Management Plan

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High	__X__
Medium	_____
Low	_____

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

The population of Maine's coastal zone has steadily increased over the last 10 years and is expected to continue its growth, albeit at a rate much less than other parts of the country. With continuous growth comes land development and the challenge of managing cumulative and secondary impacts. Although developmental impacts are addressed at a state level, many land use planning decisions are made at the municipal level. Maine is home to many rural communities including several rural coastal towns to the north. These towns lack the expertise and funding to focus on impacts to coastal resources. The Maine Coastal Program considers Cumulative and Secondary Impacts to be a

high priority. This is a cross-cutting issue that is applicable to many aspects of coastal management, and there are numerous opportunities to partner with other organizations

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Special Area Management Planning

CZMA Section 309 Enhancement Objective: *Preparing and implementing special area management plans for important coastal areas. §309(a)(6)*

The Coastal Zone Management Act defines a special area management plan (SAMP) as "a comprehensive plan providing for natural resource protection and reasonable coastal-dependent economic growth containing a detailed and comprehensive statement of policies; standards and criteria to guide public and private uses of lands and waters; and mechanisms for timely implementation in specific geographic areas within the coastal zone. In addition, SAMPs provide for increased specificity in protecting natural resources, reasonable coastal-dependent economic growth, improved protection of life and property in hazardous areas, including those areas likely to be affected by land subsidence, sea level rise, or fluctuating water levels of the Great Lakes, and improved predictability in governmental decision making."

PHASE I (HIGH-LEVEL) ASSESSMENT: *Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.*

Resource Characterization:

1. *In the table below, identify geographic areas in the coastal zone subject to use conflicts that may be able to be addressed through a SAMP. This can include areas that are already covered by a SAMP but where new issues or conflicts have emerged that are not addressed through the current SAMP.*

Geographic Area	**Opportunities for New or Updated Special Area Management Plans** Major conflicts/issues
Coastwide	Coastal towns will continue to develop Municipal Comprehensive Plans under the Comprehensive Planning and Land Use Regulation Law (CPLURA) and submit plans to the State (DACF/Municipal Planning Assistance Program) for a consistency finding. Plans must address state goals expressed in CPLURA and the State's Coastal Policies Act. Municipalities are increasingly developing policies and implementation methods to address climate change; and a multi-town resiliency planning effort is now underway in coastal southern Maine, led by the Town of Kennebunkport. Shoreline management plans, beach and bluff management plans and resiliency plans are anticipated to be areas of focus for municipal and regional efforts, supported by MCP as resources allow.

2. If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends of SAMPs since the last assessment.

N/A

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if there have been any significant state- or territory-level management changes (positive or negative) that could help prepare and implement SAMPs in the coastal zone.*

Significant Changes in Special Area Management Planning

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
SAMP policies, or case law interpreting these	N	N	N
SAMP plans	N	N	N

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

N/A

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High _____
Medium _____
Low __X__

2. *Briefly explain the reason for this level of priority.*

Maine has not used a formal Special Area Management Plan designation to date. The Coastal Program continues to address the need for comprehensive issue and geography-specific planning through a) financial and technical assistance to towns and regional planning councils; and b) development of special studies to inform state policy (for example, Penobscot Bay Working Waterfront Resiliency Study, 2019, and Protecting Maine's Beaches for the Future: 2017 Update. In addition, several place-based and/or issue-based projects are described in other sections of this assessment. If a formal SAMP designation is determined to be the best approach in a particular geography, MCP will submit a detailed work plan to NOAA/OCM.

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Ocean Resources

CZMA Section 309 Enhancement Objective: *Planning for the use of ocean resources. §309(a)(7)*

PHASE I (HIGH-LEVEL) ASSESSMENT:
Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

Resource Characterization:

Status of Ocean and Great Lakes Economy for Coastal Counties (2015)

	All Ocean Sectors	Living Resources	Marine Construction	Ship & Boat Building	Marine Transportation	Offshore Mineral Extraction	Tourism & Recreation
Employment (# of Jobs)	55367	7938	321	12298	3339	138	31330
Establishments (# of Establishments)	3101	498	35	84	69	14	2401
Wages (Millions of Dollars)	1.7 b	71	12.3	862.3	131.4	2.6	653.4
GDP (Millions of Dollars)	2.6 b	239.9	20.8	744.9	183.2	7.6	1.4 b

Change in Ocean and Great Lakes Economy for Coastal Counties (2005-2015)[17]

	All Ocean Sectors	Living Resources	Marine Construction	Ship & Boat Building	Marine Transportation	Offshore Mineral Extraction	Tourism & Recreation
Employment (# of Jobs)	9.9%	-4.0%	-15.0%	7.2%	33.4%	2.2%	12.3%
Establishments (# of Establishments)	11.1%	20.5%	17.1%	-16.7%	-10.1%	-42.9%	11.0%
Wages (Millions of Dollars)	29.4%	29.3%	33.3%	26.4%	48.2%	19.2%	32.4%
GDP (Millions of Dollars)	26.9%	32.0%	15.9%	14.8%	35.8%	38.2%	31.8%

1. *Understanding existing uses within ocean and Great Lakes waters can help reduce use conflicts and minimize threats when planning for ocean and Great Lakes resources. Using Ocean Reports[18], indicate the number of uses within ocean or Great Lakes waters off of your state. For energy uses (including pipelines and cables, see the "Energy and Government Facility Siting" template following). Add additional lines, as needed, to include additional uses that are important to highlight for your state. Note: The Ocean Reports tool does not include data for the Great Lakes states. Great Lakes states should fill in the table as best they can using other data sources.*

[17] The trend data is available at the bottom of the page for each sector and type of economic data. Mouse over the data points for 2005 and 2015 to obtain the actual values and determine the change by subtracting 2005 data from 2015.

[18] *www.coast.noaa.gov/digitalcoast/tools/ort.html*. Go to "Quick Reports" and select the "state waters" option for your state or territory. Some larger states may have the "Quick Reports" for their state waters broken into several different reports. Use the icons on the left hand side to select different categories: general information, energy and minerals, natural resources and conservation, oceanographic and biophysical, transportation and infrastructure, and economics and commerce. Then scroll through each category to find the data to complete the table.

Uses within Ocean or Great Lakes Waters

Type of Use	Number of Sites
Federal sand and gravel leases *(Completed)*	NA
Federal sand and gravel leases *(Active)*	NA
Federal sand and gravel leases *(Expired)*	NA
Federal sand and gravel leases *(Proposed)*	NA
Beach Nourishment Projects	10
Ocean Disposal Sites	17
Principle Ports *(Number and Total Tonnage)*	2 (Portland: 5817486: Searsport: 1352913)
Coastal Maintained Channels	34
Designated Anchorage Areas	29
Danger Zones and Restricted Areas	2
Other (please specify)	

2. *In the table below, characterize how the threats to and use conflicts over ocean and Great Lakes resources in the state's or territory's coastal zone have changed since the last assessment.*

Significant Changes to Ocean and Great Lakes Resources and Uses

Resource/Use	Change in the Threat to the Resource or Use Conflict Since Last Assessment (unknown)
Benthic habitat (including coral reefs)	– Activity impacting benthic habitat is largely unchanged. It remains very site specific.
Living marine resources (fish, shellfish, marine mammals, birds, etc.)	Lobster ↑: Lobster landings reached a record high of 132 million pounds in 2016. Landings have subsequently declined, and are expected to total ~100 million pounds in 2019. While this is still well above the long-term average landings, there is concern that changing environmental conditions are becoming less favorable to maintaining the recent high abundance of this resource. Shellfish ↑: The threat to shellfish continues to increase due to environmental conditions such as ocean acidification and invasive species. Groundfish ↑: Threat has increased due to uncertainty about the status of the population, stock structure, and efficacy of management measures. Marine Mammals ↑: There are different trends within this group of species, but concerns about the North Atlantic Right Whale have dominated discussion in Maine. The potential increasing threat is not due to changes in other ocean uses, but a combination of an Unusual Mortality Event in 2017 and poor calving rates. Birds ↑: Coastal and ocean birds are increasingly threatened. Much of the threat is due to availability of prey, and climate variability is an overarching issue that is having a negative impact due to warming oceans, sea level rise, and coastal storms. SAV (eelgrass) ↑ : Threat level has increased and is expected to continue in this direction. Green crabs and ocean acidification are thought to be factors resulting in eelgrass decline.
Sand/gravel	– There is no known threat to the sand and gravel resource.
Cultural/historic	↑ Cultural and historical resources (e.g. archaeological sites, forts) are under increasing threat due to sea level rise and shoreland erosion
Other (please specify)	

Transportation/navigation	↑ Use conflict was increasing in certain localized areas between cruise ships and lobster gear. Agreements have been developed for recommended approach routes to avoid gear loss.
Offshore development[19]	– Use conflict has not increased.
Energy production	– Use conflict has not increased, but there is increased interest in the potential for offshore energy production (see Energy Section).
Fishing (commercial and recreational)	– Use conflict has not increased.
Recreation/tourism	– Tourism and recreation are increasing, but no known increase in use conflicts.
Sand/gravel extraction	– No activity.
Dredge disposal	↑ Modest increase in activities to address project-specific conflicts regarding the haul route used for maintenance of small, shallow-draft federal navigation projects.
Aquaculture	↑ Use conflicts occur on a case-by-case basis, associated with controversial lease applications. Small scale aquaculture operations (LPAs, less than 400 square feet) continue to increase.
Other (please specify) Scientific/Monitoring/Data	– Various survey, mapping, or other types of both NOAA and EPA cruises cause sporadic use conflicts due to lack of adequate notification to fishermen.

3. *For the ocean and Great Lakes resources and uses in the table above that had an increase in threat to the resource or increased use conflict in the state's or territory's coastal zone since the last assessment, characterize the major contributors to that increase. Place an "X" in the column if the use or phenomenon is a major contributor to the increase.*

[19] Offshore development includes underwater cables and pipelines, although any infrastructure specifically associated with the energy industry should be captured under the "energy production" category.

Major Contributors to an Increase in Threat or Use Conflict to Ocean and Great Lakes Resources

	Land-based	Offshore developm	Polluted	Invasive species	Fishing (Comm	Aquaculture	Recreation	Marine Transport	Dredging	Sand/Mineral	Ocean Acidificati	Changing Environmental	Sea Level Rise Shoreland
Example: Living marine resources		*X*	*X*	*X*	*X*	*X*		*X*	*X*				
Living Marine Resources	X		X	X	X						X	X	
Cultural/historic													X
Transportation/Navigation					X		X						
Dredge Disposal					X								
Aquaculture					X	X							

4. *If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends of ocean and Great Lakes resources or threats to those resources since the last assessment to augment the national data sets.*

Lobster Data from Department of Marine Resources - DMR monitors the status of the lobster resource through sea sampling (collection of catch data aboard lobster vessels) and the ventless trap survey. There is also a settlement index, which may provide the earliest indication of any potential change in the status of the resource.
Maine Coastal Atlas – The Maine Coastal Atlas is a spatial display and analysis tool developed by MCP. It is used to depict coastal and marine spatial data, to serve as a data repository, and to allow for the download of otherwise inaccessible spatial data. A link to the Maine Coastal Atlas is here: http://www.maine.gov/dacf/mcp/coastalatlas/index.htm.

State of the Gulf of Maine – The State of the Gulf of Maine Report is a dynamic document hosted by the Gulf of Maine Council on the Marine Environment (GoMC). The GoMC is a partnership of state, provincial and federal (both Canadian and American) governments that work together to foster a vibrant Gulf of Maine. The Report delves into a range of issues affecting the marine environment. Information on the State of the Gulf Report can be found here: http://www.gulfofmaine.org/2/sogom-homepage/.

Maine Farmed Shellfish Market Analysis – In 2016, the Hale Group prepared a report at the direction of the Gulf of Maine Research Institute, describing the opportunity for Maine's aquaculture industry. The report also includes strategic recommendations to optimize growth to maintain product quality without competing with existing farms or overburdening coastal ecosystems and communities.

Maine Aquaculture Economic Impact Report. – In January 2017, the Aquaculture Research Institute at the University of Maine released the Maine Aquaculture Economic Impact Report. It found that Maine's aquaculture sector has a direct economic impact of $73.4 million in output, 571 in employment, and $35.7 million in labor income. Including multiplier effects, Maine's aquaculture sector generates a statewide annual economic contribution of $137.6 million in output (i.e., sales revenue), 1,078 full- and

part-time jobs, and $56.1 million in labor income. Since 2007 the total economic impact of aquaculture has almost tripled from $50 million to $137 million dollars.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if any significant state- or territory-level changes (positive or negative) in the management of ocean and Great Lakes resources have occurred since the last assessment?*

Significant Changes to Management of Ocean and Great Lakes Resources

Management Category	**Employed by State or Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y	Y	Y
Regional comprehensive ocean/Great Lakes management plans	Y	N	Y
State comprehensive ocean/Great Lakes management plans	N	N	N
Single-sector management plans	Y	N	Y

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

Statutes, regulations, policies, or case law interpreting these
For living marine resources, DMR has made extensive changes to statutes and regulations over the past 5 years to improve management and reduce conflicts. Some notable examples of this include legislation to implement owner-operator requirements in the scallop and urchin fisheries and extensive changes to aquaculture laws and regulations. Much of this work was supported through 309 projects.

Regional comprehensive ocean/Great Lakes management plans
Northeast Regional Ocean Planning: The New England Regional Planning Body (RPB) was formed in 2012 and includes representatives from the five coastal New England states, ten federally recognized tribes, ten federal agencies, a representative of the New England Fishery Management Council, and two ex-officio members (one from a Canadian federal agency and one from the Mid-Atlantic Regional Ocean Council). The RPB has no authority to create new regulations. Its mandate is to create a plan and oversee its implementation, with many opportunities for public participation. The RPB is currently working to develop a regional ocean plan (to be completed in 2016) that will include goals that help to

foster healthy oceans and ecosystems; effective decision-making; and compatibility among past, current, and future ocean uses. While the regional planning process is still underway, it is anticipated that the final product will provide guidance; data and tools; and a data use agreement for regulatory certainty to agencies, the private sector, and the public.

a) More information on the RPB and the regional planning process can be found here: http://neoceanplanning.org/.

b) State Initiatives: The Maine Coastal Mapping Initiative (MCMI) was created by the Maine Coastal Program (MCP) in 2013 to acquire critical hydrographic data, which will be used by regulatory and planning agencies to maintain vibrant marine ecosystems, expand offshore economic opportunities, and prepare for environmental changes expected due to sea level rise and other environmental changes. Data will be used for:

a. Habitat Classification;
b. Ocean Planning;
c. Effective Management and Siting of Offshore Development;
d. Identification of Offshore Sand Deposits;
e. Fisheries Management;
f. Preservation of Unique Habitats;
g. Maritime Safety and Resilience;
h. Emergency Preparedness, and;
i. Improved Resiliency Modeling.

Single-sector management plans As referenced above, since 2010, the Maine Legislature has passed legislation that strengthened the Department's authority to develop state water Fisheries Management Plans (FMPs) by specifying what those plans should contain, and what they should seek to achieve. Since that time, DMR has developed a FMP for rockweed. Scallop, urchin, and lobster FMPs remain under development.

3. *Indicate if your state or territory has a comprehensive ocean or Great Lakes management plan.*

Comprehensive Ocean/Great Lakes Management Plan	State Plan	Regional Plan
Completed plan (Y/N) (If yes, specify year completed)	N	Y (2016)
Under development (Y/N)	N	N
Web address (if available)	N	https://neoceanplanning.org/plan/
Area covered by plan	N	Northeast (Long Island Sound to Hague Line)

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High ___X__
Medium _____
Low _____

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged*.

Maine Coastal Program has identified Ocean Resources as a high priority for its work. With increasing planning being done at the regional level, it is critical for Maine to increase its collection of baseline data. Most of the Gulf of Maine remains unmapped, which makes it difficult to make planning and management decisions on the regional, state, and local levels. Many state partners and stakeholders echoed this sentiment, sharing ideas for data collection that could measurably improve decision-making regarding coastal and ocean resources. Additionally, the Gulf of Maine is seeing rapid environmental change, and baseline data is crucial to provide a benchmark for a means of comparison to future conditions. MCP can have a role in this area by coordinating the collection and serving as a repository for this information. Additionally, climate variability and associated habitat impacts and shifts may necessitate changes to existing or the generation of new FMPs. Ocean acidification has been identified by several partners and by the Maine State Legislature as a significant threat to Maine's ocean resources. These are dynamic and complicated issues that must be addressed by leveraging MCP's resources with those of partners and other agencies and are of vital importance to the future of Maine's coastal and ocean resources and economy.

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Energy and Government Facility Siting

CZMA Section 309 Enhancement Objective: *Adoption of procedures and enforceable policies to help facilitate the siting of energy facilities and Government facilities and energy-related activities and Government activities which may be of greater than local significance. CZMA§309(a)(8).*

PHASE I (HIGH-LEVEL) ASSESSMENT:

Resource Characterization:

1. *In the table below, characterize the status and trends of different types of energy facilities and activities in the state's coastal zone based on best available data. If available, identify the approximate number of facilities by type.*

Status and Trends in Energy Facilities and Activities in the Coastal Zone				
Type of Energy Facility/Activity	**Exists in CZ**		**Proposed in CZ**	
	(# or Y/N)	Change Since Last Assessment (unknown)	(# or Y/N)	Change Since Last Assessment (unknown)
Energy Transport				
Pipelines	Y	⍰	Y	⍰
Electrical grid (transmission cables)	Y	⍰	Y	⍰
Ports	Y	⍰	Y	⍰
Liquid natural gas (LNG)	N	⍰	Y	⍰
Energy Facilities				
Oil and gas	N	⍰	N	⍰
Coal	N	⍰	N	⍰
Nuclear	N	⍰	N	⍰
Wind	Y	⍰	Y	⍰
Wave	N	⍰	N	⍰
Tidal	Y	⍰	Y	⍰
Current (ocean, lake, river)	N	⍰	N	⍰
Hydropower	Y	⍰	Y	⍰
Ocean thermal energy conversion	N	⍰	N	⍰
Solar	Y	⍰	Y	⍰
Biomass	Y	⍰	N	⍰

Narrative describing previous table:

Energy Transport

Pipelines:

Minor Increase in Existing Facilities:
Crude oil pipeline: Portland Pipe Line Corporation (PPLC) owns and operates a crude oil pipeline comprised of two co-located piping runs that for decades was used to transfer crude oil from the South Portland marine oil terminal to an oil refinery in Montreal. The Montreal refinery has closed, and the piping runs do not currently contain any product.

Marine Oil Terminals: There are six marine oil terminal facilities in South Portland which have piping runs of varying lengths from the terminal piers to aboveground storage facilities and which only contain product during the transfer of oil to and from ships and the storage tanks. One terminal has two pipelines that run from the South Portland shoreline to more distant storage tanks. Portions of these pipelines run underground through the South Portland community. Some are not in use and are filled with inert gas; others are available for use subject to testing. Similarly designed and operated marine oil terminal facilities are in Searsport, Yarmouth, Bucksport, and Bangor.

Natural gas pipelines: The state has three interstate natural gas pipelines - Portland Natural Gas Transmission System; Maritimes & Northeast Pipeline; and Granite State Gas Transmission Company - with sections in the coastal zone. Since the last assessment, local natural gas distribution lines have been installed in the coastal zone, including areas north of Portland and along the Kennebec River in Augusta and many of these local natural gas pipelines have been placed into service.

Minor Increase in Proposed Facilities.
Technological advances and economic conditions have spurred extraction of large volumes of oil from the Dakota/Canadian tar sands formation. The potential for use of the PPLC pipeline to transfer that oil from Montreal to South Portland for shipment to refineries, such as the one in New Brunswick, generated significant interest in the pipeline's operations and in 2014 the City of South Portland adopted local ordinances that would effectively prohibit use of the pipeline in this manner. PPLC has made no formal proposal for authorizations required to reverse the flow of its pipeline to carry tar sands oil to refineries. PPLC's challenge to those ordinances on constitutional and other grounds is now pending before the U.S. Court of Appeals for the First Circuit. Modest expansion of local natural gas pipelines to serve Maine communities continues.

Electrical grid (transmission cables)

Increase in existing land-based electrical grid. Land-based: Like other states, Maine has a statewide electrical transmission network connected to the regional power grid, parts of which are in the coastal zone. During the prior assessment period, Central Maine Power Company completed a large-scale upgrade of its transmission system, parts of which are in the coastal zone. Ocean-based: There are submerged cables to connect many (not all) inhabited islands to the shore-side electric power grid.

Increase in Proposed Facilities. The Maine Aqua Ventus ocean wind energy pilot project proposal (see below) includes submerged power lines to serve Monhegan Island and connect to the regional power

grid. During the prior 309 assessment period, Anbaric Transmission and National Grid were discussing with state officials their proposal to partner to build 1-gigawatt, sub-sea merchant power line, dubbed the "Maine Green Line", a roughly 300-mile HVDC line that would link northern New England and Quebec generation with Boston area markets and be located in the Gulf of Maine seabed. It appears that active consideration of this project is suspended. In some ways a functionally comparable project, the New England Clean Energy Connect (NECEC) project, which may include a small secondary line in the coastal zone, is under active consideration by regulators in 2020. If this controversial project, which would pass through Maine's North Woods, were approved and put into service, it would be a significant addition to Maine's electric transmission system and provide a route for Quebec's hydropower to connect to the ISO New England grid.

Ports

Increase in Existing Facilities. Maine continues to invest in port development to increase marine freight capabilities. MaineDOT, the Maine Port Authority, and an Icelandic shipping company, Eimskip, have partnered to develop and bring container service to the International Marine Terminal (IMT) in Portland Harbor. The IMT offers weekly container shipping service to Europe and Asia, and the operation continues to expand due to significant investment of state and federal dollars. Portland and Searsport Harbor remain the primary state energy ports, handling imported oil and other fossil fuel products. Searsport also handles bulk, project and heavy lift cargo, including wind turbine components. Eastport had major repair completed in 2017 after a 2014 breakwater collapse. The breakwater facility has since been used for passenger operations and has hosted military vessels as well. Eastport also continues its business exporting wood pulp at the Estes Head facility. Cruise ship calls are also continuing to increase in Maine, the primary cruise ports being Portland and Bar Harbor and Rockland.

Increase in Proposed Facilities. MaineDOT continues to consider future plans for port development, and several initiatives now underway have potential to increase the capacity and utility of key state ports. Cargo handling equipment, including new mobile harbor cranes, has been purchased for the IMT in recent years. Portland has made progress in the study of a confined aquatic disposal (CAD) cell and hopes to apply for federal funding in 2020 to construct the CAD cell and dredge the wharves and piers on the Portland waterfront. Searsport is hoping to receive maintenance dredging for the Searsport federal navigation channel in 2020. The U.S. Army Corps of Engineers is working with Sprague Energy to find a solution for upland sediment disposal at Mack Point Terminal for the Searsport channel dredging. Eastport hopes to achieve its goal of exporting Phyto-sanitized wood chips which, if successful, could involve expansion of infrastructure to meet demand. Development activities under each of these initiatives, if approved and funded, would likely occur over the next five years.

Liquid natural gas (LNG)

No change in Existing Facilities - There are no LNG import or export facilities on Maine's coast.

Decrease in Proposed Facilities: In 2016, FERC dismissed without prejudice the Downeast LNG terminal proposal then proposed as a bi-direction (import and export) LNG facility in Robbinston due to lack of progress toward application completion. No application for an LNG import or export facility is anticipated during this assessment period.

Energy Facilities

Oil and gas

No change in either Existing or Proposed Facilities: There are no existing oil and natural gas refining, development or production facilities in Maine and none are anticipated. A 2019 state law (P.L. 2019, Chapter 294, section 2) prohibits DEP from authorizing in any way any oil or natural gas exploration, development, or production in, on, or over state waters or transfer of oil or natural gas to or from state waters if the oil or gas was produced in the North Atlantic Planning Area, the federal OCS area proximate to state waters, where there are now no existing or proposed hydrocarbon leasing, exploration, or development-related activities, with an exception allowing import and transport of petroleum products, e.g., home heating oil and gasoline for cars, into and within the state. The U.S. Energy Information Administration (USEIA) reports that Maine remains one of the nation's most petroleum-dependent states. Many in Maine's largely dispersed population use oil for heating and, as elsewhere, gasoline for transportation. There are two power plants in the coastal zone which burn oil to produce electricity relatively infrequently as peaking facilities.

Coal

No change in either Existing or Proposed Facilities: There are no existing or proposed energy facilities in Maine's coastal zone that use coal as their sole or primary fuel. USEIA reports that only Vermont and Rhode Island use less coal than Maine. There is a 102 MW power plant which uses coal along with wood for power generation and a paper mill whose wood waste-fueled power generators use coal as a backup fuel.

Nuclear

No change in either Existing or Proposed Facilities: There are none existing or proposed nuclear power plants in Maine.

Wind

No change in Existing Facilities: Fox Islands Wind LLC 's three-turbine project in Vinalhaven remains the only commercial-scale wind power facility in the coastal zone.

Increase in Proposed Facilities: A floating wind turbine demonstration project, Maine Aqua Ventus, which has been proposed for siting in state waters off Monhegan Island and which would use a floating platform designed by the University of Maine, remains in the R&D phase. BOEM's Gulf of Maine Intergovernmental Task Force has potential to result in federal designation of one or more Wind Energy Areas on the Gulf of Maine. This effort, along with Governor Mills' policies addressing climate change in part by moving the state to meeting its electric power demand with 100% renewable sources by 2050, and general market conditions and technological advancements may be expected to spur increased interest among developers over the next five years in siting grid-scale offshore wind energy developments in OCS areas in the Gulf of Maine and potentially proximate to Maine's coastal waters. Although there have been press accounts indicating developers are exploring options for siting land-based wind projects in the coastal zone in Downeast Maine, no such project proposal is under active discussion with state regulators.

Wave

No change in either Existing or Proposed Facilities: There are no existing or proposed wave power projects in Maine's coastal zone and none are anticipated. Studies have indicated that Maine does not have a promising wave power resource.

Tidal

Increase in Existing Facilities: In 2012, the first grid-connected in-stream tidal power project in the U.S., Ocean Renewable Power Company's (ORPC) facility in Eastport, came on line. Off-line for several years after a mechanical failure necessitated significant re-design, the project is slated to be back up and running in 2020.

Increase in Proposed Facilities: In 2020, ORPC is expected to file state and federal permit applications for a larger-scale tidal power project in Western Passage, also in the Eastport area, which has a commercially-significant tidal power resource. A proposal to site a tidal barrage project on Pennamaquan River in Cobscook Bay region which was active during the prior 309 assessment period has been discontinued by the developer.

Current (ocean, lake, river)

No change in either Existing or Proposed Facilities: There are no projects of this kind existing or proposed in Maine's coastal zone.

Hydropower [update pending]

No change in Existing Facilities. No new FERC-licensed hydropower projects have come on line in the last five years.

No change in Proposed Facilities:

Four projects in the coastal zone - Ellsworth Hydro, FERC no. 2727 (Union River); America First Hydro, FERC no. 14856 (lower Mousam River); Green Lake Hydro, FERC no. 7189 (Reed Brook), and Rollinsford Hydro, FERC no. 3777 (Salmon Falls River) - are engaged in FERC's relicensing process. No other hydro projects in the coastal zone are slated to begin the FERC relicensing process prior to 2025. There are no current proposals for new hydropower facilities in the coastal zone other than the tidal power facilities discussed above.'

Ocean thermal energy conversion

No change in either Existing or Proposed Facilities: There are none in Maine's coastal zone and proposal of such a project is not anticipated.

Solar

Increase in Existing Facilities. The Solar Energy Industries Association (SEIA) reports that in 2019 Maine had 60.34 MW of installed solar power and that 11.38 MW was installed in 2018 and ranks 42nd in that nation in terms of installed capacity. As noted in the prior 309 assessment, in early 2015 an estimated

10.4 MW of solar had been installed in Maine, almost all over the prior years. To date, solar power in Maine has been a distributed energy resource. Maine currently has no grid-scale solar power facilities on-line.

Increase in Proposed Facilities: SEIA estimates that solar capacity in Maine will continue to grow and projects an additional 849.47 MW will be added over the next five years. This is a notable increase over the growth in this sector projected in the prior 309 assessment. While SEIA ranks Maine low among states in terms installed capacity as noted above, it places the state in the middle of the pack (28th) in terms of projected growth. Pursuant to a state law enacted in 2019, the Maine Public Utilities Commission (PUC) is directed to issue power purchase agreements for 125 MW of distributed solar power from projects of 5 MW or less, environmental approvals for which must be in hand this year for a project to qualify. There is significant interest in the program. Under another state program, PUC is directed to purchase 1,000 MW of solar power from grid-scale projects which are anticipated to be built within the next five years. Significant additional solar power is expected to come on-line through state net-billing policies which allow businesses to effectively purchase distributed solar power unused by its generator.

Biomass

Decrease in Existing Facilities: Since 2015, biomass plants in West Enfield, Fort Fairfield, Ashland, and Jonesboro (only the latter is in the coastal zone) have closed. (The West Enfield and Jonesboro facilities remained licensed to operate and could theoretically restart at any time.) ND Paper purchased the now-closed pulp and paper mill in Old Town (not in the coastal zone) and is in the process of restarting operations which have included biomass generation. Two small biomass fired units (each about 8 MW, neither in the coastal zone) have been licensed in the last few years and are now operational.

Minor Change in Proposed Facilities: There are no biomass facilities proposed in the coastal zone. In Maine, biomass facilities have often been associated with industrial papermaking operations which overall are experiencing an economic downturn due to societal migration away from paper, international competition, and other factors. The biomass industry appears to be evolving. In Maine over the next five years, growth for some types of facilities, such as those associated with lumber mills, may be foreseeable. Such growth seems more likely outside the coastal zone, in inland areas closer to large-scale sources of wood and wood waste.

2. *If available, briefly list and summarize the results of any additional state-specific information, data, or reports on the status and trends for energy facilities and activities of greater than local significance in the coastal zone since the last assessment.*

   State of Maine Comprehensive Energy Plan

   The State updated the State Energy Plan in January 2015 http://maine.gov/energy/pdf/2015%20Energy%20Plan%20Update%20Final.pdf This plan focuses on residential energy costs, expanded mass transportation and related alternative fueling options, and expanded access of natural gas. It has not been amended since 2015. However, several major, bi-partisan legislative changes in 2019 as well as energy policy-related legislative and rule changes reasonably foreseeable over the next five years may result in notable revisions in the overall state energy plan. See, e.g., discussion regarding the Maine Climate Council and RPS standard in the Enhancement Priority Area section below. See also discussion above regarding state recent statutory incentives for development of solar power.

3. *Briefly characterize the existing status and trends for federal government facilities and activities of greater than local significance in the state's coastal zone since the last assessment.*

   There have been no marked changes in the general nature of activities related to federal government facilities since the last assessment. State and local authorities continue redevelopment activities at the Brunswick Naval Air Station, closed as recommended by the federal Base Closure and Realignment Commission (BRAC) before the prior 309 assessment. The Navy continues to maintain and make improvements to the Portsmouth Naval Shipyard's facilities. Review of these actions remains a significant part of the federal consistency review-related work of DEP's southern Maine regional office. There have been no significant new federal facilities built or proposed in the coastal zone since the last 309 assessment.

   Energy infrastructure-related development proposals, which are discussed above, continue to be the main category of foreseeable "activities of greater than local significance" potentially in or affecting the coastal zone. Given the strong and growing interest among lawmakers in in-state ocean-based and other renewable energy sources both to address climate change and to transition and grow the state economy, proposals for renewable energy facility siting in or potentially affecting the coastal zone are reasonably foreseeable. The work of BOEM's Gulf of Maine Interagency Renewable Energy Task Force, which BOEM convened at New Hampshire's request, has potential to result in designation of one or more Wind Energy Areas in the Gulf of Maine. The University of Maine-led Aqua Ventus floating wind turbine technology demonstration project also has potential to spark commercial interest in siting grid-scale floating wind farm(s) in deep waters off Maine's coast.

   As with other development, the adverse effects and changes stemming from energy-related development are experienced locally, while its benefits may be realized more broadly, at a state or regional scale. Consequently, proposals for siting large-scale energy facilities and related infrastructure, such as transmission lines, may be expected to be controversial.

Management Characterization:

1. *Indicate if the approach is employed by the state and if significant state-level changes (positive or negative) that could facilitate or impede energy and government facility siting and activities have occurred since the last assessment.*

2.

Management Category	Employed by State (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	Y	Y[20]	N
State comprehensive siting plans or procedures	N	N/A	N

3. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

N/A

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High _____
Medium __X__
Low _____

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

Current public and private sector interest in energy infrastructure development and related public policy issues is likely to continue and increase in the foreseeable future at the global, national, regional, state, and local levels. This is due in no small part to growing recognition of the immediate need to reduce greenhouse gas emissions to forestall the potentially catastrophic ecological, economic, and social consequences and existential threat of climate change. Comparable interest and activity regarding government facility siting is not anticipated. However, Maine policymakers' increasing focus on sea-level rise and other climate change-related issues, as noted below, is likely to increase consideration by the state and local governments of how best to ensure that public infrastructure developments are sited, designed, and built in ways that reflect the best available information regarding reasonably foreseeable climate change-related effects.

There is apparent interest in Maine's private sector and non-governmental organizations to build on progress to date and optimize the environmental and economic benefits to the state in the renewable ocean energy sector, particularly those regarding deep-water ocean wind and tidal power. At the

[20] The State (DEP) supports local implementation of the Mandatory Shoreland Zoning Act and, in a few instances, Site Law, under which a qualified municipality may exercise delegated authority.

initiative and with the leadership of Governor Mills, the state enacted laws in 2019 to create the Maine Climate Council and to increase Maine's renewable energy portfolio standard (RPS) from its current 40% to 80% by 2030 and 100% by 2050. The Maine Climate Council is tasked with making recommendations on how to reduce the state's greenhouse gas emissions by 80% by 2050 and 45% by 2030 in addition to other related policy objectives. With members and multiple, topic-specific working groups, including one focused on energy policy, the Council embodies its commitment to broad and diverse stakeholder input in charting a course for Maine's future. These and other new (see discussion of solar power incentives above) and foreseeable subsequent, related law and policy changes may be reasonably anticipated to result in systemic changes in state policy and law regarding energy and infrastructure development.

State-level public policy changes regarding renewable ocean energy and other energy facilities would likely focus in large part on economic and public utilities-related matters regarding which there is not a central role for the Maine Coastal Program (MCP) and which are under the purview of the Governor's Energy Office, Public Utilities Commission, and other agencies, industry organizations, and non-governmental entities. This factor, not the importance of the state policy regarding energy facilities siting, accounts for its medium priority ranking in this assessment. That said, significant policy work remains to be done to address federal-state coordination and other key issues to facilitate efficient and well-sited development of renewable ocean energy facilities, particularly in federal waters. MCP anticipates this will be a key topic for consideration by BOEM's Gulf of Maine Interagency Renewable Ocean Energy Task Force which began meeting in late 2019 and which will provide opportunities for stakeholder input at various points throughout its deliberations. MCP anticipates providing staff support for senior DMR leadership serving on the Task Force on various matters including stakeholder engagement. The Task Force's recommendations regarding ocean wind energy facility siting and related matters may result in policy options for consideration by state law makers and agency decision makers.

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Aquaculture

CZMA Section 309 Enhancement Objective: *Adoption of procedures and policies to evaluate and facilitate the siting of public and private aquaculture facilities in the coastal zone, which will enable states to formulate, administer, and implement strategic plans for marine aquaculture. §309(a)(9)*

PHASE I (HIGH-LEVEL) ASSESSMENT:
Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

Resource Characterization:

1. *In the table below, characterize the existing status and trends of aquaculture facilities in the state's coastal zone based on the best-available data. Your state Sea Grant Program may have information to help with this assessment.*[21]

Status and Trends of Aquaculture Facilities and Activities

Type of Facility/Activity	Number of Facilities[22]	Approximate Economic Value	Change Since Last Assessment (unknown)
Finfish Leases	25 (637 acres)	confidential	Very slight increase in acreage, same # facilities
Shellfish Lease	91 (716 acres)	$11.2M	Moderate increase
Marine Algae Lease	69 (69 acres)	confidential	Significant increase
Limited Purpose Aquaculture License	596 (each site=400 sq ft)	Included in total revenues above by species	Significant increase

2. *If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends or potential impacts from aquaculture activities in the coastal zone since the last assessment.*

   Maine Aquaculture Economic Impact Report:
   A collaboration between the University of Maine and the Maine Aquaculture Association, this report summarizes economic impact of Maine's aquaculture sector, including direct vessel revenues, jobs, and indirect/supply chain revenue and jobs.
   https://umaine.edu/aquaculture/wp-content/uploads/sites/134/2017/01/Aquaculture-Econ-Report.pdf

[21] While focused on statewide aquaculture data rather than just within the coastal zone, the *Census of Aquaculture* (*www.agcensus.usda.gov/Publications/Census_of_Aquaculture/*) may help in developing your aquaculture assessment. The census is conducted every 10 years and the last report was released in 2013. The report provides a variety of state-specific aquaculture data to understand current status and recent trends. .

[22] Be as specific as possible. For example, if you have specific information of the number of each type of facility or activity, note that. If you only have approximate figures, note "more than" or "approximately" before the number. If information is unknown, note that and use the narrative section below to provide a brief qualitative description based on the best information available.

Maine Farmed Shellfish Market Analysis:
The Gulf of Maine Research Institute conducted a market analysis to support its work with Focus Maine, a private-enterprise initiative to promote economic growth in three key sectors in Maine. This work assesses potential markets for increased shellfish aquaculture production.
https://www.gmri.org/sites/default/files/resource/gmri_farmed_shellfish_final_with_cover_10.13.16.pdf

Edible Seaweed Market Analysis:
The Island Institute conducted a market analysis as interest in marine algae aquaculture has increased dramatically in Maine in recent years. In particular, kelp aquaculture is being promoted, through Island Institute programming and elsewhere, as a diversification opportunity for lobster fishermen. The kelp grow-out season is during the winter, when fishing activity slows considerably, and harvest occurs in the late spring prior to fishing picking back up.
http://www.islandinstitute.org/resource/edible-seaweed-market-analysis

Sustainable Ecological Aquaculture Network project database:
This EPSCoR project includes four research themes: Carrying Capacity, Changing Environment, Aquaculture Innovation, and Human Dimensions. Project information is available online.
https://umaine.edu/aquaculture/seanet-award/projects/

Maine Aquaculture: 2020 Research, Development & Education Priorities:
This report was produced by the Maine Aquaculture Innovation Center, in collaboration with Maine Aquaculture Association, Maine Sea Grant, and the University of Maine's Aquaculture Research Institute. This report is based on the research priorities survey conducted in June 2019 of Maine's aquaculture community, and is compared with surveys from 2012 and 2016 to look at trends.

Management Characterization:

1. *Indicate if the approach is employed by the state or territory and if there have been any state- or territory-level changes (positive or negative) that could facilitate or impede the siting of public or private aquaculture facilities in the coastal zone.*

Significant Changes in Aquaculture Management

Management Category	**Employed by State or Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Aquaculture comprehensive siting plans or procedures	No	No	No
Other aquaculture statutes, regulations, policies, or case law interpreting these	Yes	Yes	Yes

2. *For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:*
    a. *Describe the significance of the changes;*
    b. *Specify if they were 309 or other CZM-driven changes; and*
    c. *Characterize the outcomes or likely future outcomes of the changes.*

Aquaculture continues to grow in Maine and accordingly, the state continues to revise statutes and rules regularly in order to facilitate appropriate growth in the sector. Since the previous assessment, a number of statutory and regulatory changes have been made to the aquaculture leasing and licensing program to improve the efficiency of application review, increase opportunities for meaningful public engagement in the lease evaluation process, and facilitate compliance with regulations and lease conditions.

Public Law 2017, Chapter 159 statutory changes included: removal of a prohibition on the provision by the Department of Marine Resources of promotional and marketing assistance to the aquaculture industry; extension of the potential term of an aquaculture lease from 10 to 20 years; creation of a process by which a holder of a standard lease could seek an expansion of the lease area by up to 10% once during the duration of the lease without having to apply for a new lease; educational requirement for Limited-Purpose Aquaculture license holders; and public health provisions to ensure alignment with the National Shellfish Sanitation Program's model ordinance.

Public Law 2017, Chapter 296 created an aquaculture license. The holder of this license is exempt from certain requirements in law to hold a separate license for the removal, possession, transport or sale of cultured marine organisms and authorizes the holder to remove, possess, transport or sell cultured marine organisms.

In 2019, regulatory changes were made to clarify the aquaculture leasing regulations, including the elimination of redundant language from 12 M.R.S.A. §6072, 6072-A, and the Maine Administrative Procedures Act, elimination of duplicative references to the National Shellfish Sanitation Program (NSSP) Model Ordinance, and added/modified provisions based on the NSSP. The regulations also made several changes to the leasing procedures for standard and limited-purpose aquaculture leases, including the adjustment of the timing for the scoping session, the information required to be submitted regarding an applicant's financial capability, and a prohibition on the siting of leases within the 300:1 dilution zone around a wastewater treatment plant. These regulations also: enacted lease expansion application procedures in accordance with 12 M.R.S.A. §6072(12-C), a statutory change made in 2017; restricted the number of pending limited-purpose lease applications any one applicant could have in process to two applications; clarified that an emergency lease could be utilized when the safety of the consumer is threatened, as well as that of the shellfish or animal; and clarified and established additional minimum lease maintenance standards.

Additional legislative changes meant to further improve the leasing and licensing program are currently pending for this program.

Enhancement Area Prioritization:

1. *What level of priority is the enhancement area for the coastal management program?*

High _____
Medium _____
Low __x___

2. *Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

The Governor, Department of Marine Resources (DMR) and constituents agreed that aquaculture is very important, but that Maine Coastal Program is likely not the best program to work in this area. In the last few years, MCP has provided bridge funding for DMR's Aquaculture program to hire a technical support position to administer the Limited Purpose Aquaculture licensing program and help support the early phases of lease application review. The Maine Coastal Program will also continue to work on issues in other priority enhancement areas that overlap and are important aquaculture, such as cumulative impacts of development (water quality) and ocean acidification. These efforts may assist in the expansion of the aquaculture industry in Maine.

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Coastal Hazards

In-Depth Resource Characterization:
Purpose: To determine key problems and opportunities to improve the CMP's ability to prevent or significantly reduce coastal hazard risks by eliminating development and redevelopment in high-hazard areas and managing the effects of potential sea level rise and Great Lakes level change.

1. Based on the characterization of coastal hazard risk, what are the three most significant coastal hazards within your coastal zone? Also indicate the geographic scope of the hazard, i.e., is it prevalent throughout the coastal zone, or are there specific areas most at risk?

	Type of Hazard	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Hazard 1	Shoreline Erosion	2000+ miles of coastal dunes, beaches, marshes, and coastal bluffs are eroding with land loss threatening development and existing natural resiliency
Hazard 2	Coastal Flooding	Coastwide superstorm about 2.5 feet higher than 1% FIRM level with low awareness and preparedness for the risk statewide
Hazard 3	Sea Level Rise	Nuisance flooding frequency up 15-fold over 20th century and expanding by 370 acers/year statewide; tides 1.5 feet over year 2000 level projected for 2050; 3-5 feet very likely by 2100 with 10 feet a possible extreme level

2. Briefly explain why these are currently the most significant coastal hazards within the coastal zone. Cite stakeholder input and/or existing reports or studies to support this assessment.

Shoreline Erosion
Maine's 2015 309 Assessment found that about 13% (677 miles) of Maine's total coastline is classified as highly or very highly vulnerable to shoreline erosion. An additional 1,200 miles of bluffs may become erosional with higher tides. These areas are limited to coastal sand dunes (including beaches) and erodible bluff shorelines. MGS continues to monitor beach and dune changes through the Maine Beach Mapping Program (MBMAP)[1] at 33 beaches in 15 different municipalities in southern and mid-coast Maine. MBMAP continues to monitor the edge of dune vegetation and has been updated to include monitoring of changes in the mean high water (MHW) line and the dry beach width (the distance from the MHW to the vegetation line or coastal engineering structure). MGS digitized (a) coastal engineering structures along York and Cumberland County (Kittery to South Portland) and (b) dune-beach shorelines. Based on these data, about 28% of Maine's sandy beach shoreline is measurably eroding, while 43% is "stable due to armoring" yet over 80% of the coastal engineering structures and 60% of dune crests are below the FEMA base flood elevation [2].

Maine is also concerned about the potential impacts of long-term sea level rise and short-term storm events on the erodible bluff shoreline, which comprises about 33% (1874 miles) of mapped shorelines. A NOAA Project of Special Merit titled *Building Resiliency along Maine's Bluff Coast*[3] developed better predictive models relating to bluff response (and landslide hazard) to increased sea levels and storms, along with a range of products for assessing bluff stability and case studies[4]. MGS conducted a

pilot landslide study within Casco Bay, where approximately 250 coastal slope failure sites were identified using newly available LiDAR data. Previously only 118 identified landslide sites had been identified in this populated section of Maine coast[5]. Recent MGS research has identified multiple ways landslides occur by erosion at the toe of the slope[6].

About 13% (677 miles) of Maine's coastline is classified as highly or very highly vulnerable to shoreline erosion. These areas are generally limited to coastal sand dunes (including beaches) and erodible unstable or highly unstable bluffs. Through the Maine Beach Mapping Program (MBMAP), MGS monitors around 21.4 miles of sandy beaches and dunes in southern and mid-coast Maine. In addition, MGS has also either measured with GPS or digitized approximately 16 additional miles of seawall within and adjacent to these sandy beach areas. Based on these data, about 28% of Maine's sandy beach shoreline is measurably eroding, while 43% is "stable due to armoring." Coastal dunes "stabilized" are often lower[2] than the FEMA special flood hazard area elevation and thus could be prone to failure and inducing rapid erosion and flooding hazards to adjacent development.

Sea Level Rise and Flooding
Maine's 2021 Phase I assessment showed that about 42% (2,284 miles) of Maine's coastline is highly or very highly vulnerable to long-term sea level rise, and in turn, short-term coastal inundation. These numbers do not include regions of the coastal zone that may be vulnerable to freshwater flooding during precipitation events, which remains an unquantified hazard. Areas vulnerable to both sea level rise and inundation include all of Maine's mapped coastal sand dunes, coastal wetlands, other low-lying areas (such as developed waterfront areas or low-elevation freshwater wetlands), and unstable sediment bluffs.

In 2019, the Maine Geological Survey completed state-wide mapping of the Highest Astronomical Tide (HAT)[7] in support of Shoreland Zoning, the King Tide boundary, and as the foundation for sea level rise projections. MGS developed Maine-specific sea level rise projections using NOAA[8] and U.S. Army Corps of Engineers modeling[9] adapted to the region for the Maine Climate Council[10]and summarized in a draft report[11]. Scenarios of 1.6, 3.9, 6.1, 8.8, and 10.9 feet of static sea level rise (or storm surge) on top of the HAT are mapped for the entire Maine coast[12]. MGS and the U.S. Army Corps of Engineers collaborated to create hurricane inundation maps for categories 1-4 and MGS produced an online viewer[13] to show the inland extent of hurricane surge. Derivative map products were made for emergency managers in Lincoln County[14].

Through two NOAA-funded Projects of Special Merit, staff have developed (1) sea level rise and storm surge vulnerability assessments for marsh systems[15] (2) a tool for land-use development and land-conservation planning[16] and (3) sea level rise planning for coastal state parks and historic sites[17].

3. Are there emerging issues of concern, but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.

Emerging Issue	Information Needed
Damage from wave runup and overtopping	Combined flood and erosion modeling
Future coastal floodplain extent	Dynamic modeling of wave runup at higher sea level scenarios for 2050 and 2100

In-Depth Management Characterization:

Purpose: To determine the effectiveness of management efforts to address identified problems related to the coastal hazards enhancement objective.

1. For each coastal hazard management category below, indicate if the approach is employed by the state or territory and if there has been a significant change since the last assessment.

Significant Changes in Coastal Hazards Statutes, Regulations, and Policies

Management Category	**Employed by State/Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Change Since the Last Assessment** (Y or N)
Shorefront setbacks/no build areas	Y	Y	Y
Rolling easements	Y	N	N
Repair/rebuilding restrictions	Y	N	N
Hard shoreline protection structure restrictions	Y	Y	N
Promotion of alternative shoreline stabilization methodologies (i.e., living shorelines/green infrastructure)	Y	Y	Y
Repair/replacement of shore protection structure restrictions	Y	Y	N
Inlet management	N	N	N
Protection of important natural resources for hazard mitigation benefits (e.g., dunes, wetlands, barrier islands, coral reefs) (other than setbacks/no build areas)	Y	Y	N
Repetitive flood loss policies (e.g., relocation, buyouts)	N	N	N
Freeboard requirements	Y	Y	Y
Real estate sales disclosure requirements	N	N	N
Restrictions on publicly funded infrastructure	Y	N	N
Infrastructure protection (e.g., considering hazards in siting and design)	Y	Y	Y
Other (please specify)			

Significant Changes to Coastal Hazard Management Planning Programs or Initiatives

Management Category	Employed by State/Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Change Since the Last Assessment (Y or N)
Hazard mitigation plans	Y	N	Y
Sea level rise/Great Lake level change or climate change adaptation plans	Y	Y	Y
Statewide requirement for local post-disaster recovery planning	N	Y	N
Sediment management plans	Y	N	Y
Beach nourishment plans	Y	N	Y
Special Area Management Plans (that address hazards issues)	N	N	N
Managed retreat plans	Y (dunes)	N	N
Other (please specify)	Y	N	N

Significant Changes to Coastal Hazard Research, Mapping, and Education Programs or Initiatives

Management Category	Employed by State/Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Change Since the Last Assessment (Y or N)
General hazards mapping or modeling	Y	Y	Y
Sea level rise mapping or modeling	Y	Y	Y
Hazards monitoring (e.g., erosion rate, shoreline change, high-water marks)	Y	Y	Y
Hazards education and outreach	Y	Y	Y
Other (Living Shorelines)	Y	Y	Y

Discussion of Significant Changes

Shorefront Setbacks/No build areas – With support from MGS, the Town of Cape Elizabeth redefined its Shoreland Zoning setbacks to be measured from a newly defined "normal high water line". Instead of using the highest annual tide, it adopted using the Highest Astronomical Tide plus 3 feet.

Promotion of alternative shoreline stabilization methodologies (i.e., living shorelines/green infrastructure) – MCP and MGS continued to promote alternative shoreline stabilization methodologies in Maine through work through several NOAA-funded efforts. Working with several different project partners, Maine completed a project focusing on bluff shorelines in Casco Bay, and developed several different outputs useful for coastal decision-makers and stakeholders, including decision support tools for bluff evaluation and management, a Coastal Planting Guide, and a living shoreline suitability viewer for Casco Bay.

Working with the other New England states (NH, MA, CT, RI), NROC, and The Nature Conservancy through a Regional Resilience Grant, a Living Shorelines in New England: State of the Practice report was generated, along with specific guidance on living shorelines applications in coastal New England and a Living Shorelines stacker. This phase of work also generated valuable information on challenges and opportunities for implementing living shorelines in New England, which led to a second-funded phase of work on implementing and monitoring living shorelines. Maine's project entails the selection, design, and permitting of living shoreline demonstration treatments in Casco Bay that beneficially reused naturally occurring materials (in this case, trees and oyster shells). Construction of demonstration sites is slated for May 2020.

Maine also created a Coastal Structure and Dune Crest Inventory and Overtopping Potential viewer which documents the extent of shoreline engineering structures and natural dune crests in coastal areas of York and Cumberland County, and also determines the relationship of structure/dune crests with base flood elevations from FEMA flood maps.

Freeboard Requirements – working with partner RPOs, several municipalities developed increased freeboard requirements in their local floodplain management program ordinances. This included the communities of York (2 feet above BFE), and Saco and Damariscotta (3 feet above BFE).

Infrastructure protection (e.g., considering hazards in siting and design) - MCP and MGS completed a Project of Special Merit focused on determining vulnerability of 10 public working waterfronts in Penobscot Bay to flooding and sea level rise. The project included determining applicable adaptation measures for existing and future identified vulnerabilities to critical infrastructure, and simplified costs associated with those adaptation measures. Through an MPAP Coastal Community Grant (CCG), MCP and MGS supported the Lincoln County Planning Commission in a waterfront resiliency effort in Boothbay Harbor, which focused on public and private infrastructure. Other CCG funded efforts in Lincoln County focused on determining vulnerability and adaptation of wastewater treatment plant infrastructure in Boothbay Harbor and Wiscasset.

Hazard Mitigation Plan Updates – In 2018 Maine conducted a State Risk Assessment that included natural and built environments. This effort resulted in an updated State Hazard Mitigation Plan in 2019 including coastal erosion, mass wasting, hurricanes, winter storms, and historical sea level rise.

Sea level rise/Great Lake level change or climate change adaptation plans – Under the leadership of the Governor's Office, the Maine Climate Council was formed. The Council is tasked with developing mitigation strategies to meet state emissions reduction requirements in all sectors of the economy, with a focus on Maine's transportation, electricity, and buildings sectors, and resilience strategies that will make Maine people, industries, and communities resilient to the impacts of climate change.
MCC includes a Science and Technical Subcommittee which released a Scientific Assessment of Climate Change and Its Effects in Maine, Phase I Working Document (PDF) and many Working Groups, including: Energy; Transportation; Buildings, Infrastructure and Housing; Coastal and Marine; Natural and Working Lands; and Community Resilience Planning, Public Health and Emergency Management. Each group is tasked with developing specific recommendations for each of their sectors for consideration by the Council.

Maine also completed a NOAA-funded Project of Special Merit which focused on the vulnerability and resiliency of its working waterfronts in the Penobscot Bay region. Critical working waterfront

infrastructure from ten different communities (Belfast, Camden, Castine, Lincolnville, Northaven, Vinalhaven, Rockland, Searsport, South Thomaston, and Stonington) was selected for detailed engineering analysis for existing and potential future (1, 2 and 4 feet SLR) flood vulnerabilities. Site-specific reports, including engineering and adaptation plans (including estimated costs) were developed for the municipalities. Several education and outreach workshops (in-person and online) were held to disseminate results from the reporting and provide follow up.

Sediment management plans – MCP and MGS began monitoring sediment movement near three federal dredge/beach nourishment locations in Wells, Saco, and Scarborough as part of a NOAA-funded Project of Special Merit. This project uses offshore and nearshore bathymetric mapping in conjunction with UAS subaerial beach mapping in order to determine the fate of nourishment materials to help better optimize beach nourishment design and regional sediment management programs.
Beach nourishment plans – (see above). Maine also completed Protecting Maine's Beaches for the Future: 2017 Update which documents the need for and develops new strategies for implementing a statewide beach nourishment program. Maine also updated its Chapter 418 - Solid Waste Management Rules: Beneficial Use of Solid Wastes which documents procedures for the beneficial reuse of dredged materials for beach nourishment. Imported marine sediment must meet EPA contaminant thresholds.
General hazards mapping or modeling – as described under *Promotion of alternative shoreline stabilization methodologies (i.e., living shorelines/green infrastructure*, many new products and viewers were created relating to coastal bluffs and living shorelines.
Sea level rise mapping or modeling – MGS completed mapping of the Highest Astronomical Tide for the Maine coastline. It also released new regionalized sea level rise scenarios (1.2, 1.6, 3.9, 6.1, 8.8 and 10.9 feet) consistent with the latest work from NOAA (2017) along the entire Maine shoreline and released the Sea Level Rise/Storm Surge Viewer. The Maine Natural Areas Program (MNAP) used a 1-m SLR scenario to develop a Coastal Undeveloped Habitat Blocks Viewer to help guide land conservation organizations with acquisition priorities.

Hazards monitoring (e.g., erosion rate, shoreline change, high-water marks) – Maine continues to monitor beach and dune erosion through its Maine Beach Mapping Program, with updated information released annually to the public. The Southern Maine Beach Profiling Program (SMBPP) continues to collect monthly beach profile data at many of southern Maine's beaches. MGS recently migrated the database supporting this program to its MGS Collect page.
In conjunction with the Maine Silver Jackets Team, MGS and MCP worked with the communities of York and Portland to institute a high water marks program which re-established benchmarks from the 1% storm event (February 1978 along with other local storm events) and translated those marks to publicly accessible locations where signs were developed and placed. Marks and signs were developed to incorporate low to extreme (1-4 feet) sea level rise scenarios by 2050. Currently, the Maine Team is working with South Portland, Scarborough, and Belfast to re-establish marks in their communities and expand public outreach by developing newer signs and artistic murals which will be placed at strategic, publicly accessible areas of the community.

Hazards Education and Outreach – in conjunction with its NOAA Coastal Management Fellow (2015-2017), MGS and MCP created the Maine Flood Resilience Checklist, a community self-assessment guide which helps municipalities determine vulnerabilities of different key environments (built, social, natural) to existing and future flood hazards. Training was provided by MPAP to regional planning organization (RPO) staff and several NGO organizations (Island Institute) so that additional resources in each coastal region could be used to support completion of the checklist by municipalities.

MGS continued to provide education and outreach on coastal hazards at the municipal, regional, and state levels by providing over 50 presentations during the assessment period to a variety of coastal stakeholders and decision-makers. MGS also provides technical support to many communities who have received Coastal Community Grants from MPAP.

Living Shorelines – as described previously, MCP and MGS are participating in a regional resilience effort on demonstration treatments for living shorelines in Casco Bay, Maine. To support this and other living shoreline efforts in the region, MGS created a Living Shoreline Decision Support Tool for Casco Bay. This tool is meant to help guide stakeholders determine suitability of living shoreline applications, and accounts for a variety of factors (fetch, nearshore bathymetry, landward and seaward shoreline types, relief, slope and aspect).

2. Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's management efforts in addressing coastal hazards since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's management efforts?

In 2017, NOAA completed a 312 review of MCP for the period October 2009-May 2017. This review included numerous accomplishments and recommendations relating to coastal hazards and resilience. Findings indicated that the MCP has been a leader in building coastal resilience through conducting and supporting research to improve understanding of localized impacts of coastal hazards including sea level rise, conducting outreach and education with local communities, and assisting local communities through funding and technical support to improve their coastal resilience.

Research into the socio-ecological resilience of Maine communities was published in 2019[18]. Using ecological, social, and economic metrics for coastal communities, strengths and weaknesses in comprehensive plans were evaluated. Most notably, plans lacked (a) sea level rise, (b) storm surge, (c) coastal hazard awareness. Existing plans were soundly based in (a) preservation of natural systems, (b) understanding of erosion, and (c) floodplain management. This study highlights the need for the Maine 309 program to address technical aspects of storm surge and sea level rise with content that can be applied at the local planning level.

A survey of Maine coastal communities published in 2019 evaluated the most important aspects of climate change planning at the local level[19]. Local leaders identified geospatial data sets and online mapping tools as the top priority need. The second most important need was for technical assistance. This plan provides to meet both top needs identified by Johnson et al. (2019).

Identification of Priorities:

1. Considering changes in coastal hazard risk and coastal hazard management since the last assessment and stakeholder input, identify and briefly describe the top one to three management priorities where there is the greatest opportunity for the CMP to improve its ability to more effectively address the most significant hazard risks. *(Approximately 1-3 sentences per management priority.)*

Management Priority 1: Coastal hazard mapping for the entire Maine coast identifying the geographic area at risk from storms and sea level rise in 2100.

Description: Inundation extent will be from a 4-foot (intermediate) scenario of sea level rise, a 4.8-foot superstorm surge, and a King Tide were presented in a report to the Maine Climate Council[11]. The state needs to prepare to manage hazards from this future superstorm condition, among others. This mapping effort will identify over 63,000 acres of coastal lowlands at risk in a *Sea Level Hazard Area*. Map criteria can be modified if a different alternative scenario selected by the Maine Climate Council in 2021. This product will be the foundation for sea level rise policy, adaptation planning, and resiliency efforts.

Management Priority 2: New Coastal Storm and Sea Level Rise Policies.

Description: In coordination with the Maine Climate Council, develop policies on adaptation, management. At the time of development of this Assessment, the Maine Climate Council (MCC) is developing a Maine Climate Adaptation and Mitigation Plan for submittal to the Maine Legislature in January 2021. Stakeholder outreach and public involvement begins in spring 2020. A Community Resiliency Working Group of the MCC has discussed a broad range of policy, regulatory and non-regulatory approaches as well methods of funding and technical assistance delivery.

Management Priority 3: Create Effective Technical Assistance Networks.

Description: Maine currently has a variety of technical assistance providers, but needs a more effective and coordinated method for technical assistance delivery. MCP funding has supported a coastal geologist and a land use planner, but demand exceeds capacity to meet municipal needs. Finally, the Maine Climate Council will be examining the technical assistance needs of municipalities as it relates to the 4-year state Climate Action Plan due to be released in December 2020.

2. Identify and briefly explain priority needs and information gaps the CMP has for addressing the management priorities identified above. The needs and gaps identified here should not be limited to those items that will be addressed through a Section 309 strategy but should include any items that will be part of a strategy.

Priority Needs	**Need?** (Y or N)	**Brief Explanation of Need/Gap**
Research	Y	Improved understanding of changing storm dynamics creating surge; advance wave modeling for coastal runup and future coastal flood hazard area determination
Mapping/GIS/modeling	Y	Updated sea level scenario mapping as national assessments change; map the hazard area from a superstorm in 2100
Data and information management	Y	Maintain and expand the MGS the coastal hazards and outreach web page; release digital data sets and publications on hazards
Training/Capacity building	Y	MEDEP training on coastal sand dunes, bluffs, and flooding; expand local and regional capacity on use of new data and tools Build capacity for effective delivery of technical assistance to municipalities
Decision-support tools	Y	Implementation of Flood Resilience Checklist with partners; use of sea level rise scenarios for vulnerability and risk assessments

Communication and outreach	Y	Storm damage assessments of natural systems; MEMA and others to do infrastructure damage. Provide storm reports on erosion, washover, flooding extent, and immediate land loss
Other (Partnership to acquire updated information)	Y	Develop a partnership to reacquire full-coast topo-bathymetric lidar and ortho photographs; evaluate 3-D coastal change

Enhancement Area Strategy Development:

1. Will the CMP develop one or more strategies for this enhancement area?
   Yes__X__
   No_____

2. Briefly explain why a strategy will or will not be developed for this enhancement area.

Coastal hazards will not abate and will become more acute over this assessment period and beyond. The Maine Legislature, acting on a bill submitted by Governor Mills, created the Maine Climate Council in 2019. A Maine Climate Mitigation and Adaptation Plan will be created by the Council and delivered to the Legislation in January 2021. The Plan will include recommendations for planning, management, policy development, and adaptation actions based on sound science. Critical leadership is present in Maine to consider significant new policies to prepare for environmental and socio-economic disruption anticipated from coastal hazards.

Ocean Resources

In-Depth Resource Characterization:
Purpose: To determine key problems and opportunities to enhance the ability of state CMP to better address ocean and Great Lakes resources.

1. What are the three most significant existing or emerging stressors or threats to ocean and Great Lakes resources within your coastal zone? Indicate the geographic scope of the stressor, i.e., is it prevalent throughout the coastal zone, or are specific areas most threatened? Stressors can be land-based development; offshore development (including pipelines, cables); offshore energy production; polluted runoff; invasive species; fishing (commercial and/or recreational); aquaculture; recreation; marine transportation; dredging; sand or mineral extraction; ocean acidification; or other (please specify). When selecting significant stressors, also consider how climate change may exacerbate each stressor.

	Stressor/Threat	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Stressor 1	Changing Ocean Conditions: • Temperature fluctuations and trends • SAV loss • Benthic habitat changes • Invasive species	Throughout Coastal Zone

	Stressor/Threat	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
	• Habitat "movement" and movement of commercially important fish stocks • Shell disease, new toxins.	
Stressor 2	Ocean and Coastal Water Quality • Ocean acidification • Nutrient loading • SAV loss	Observed in Casco Bay; potentially in other embayments
Stressor 3	Managing Competing uses of Ocean Space • Commercial fishing • Aquaculture • Offshore energy • Dredging	Throughout Coastal Zone

2. Briefly explain why these are currently the most significant stressors or threats to ocean and Great Lakes resources within the coastal zone. Cite stakeholder input and/or existing reports or studies to support this assessment.

Stressor 1: Changing Ocean Conditions:

New climate scenario models developed for the Gulf of Maine provide figures for forecasted changes in sea level, pH, precipitation, coastal flow, salinity, and temperature that can be used to understand how the marine environment will change for the biological communities living in this space (Gulf of Maine 2050 Symposium). Increased precipitation will lead to increased freshwater and nutrient influx into nearshore areas, both exacerbating nearshore ocean acidification and changing the environmental conditions. Invasive species are likely to expand in range and number.[23] Sea level rise will change the water depth over sensitive marine communities that are light and tide dependent for their growth and health, such as eelgrass, kelp, and rockweed, and on Maine's coast, our coastal communities are at risk of tidal or long-term flooding.[24] In 2019, the Maine Geological Service (MGS) updated a tool to show areas that may flood under different sea level rise scenarios that can be used for community planning based on the most recent regional sea level rise predictions (https://www.maine.gov/dacf/mgs/hazards/slr_ss/index.shtml), noting that the regional predictions are higher than the global predictions because of local changes to sea temperature and ocean circulation.

The Maine Climate Council was formed in 2019 by the Governor's Office of Policy Innovation and the Future in response to the documented climate-driven changes in the State and our communities with the legislative mandate of developing strategies for priority actions by the end of 2020. The Coastal and Marine Working Group within the Council has cited the importance of monitoring for mitigation and adaptation implementation. The Working Group describes coastal ecosystem conservation and restoration is necessary to both mitigate and adapt to critical climate change issues. Furthermore, coastal and marine ecosystem or habitat monitoring and mapping is necessary to determine baselines for carbon storage and carbon capture

[23] Spierre, Susan G. and Wake, Cameron P., "Trends in Extreme Precipitation Events for the Northeastern United States 1948-2007". (2010). The Sustainability Institute. 21. https://scholars.unh.edu/sustainability/21
[24] Scenario Paper: Temperature, Sea Level Rise and Storm Projections. 2019. Lucy Chisholm, Tracey Talbot, William Appleby. Gulf of Maine 2050 Symposium. 23 pp. https://www.gulfofmaine2050.org/wp-content/uploads/2019/11/Gulf-of-Maine-2050-Scenario_Sea-Level-Rise-and-Precipitation.pdf

potential, and modeling or monitoring will help detect changes and inform climate change planning and adaptation strategies. Yet there is increasing awareness and interest in improving coastal restoration practices, and growing recognition of natural ecosystem and biodiversity values for Maine's people, communities, and economy. The Working Group as identified that strategies to the Climate Council and efforts in the state should build upon existing public and private efforts and also identify and develop new strategies to address gaps, including intertidal and subtidal ecosystem restoration and planning, and coordinated local implementation.

Stressor 2: Ocean and Water Quality:

Maine's marine ecosystems are vulnerable to the predicted changes in temperature and chemistry (increasing pH). the Gulf of Maine Research Institute and the University of Maine have established through a peer-reviewed process that the Gulf of Maine is warming faster than 99.85% of the Earth's oceans.[25] Recent research has shown the effect on some of Maine's marine species. For example, increasing water temperature can make some fish species like the summer flounder develop into single gender population[26], deplete oxygen from the water and stress fishes, and force marine animals to change their biological and migration patterns, in turn putting in jeopardy Maine's coastal economies' reliance on seasonal fishing[27]. Recent declines of kelp forests in Southern Maine are likely attributable to climate change driven environmental and biological changes that have dramatically impacted ocean conditions.[28]

Ocean and coastal acidification can lead to declines in shellfish like blue mussels, oysters, and clams[29]. These changes will in turn affect our coastal fisheries and community economies. The Maine Ocean and Coastal Acidification (MOCA) partnership, formed in March 2016 and of which MCP and DMR are members, seeks to implement recommendations of the Ocean Acidification Study Commission[30] and to coordinate the work of governmental agencies and private organizations and citizens who are studying and implementing means to reduce the impacts of or help adapt to ocean and coastal acidification. Through MOCA, partners in the state advance ocean acidification research, communication, and policy efforts. Over the next five years, MOCA and its partners aim to advance the understanding of the effect of ocean acidification on Maine's ecosystems and important local fisheries and advance policy and protection measures to mitigate the impact.

Stressor 3: Managing Competing Uses of Ocean Space:

Maine's largest commercial fishery is the lobster fishery, with 4800 license holders. The spatial footprint of the fishery is substantial, and as other fisheries have waned and lobster has become the dominant fishery in the coastal economy, customary approaches to sharing ocean space have shifted over time. Due to existing reporting requirements, which are limited, the state is limited in its available resources to characterize the scale and activity of this fishery, which dwarfs all other commercial fishing

[25] http://www.seascapemodeling.org/seascape_projects/2014/01/the-gulf-of-maine-is-warming-fast.html.
[26] Induced meiotic gynogenesis and sex differentiation in summer flounder (Paralichthys dentatus). 2008. Heidi R.Colburn, George C.Nardi, Russell J.Borski, David L.Berlinsky. Aquaculture
Volume 289, Issues 1–2, 3 April 2009, Pages 175-180
[27] Mills, KE, AJ Pershing, and CM Hernàndez. 2017. Forecasting the Seasonal Timing of Maine's Lobster Fishery. Front. Mar. Sci.
[28] Rasher, DB, TS Suskiewicz, RS Steneck, JEK Byrnes. 2019. Recovery, range contraction, and the fate of kelp forests in the Gulf of Maine. Gulf of Maine 2050 International Symposium.
[29] Effects of CO2-driven sediment acidification on infaunal marine bivalves: A synthesis. 2017. Author links open overlay panelJeff C.Clements, Heather L.Hunt. Marine Pollution Bulletin
Volume 117, Issues 1–2, 15 April 2017, Pages 6-16
[30] Report of the Commission to Study the Effects of Coastal and Ocean Acidification and its Existing and Potential Effects on Species that are Commercially Harvested and Grown Along the Maine Coast: https://digitalmaine.com/opla_docs/145/

activity on the eastern seaboard. In 2017, Maine commercial harvesters took more than **twice the number of commercial fishing trips** than any other state on the east coast. That same year, Maine harvesters reported 447,523 trips while harvesters from Virginia, the next highest state, reported just 217,940.

Significant growth in the aquaculture industry has led to increased user conflicts in Maine state waters. While total area being used for aquaculture has not increased substantially, the number of small sites has, and this may be the basis for localized concerns about the rate of growth. Similarly, developing conversations around the future of offshore energy require methodologies to understand and evaluate impacts to existing uses. Finally, Maine has experienced increasing concern about coastal dredging projects and the transport of dredge materials to state waters and federal waters disposal sites. DMR's capacity to respond to community concerns and inform project permitting for all of these activities would benefit from additional planning and analytical tools that help assess impacts to existing uses based on objective data and information.

3. Are there emerging issues of concern, but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.

Emerging Issue	Information Needed
Ocean acidification	Monitoring and research, particularly on the impact on the state's two most economically important fisheries (lobster and mollusks)
Impacts of changing ocean conditions on fisheries, e.g., changes in predator/prey relationships, shell disease, new toxins	Research, monitoring, and modeling
Offshore wind energy development	Research, monitoring, and modeling, best practices for stakeholder engagement and siting to avoid use conflicts
Potential selection of a new dredged materials disposal site by the USACOA/EPA[31], and nearshore sand management in state submerged lands	Monitoring of pre- and post-disposal sands to determine sand transport patterns and nearshore beach nourishment potential, and improved intergovernmental coordination and stakeholder involvement.

In-Depth Management Characterization:

Purpose: To determine the effectiveness of management efforts to address identified problems related to the ocean and Great Lakes resources enhancement objective.

1. For each of the additional ocean and Great Lakes resources management categories below that were not already discussed as part of the Phase I assessment, indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred since the last assessment.

[31] Including, but not limited to the Jackknife Ledge Disposal Area off Phippsburg, ME

Significant Changes in Management of Ocean and Great Lakes Resources

Management Category	**Employed by State or Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Ocean and Great Lakes research, assessment, monitoring	Y	N	Y
Ocean and Great Lakes GIS mapping/database	Y	N	Y
Ocean and Great Lakes technical assistance, education, and outreach	Y	Y	N

2. For management categories with significant changes since the last assessment, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information.
    a. Describe significant changes since the last assessment;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

Ocean and Great Lakes research, assessment, monitoring

MCP, DMR and other partners continue to effectively monitor changes in the ocean and coastal environment. The Maine Coastal Mapping Initiative (MCMI), created by the Maine Coastal Program in 2012, is acquiring critical data about the seafloor and our oceanic environment, including bathymetry, sediment information, fauna type and abundance, and water column information. These data promote informed ocean planning and marine use by coastal managers and planners, private industry, fishermen, and researchers.

Ocean acidification continues to be ongoing challenge in the Gulf of Maine. The Maine Ocean and Coastal Acidification Partnership (MOCA) was created in 2016 to implement recommendations of the Ocean Acidification Study Commission (authorized by the 126th legislature) and to coordinate the work between governmental agencies, private organizations and citizens who are studying and implementing ways to reduce the impacts of ocean and coastal acidifications. With many agencies and researches studying ocean acidification, creating a forum to coordinate work, encourage collaboration and to communicate effectively between citizens, elected officials and researches, is crucial to combatting the issues of ocean acidification.

To further these connections and collaborations, The Gulf of Maine 2050 International Symposium which occurred in Portland, ME in November of 2019, brought together scientists from multiple disciplines, municipal planners, NGO's, business owners, community leaders and natural resource managers to examine the future of The Gulf of Maine in the face of rising seas and a changing climate. Plenary speakers delved into issues on acidification, coastal resilience and warming waters. These topics

drove discussions during breakout sessions which fostered the development of shared visions and encouraged collaborations.

To provide a centralized source of information relevant to designing and implementing climate adaption measures, The Maine Climate Change Adaption Toolkit was developed through interagency coordination. The toolkit, created in 2015, provides information on regulations and opportunities to connect with state agencies and practitioners for technical advice and expertise.

These changes were partially CZM Section 309-driven.

Ocean GIS Mapping/Database

From 2015-2020, MCP has actively expanded marine mapping and habitat characterization in Maine in collaboration with our partners including MGS, BOEM, the Submerged Lands Program, and the University of Maine. During that time, between the efforts of MCP and NOAA, there is high-resolution bathymetry data from Kittery to portions of Penobscot Bay, with a gap in outer Casco Bay that MCP is currently working to fill. We have also taken sediment and benthic fauna data to classify habitat within the Coastal and Marine Ecological Classification System (CMECS). Products of this work have included seamless high-resolution bathymetry, backscatter, sediment, and benthic habitat maps that have been used for federal sand and gravel source identification offshore of midcoast Maine and volumetric estimates, nearshore sand transport models to inform beach nourishment management, identification of the current use of leased cable areas under the authority of the Submerged Lands Program, and may in the future be used for identification of offshore energy siting.

Working with regional and federal partners in addition to the Maine Geolibrary Board and Maine Office of GIS, we have advocated for the collection of not only high-resolution bathymetric data products, but also intertidal and nearshore LiDAR data. MCP is currently working with regional and federal partners to combine data for the Gulf of Maine into a seamless multi-resolution bathymetry product that will be used to create a geoform (the physical form of the marine environment) map for the entire Gulf of Maine spanning the coast out to federal waters.

These changes were partially CZM Section 309-driven.

3. Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's or territory's management efforts in planning for the use of ocean and Great Lakes resources since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's or territory's management efforts?

No specific studies have been done to assess the management and planning efforts with regards to the projects undertaken during the previous Section 309 strategy period. For the habitat characterization and mapping work, the primary reason for this lack of performance data is that there have not yet been developments that have required application of these informational tools to support decision making. For the climate adaptation, research and monitoring efforts, results of this work are now being used to inform the work of Maine's Climate Council, established by Governor Mills in 2019. An initial set of recommendations is expected from that body's work in 2020.

For fisheries management plans, work is ongoing to develop a new approach to lobster research that will better inform management decisions in changing environmental conditions. In 2018, the

Department of Marine Resources created the Lobster Research Collaborative (LRC). The LRC was formed through a request for proposals which sought research initiatives that take a collaborative approach toward improved science for the lobster fishery. Six awards were given to research programs that will contribute to an increased understanding of lobster habitat, monitoring and impacts of management actions on the fishery. The LRC is supported by a $500,000 investment from the Lobster Research, Education, and Development Fund. The LRC holds quarterly meetings to share project updates, discuss advances in relevant research and consider issues of the day. Each meeting is attended by researchers, students, policy makers and industry members. The LRC was funded as a two-year effort, but it is anticipated that the collaborations created will continue beyond the duration of the LRC.

Identification of Priorities:

1. Considering changes in threats to ocean and Great Lakes resources and management since the last assessment and stakeholder input, identify and briefly describe the top one to three management priorities where there is the greatest opportunity for the CMP to improve its ability to effectively plan for the use of ocean and Great Lakes resources. *(Approximately 1-3 sentences per management priority.)*

   Management Priority 1: Increased Monitoring of Ocean Acidification and Oceanographic Conditions

   Description: MCP and its partners will continue to work with existing (and identify new) partners to increase the State's capacity to monitor changes in the marine environment and assess how those changes might affect Maine's economy and existing ocean uses.

   Management Priority 2: Spatial Management Tools and Strategies in Shared Waters

   Description: DMR will work with MCP and other relevant state and regional partners to improve our spatial management tools and inform future development and siting of facilities in shared ocean space. Appropriate information to site aquaculture and offshore energy facilities and to inform fisheries management and dredging projects requires strategic engagement with industry partners and stakeholders and improved spatial characterization of commercial activity in ocean space. Additionally, DMR has had some success incorporating spatial management approaches into state water fisheries (e.g. research projects to understand small scale fishing patterns in the urchin fishery) and will be working toward an assessment of their effectiveness and any necessary modifications.

   Management Priority 3: Continued Participation in State and Regional Management Efforts

   Description: MCP will continue to work with the DMR, MGS, and other relevant state partners to address cross-boundary issues that impact the Gulf of Maine, the Northeast region and its user communities, including the Northeast Regional Ocean Council and its Ocean Planning Committee, the Gulf of Maine Council on the Marine Environment, and the Bureau of Ocean Energy Management Task Force process.

2. Identify and briefly explain priority needs and information gaps the CMP has to help it address the management priorities identified above. The needs and gaps identified here do not need to be limited to those items that will be addressed through a Section 309 strategy but should include any items that will be part of a strategy.

Priority Needs	Need? (Y or N)	Brief Explanation of Need/Gap
Research	Yes	Work is needed to unify, standardize, and expand Maine's nearshore monitoring efforts. Better information is needed about impacts of changing ocean conditions on marine resources, particularly species that are of significant economic importance to coastal communities (e.g., lobster, soft-shell clams, scallops, and shrimp).
Mapping/GIS	Yes	Although work during the past five years has greatly improved the availability of high-quality marine seafloor information, bathymetry and habitat information are still lacking for over half of state and federal marine waters. Numerous value-added products can be developed with these data. Specifically, collection of high-resolution bathymetry, backscatter, and spatial marine habitat data will provide the basis for interpreting spatial habitat availability and will be used in marine policy and management.
Data and information management	Yes	Partners in Maine are interested in developing standardized marine habitat definitions at mappable units to provides a geospatial framework to better understand how environmental change will affect coastal Maine ecosystems in the next century. This work has implications for determining how food webs and species complexes will adapt or become compromised during the next century.
Training/Capacity building	No	
Decision-support tools	Yes	MCP is currently developing a habitat and topographical data set that will serve as a baseline for certain geographies in Maine's coastal waters. Much additional work and consultation is needed with partners and federal agencies to finalize development and products. Additionally, work in the state to manage competing uses of the marine environment will rely on these tools and underlying data.
Communication and outreach	Yes	DMR and partner agencies continue regular outreach to industry and stakeholders as a key tool for endorsement and investment in management measures. Other tools include up-to-date websites and newsletters to keep various stakeholders informed about marine policy development and other policy initiatives.

Enhancement Area Strategy Development:

1. Will the CMP develop one or more strategies for this enhancement area?

   Yes **X**
   No _____

2. Briefly explain why a strategy will or will not be developed for this enhancement area.

Based on Maine's Phase I and Phase II Assessments, state and local priorities and efforts, and a regional identification of need, MCP will develop a strategy for the Ocean and Great Lakes Resources Section 309 Enhancement Area. MCP will work within the DMR and closely with other partners and stakeholders to ensure that all relevant needs are addressed and that communication among partner agencies is consistent and constant.

Wetlands

In-Depth Resource Characterization:
Purpose: To determine key problems and opportunities to improve the CMP's ability to protect, restore, and enhance wetlands.

1. What are the three most significant existing or emerging physical stressors or threats to wetlands within your coastal zone? Indicate the geographic scope of the stressor, i.e., is it prevalent throughout your coastal zone, or are there specific areas that are most threatened? Stressors can be development/fill; hydrological alteration/channelization; erosion; pollution; invasive species; freshwater input; sea level rise/Great Lakes level change; or other (please specify). When selecting significant stressors, also consider how climate change may exacerbate each stressor.

	Stressor/Threat	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Stressor 1	Development & Land Use Change in Wetlands and Wetland Buffers that impact tidal flow and marsh migration corridors	Coastwide, though greater impacts occur within Southern and Midcoast Maine, where there is more development.
Stressor 2	Sea Level Rise	Coastwide
Stressor 3	Changes in freshwater input and groundwater flows due to historical hydrological alteration & channelization and recent development	Coastwide, though greater impacts occur within Southern and Midcoast Maine, where there is more development.

2. Briefly explain why these are currently the most significant stressors or threats to wetlands within your coastal zone. Cite stakeholder input and/or existing reports or studies to support this assessment.

   Stressor 1: Development & Land Use Change in Wetlands and Wetland Buffers that impact tidal flow and marsh migration corridors
   The cumulative and secondary effects of coastal development, both to wetlands and the landscapes that support wetlands, can have significant impacts. Stressors in this category include road crossings and culverts that reduce tidal flow, sedimentation, marsh accretion, and Blue Carbon potential, development in low-lying areas surrounding marshes that limits potential marsh migration areas, and changes in land cover or land use type, habitat quality (size, connectivity) alteration in the surrounding watershed that impact habitat quality and marsh species behavior. This is a broad and significant stressor, as it ultimately lends to the incremental decline in wetland health and function. For example, these effects can lead to erosion and sedimentation into waterways, loss of wildlife habitat, increased invasive species infestations, decreased flood control capacity, poor water

quality, and loss of corridors and refugia that are needed to support species and habitat adaptation and resiliency to the impacts of climate change. Maine's 2015 State Wildlife Action Plan identifies housing/urban areas and commercial/industrial areas as moderate and severe stressors, respectively, for tidal marshes.

Stressor 2: Sea Level Rise

Tidal marshes and mudflats are some of the most vulnerable habitats to sea level rise in Maine. As the rate of sea level slowly increases over long periods of time, coastal marshes accumulate sediment and build up the marsh platform at a rate that matches that of sea level rise. During the last 5,000 years, sea levels in Maine have risen slowly and consistently. This has given tidal marshes, coastal dunes, and beaches enough time to accumulate sediment and organic material to keep up with sea level rise. Tide gauges in Portland have recorded a roughly 2mm rate of sea level rise per year since 1930, which is a much faster rate than any rate in the last 5,000 years[32]. If the rate of sea level rise exceeds the rate of sediment and material buildup on the marsh, plants of the low-lying parts of the marsh will drown and saltwater will intrude into areas that previously had mostly freshwater conditions. Under this scenario as sea level rises, the upper boundary of the marsh will shift inland and the lowest of the low marsh will become inundated and shift to subtidal, where marsh cannot grow. Potential impediments to marsh migration include unsuitable land cover types, development, soils, sediment accretion rates, and local topography. A recent study by the Maine Natural Areas Program and Maine Geological Survey[33] found that under a 3.3' sea level rise scenario only half of the area needed to accommodate marsh migration is currently wetland (the remainder is upland) and only 46% of the area needed to accommodate marsh migration is currently available. In other words, given current conditions and data Maine stands to lose up to 54% of its marsh area under a 3.3' sea level rise. The loss of tidal marsh acreage is concerning because it provides a range of important functions, services, and goods despite its meager representation in the coastal landscape. The potential impacts of sea level rise include habitat shifting and loss, altered hydrology, increased erosion, infrastructure impacts, flooding, and saltwater intrusion.

Stressor 3: Changes in freshwater input and groundwater flows due to historical hydrological alteration & channelization and recent development

Stressors under this category include wetland alterations that are unregulated and historical, such as fill, ditching, and current regulated alterations to wetland buffers such as increased impervious surface (and accompanying runoff). Tidal marshes in New England have been ditched, diked, and drained for agricultural, commercial, or residential use. Although dikes have been breached and ditches repurposed over the last century, the legacy effects of these structures can still affect water movement patterns, natural community distribution, and relative elevations within the marsh system.[34] Ongoing development around and within marshes, though regulated, can have significant impacts on freshwater input and groundwater flow. Both legacy and current effects can lead to die-off of salt tolerant plants that sequester carbon and build the marsh platform, and see these areas

[32] Kelley, J. T., Belknap, D. F., Jacobson, G. L., and Jacobson, H. A., 1988, The morphology and origin of salt marshes along the glaciated coastline of Maine, USA: Journal of Coastal Research, Vol. 4, no. 4, p. 649-665.

[33] Cameron, D. and P.A. Slovinsky. 2014. Potential for Tidal Marsh Migration in Maine. NOAA Project of Special Merit. Maine Natural Areas Program and Maine Geological Survey, Maine Department of Agriculture, Conservation and Forestry.

[34] Adamowicz, SC and G. Wilson. 2018. "Farmers in the Marsh." Oral presentation at New England Estuarine Research Society, Spring Meeting, Portsmouth, NH.

dominated by freshwater plants and invasive species (e.g. *Phragmites*), pools on the marsh surface, and overtime subsidence leading to increased methane and other greenhouse gas release.[35]

3. Are there emerging issues of concern but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.

Emerging Issue	Information Needed
Impact and extent of tidal flow restrictions	On-the-ground data collection characterizing tidal restrictions and rapid assessments of marsh ecosystem impacts
Sea level rise and marsh migration	Sediment accretion rates; sea level rise rate
Invasives	Forecasting, identifying, tracking, and responding to new invasive species
Anticipated changes in biodiversity in the coastal zone	Natural communities mapping for coastal area
Use of wetlands as "green infrastructure" for stormwater management	Reliability of this technique in cold climates; design guidelines to insure biological integrity of receiving wetlands.
Blue Carbon	Coastwide inventory of coastal blue carbon resources: quantify mitigation of existing tidal marshes and potential increase in emission mitigation based on tidal restoration opportunities; additionally, quantify potential at seagrass and seaweed beds; understand the impact of strategic aquaculture management.

In-Depth Management Characterization:
Purpose: To determine the effectiveness of management efforts to address identified problems related to the wetlands enhancement objective.

1. For each additional wetland management category below that was not already discussed as part of the Phase I assessment, indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred since the last assessment.

[35] Johnson B.J., Lovelock C.E., Herr D. (2016) Climate Regulation: Salt Marshes and Blue Carbon. In: Finlayson C. et al. (eds) The Wetland Book. Springer, Dordrecht

Significant Changes in Wetland Management

Management Category	**Employed By State or Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Wetland assessment methodologies	Y	N	Y
Wetland mapping and GIS	Y	N/Y*	Y
Watershed or special area management plans addressing wetlands	Y	Y**	Y
Wetland technical assistance, education, and outreach	Y	Y	Y

* Note that Maine Natural Areas Program (MNAP) provides assistance to locals in the areas of wetland assessment methodologies; wetland mapping and GIS; and wetland technical assistance, education, and outreach. MNAP is not a networked MCP partner.

** Maine DEP provides assistance with watershed management plans and is a networked MCP partner.

2. For management categories with significant changes since the last assessment, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information.
    a. Describe significant changes since the last assessment;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

Wetland Assessment Methodologies

During 2017-2018, MCP and our partners established sentinel monitoring sites at eleven marshes spanning the coastline to document changes in salt marshes over time through monitoring elevation using Rod Surface Elevation Tables (RSETs), tidal inundation and duration, and vegetation change at eleven marshes spanning the coastline. Precise measures of sediment elevation, water/tide levels, and vegetation communities are necessary to determine rates of elevation change, particularly relative to sea level rise, and to gain an understanding of the processes and rates of change in marsh elevation and ecosystem composition. Maine Coastal Program worked with many partners to select these study locations, install the long-term monitoring equipment, and perform the first salt marsh elevation readings in 2018. Over the coming years, we will gather data from the RSETs to determine changes in marsh elevation. Additionally, we will collect information at each site about plant communities, sedimentation rates, water depth, and other environmental factors. The Maine Geological Survey and Maine Natural Area Program have developed coastal inundation models due to sea level rise and storm surges, and have created simulations of potential marsh migration under several different sea level rise scenarios. Marsh migration datasets, however, are not constrained by actual sedimentation rate measurements. Aside from short-term studies at localized areas, there has been no consistent, large scale monitoring of sedimentation rates in Maine's marsh systems. Development of this state-wide dataset through this project will have far reaching implications for marsh management from the local,

regional, and state-wide levels. By combining the results of the coastal inundation and marsh migration models with those of tidal marsh elevation dynamics gathered from these sentinel sites, we will develop a stronger understanding of the factors that threaten our coastal environments and communities and which areas are most vulnerable.
This management change was CZM-driven; 309 and NOAA Coastal Management Fellow.

The Maine Natural Areas Program (MNAP) employed a new wetland assessment methodology for Maine, the Ecological Integrity Assessment (EIA), which is based on a national methodology developed by NatureServe, but adapted specifically to Maine. MNAP is currently evaluating the use of this new assessment in wetlands across a spectrum of condition and type. Potential applications for this methodology include monitoring of restoration sites, long term monitoring of reserve areas, and more objective metrics for scoring and comparing wetland natural communities.
This management change was not CZM-driven.

Wetland Mapping and GIS
Roads, dams, and other structures crossing through estuaries often restrict tidal flow. Sufficiently restrictive conditions can alter and impair the physical, chemical, and biological conditions necessary for these systems to persist and thrive. Knowing the locations and condition of tidal restrictions provides an opportunity to reverse or alleviate these impacts and is a key element in efforts to apply the most effective allocation of restoration resources to affected sites. In 2014, MCP began exploring the feasibility of providing a tidal restriction atlas that would reflect current conditions, sea level rise considerations, and knowledge gained since RTT was initiated over 20 years ago. In 2018-2020, MCP with the support of a NOAA Coastal Management Fellow has developed such an atlas that will be a resource for communities, restoration practitioners, land trusts, and others to identify priority crossings for replacement and to assess the potential for wetland restoration. MCP used several sources of existing data to provide the locations of road crossings and dams in Maine or to assess the impact of known tidal restrictions. These included Conservation Law Foundation's (CLF) Return the Tides (RTT) project; the statewide crossing database maintained by the United States Fish and Wildlife Service's (USFWS) Gulf of Maine Coastal Program; and regional projects commissioned or executed by Maine Department of Transportation, Maine Coastal Program, Casco Bay Estuary Partnership, and several unreported efforts. The resulting Tidal Resilience Atlas is a free online map viewer that provides information on over 1,000 tidal crossings including salt marsh acreage impact, restriction of tidal flow, potential dam effects of crossings, marsh migration and sea level rise scenarios, ecological and aquatic organism passage information, and impacts of the restrictions.
This management change was CZM-driven; 309 and NOAA Coastal Management Fellow.

With the expanded availability of LiDAR imagery for the entire coastline over the past 5 years, the Maine Geological Survey was able to create new projection maps for sea level rise that were based on LiDAR's high-resolution topographic information.
This outcome was MCP-driven; 309.

Watershed or special area management plans addressing wetlands
In 2009, conversations on vernal pool regulations and the perceived impacts on development began in the Legislature. The Vernal Pool Streamlining Working Group was created and included representatives from the research, regulatory, development and non-profit communities and was co-led by the Maine

Coastal Program. The Maine Vernal Pool Special Area Management Plan (VP SAMP)[36], developed in 2016 as a result of the working group had the primary purpose to increase the mitigation options available for vernal pool protection using an approach that balances aquatic resource protection and economic development. This project was as a collaborative, conservation-based mitigation option that acknowledges the biological and ecological functions of vernal pools surrounded by development will be less likely to persist, recognizes the importance of local involvement in the long-term protection of vernal pools, understands that natural resources in rural areas are still under the threat of degradation from low-density sprawl, and respects that the economics of development is very location specific. The coastal town of Topsham is implementing the Vernal Pool SAMP, which allows more development in a highly developed area designated for commercial development in the town, whereby, additional disturbance is allowed and permanent protections are offered to functioning, intact pools elsewhere in Topsham.
MCP Section 309-driven

Wetland technical assistance, education, and outreach
From 2018-2020, MCP and partners have led the development of the CoastWise Approach for tidal road crossing design. CoastWise will deliver a set of voluntary best practices for crossing design with an emphasis on safety, road crossing climate-resilience, cost-effectiveness, low-maintenance structures, and proven methods for supporting tidal ecosystem quality. The CoastWise Approach includes various tools and outreach opportunities for road owners, restoration practitioners, and engineers to use when considering, designing, and constructing tidal road crossings. These include project checklists, methods supporting checklist steps, and outreach and training modules to explain how tidal, and specifically salt marsh, road crossings are complex issues that require consideration of not just the road crossing but also the surrounding environment, both built and natural.
This management change was CZM-driven; 309 and NOAA Coastal Management Fellow.

3. Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's or territory's management efforts in protecting, restoring, and enhancing coastal wetlands since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's or territory's management efforts?

The below descriptions represent studies that relate to coastal wetlands management. However, Maine lacks a comprehensive report of the effectiveness of wetlands management in Maine.

Bartow-Gillies, E., S. Moore, and C. Enterline. 2020. Mapping Tidal Restrictions in Maine: Identifying, analyzing, and assessing tidal restrictions including culverts, bridges, and dams, to jumpstart efforts of community resiliency and habitat restoration throughout Maine. Maine Coastal Program Report.

From 2018-2020, MCP through the support of a NOAA Coastal Management Fellow performed a coast-wide assessment of tidal crossings and their restriction potential based on a compilation of past data sources and a rigorous desktop GIS assessment. This assessment catalogued and mapped over 900 current tidal restrictions and an additional ~250 potential future tidal crossings based on sea level rise scenarios. A report detailing these methods and findings will be completed in the fall of 2020.

[36] This Special Area Management Plan is not a SAMP as outlined in the Coastal Zone Management Act, but rather is a US Army Corps of Engineers designation

Maine Natural Resource Conservation Program, Annual Reports. U.S. Army Corps of Engineers, Public Notice.

Annually, The Nature Conservancy releases a report on the outcomes of the most recent round of Maine Natural Resource Conservation Program (MNRCP) projects. These detail in-lieu fee payments received by region, impacts to specific habitat types by region (and aggregated), and funds awarded. The report provides an update of past rounds of funded projects, but at this point does not comprehensively examine the success of the program.

Maine Wetland Program Plan 2017-2022

The Maine Wetland Program Plan was prepared by the Maine Wetland Interagency Team, led by Maine DEP. It provides a framework and direction for wetlands management in Maine, organized around four core elements: monitoring and assessment, regulatory activities, voluntary restoration and protection, and water quality standards for wetlands. The plan documents planned activities over the six-year period, responsible agencies, and potential partners. While the plan includes a diverse group of people and clearly links to wetlands goals, it does not comprehensively assess the effectiveness of programs.
https://www.epa.gov/sites/production/files/2017-07/documents/2017_01_27_mwpp_2017-2022_final.pdf

Craig, M. 2019. Long Reach Lane at Long Marsh, Harpswell, 2018 Post-Project Monitoring Report; Year 5 of 5. Casco Bay Estuary Partnership.

In 2012, the Maine Department of Transportation (MaineDOT) proposed a mitigation project at Long Reach Lane in Harpswell to compensate for the functional impacts to marine wetlands associated with the construction of the Martin's Point Bridge between Falmouth and Portland. The mitigation project was implemented in January and February 2014, and resulted in the successful replacement of a 36-inch (7.1 ft^2 flow area) round concrete pipe beneath Long Reach Lane with a larger 6-ft x 12-ft concrete box culvert (72 ft^2 flow area) in February 2014. This report primarily presents the results of pre-project monitoring, which occurred during the 2013 growing season, and Year 5 of post-project monitoring, which occurred during the 2018 growing season, at the Long Marsh mitigation site.
https://www.cascobayestuary.org/publication/long-reach-lane-at-long-marsh-harpswell-2018-post-project-monitoring-report-year-5-of-5/

Craig, M. 2017. Wallace Shore Road in Harpswell, Tidal Restriction Restoration 2017 Monitoring Report, Year 3 of 5, Post-Project. Casco Bay Estuary Partnership.

The primary objective of this project was to reestablish natural hydrology, and specifically, to restore natural tidal variability into the Appletree Marsh adjacent to Wallace Shore Road in Harpswell, ME. Two existing culverts were replaced according to amended designs provided with permit applications: A 3.3-ft box culvert was replaced with a 15-ft open bottom span concrete box culvert, and an 18-inch HDPE culvert was replaced with a 5-ft pre-cast concrete culvert. At the 15-ft open bottom box, remnant slugs of fill from the original crossing structure were dredged from the channel immediately adjacent to the crossing in order to promote the free exchange of water into and out of the marsh. A monitoring plan was incorporated into the Wallace Shore Road Restoration Work Plan. Casco bay Estuary Partnership is conducting pre- and post- project monitoring in the wetland adjacent to the project area.

Johnson, B., C. Bohlen, C. Gunn, E. Beirne, C. Barry, M. Craig, and P. Dostie. 2016. Ecogeomorphology of Two Salt Marshes in Midcoast Maine. Casco Bay Estuary Partnership.

This paper summarizes the geomorphological processes that created and sustain salt marshes in Maine and provides a broad overview of the vegetation zonation in marshes and the ecosystem services they provide. The paper details the human impacts to marshes in Maine, and uses as a case example the Long Marsh tidal crossing restoration project to detail the change in methane emissions that can be realized with re-establishing tidal flow at impaired systems through presenting methane data collected at the site pre- and post-restoration.

Identification of Priorities:

1. Considering changes in wetlands and wetland management since the last assessment and stakeholder input, identify and briefly describe the top one to three management priorities where there is the greatest opportunity for the CMP to improve its ability to more effectively respond to significant wetlands stressors. *(Approximately 1-3 sentences per management priority.)*

   Management Priority 1: Implement the CoastWise Approach through Trainings and Municipal Support Materials
   Description: MCP and its partners will continue to work with existing (and identify new) partners to roll out the CoastWise Approach for tidal crossing restoration to create and deliver material geared toward engaging municipalities and hands-on trainings with municipal road managers and/or contractors and professionals that frequently work with municipal clients.

   Management Priority 2: Marsh Health Assessment
   Description: MCP and its partners will adopt methods to gather on-the-ground information about the degree to which tidal restrictions are impairing marsh ecosystem health and aquatic passage, including information specific to tidal crossings as well as marsh health.

   Management Priority 3: Modeling and Monitoring to Inform and Document Changing Marsh Conditions and Potential for Marsh Migration
   Description: MCP and its partners will increase the State's capacity to monitor changes in tidal marshes through mapping and field data collection and assess how those changes might affect Maine's marshes ability to keep pace with sea level rise. In addition to understanding the passive impacts of sea level rise, this will include work to determine the current amount of marsh acreage impaired and possibly emitting greenhouse gases because of impaired tidal flow and marsh subsidence, and the potential Blue Carbon potential (greenhouse gas reduction) of restoring tidal flow at these sites. These objectives will build upon and continue MCP's sentinel site work and Tidal Restriction Atlas.

2. Identify and briefly explain priority needs and information gaps the CMP has to help it address the management priorities identified above. The needs and gaps identified here do not need to be limited to those items that will be addressed through a Section 309 strategy but should include any items that will be part of a strategy.

Priority Needs	**Need?** (Y or N)	Brief Explanation of Need/Gap
Research	Y	Sediment accretion rates associated with sea level rise. Plant and habitat shifts related to climate change. Development and field validation of methods for coast-wide assessment of

		impacts to tidal wetlands and feasibility of restoration. See Blue Carbon Optimization in #3 of section above
Mapping/GIS	Y	Expanded LiDAR. Documentation of impacts to wetlands less than 4300 sq. ft.; access to georeferenced data on permitted wetland impacts. New marsh migration scenarios.
Data and information management	Y	Field data collection at tidal restriction to inform wetland restoration projects, tracking of restoration projects and pre- and post-monitoring results.
Training/capacity building	Y	Implement the CoastWise Approach through trainings and municipal support materials.
Decision-support tools	Y	Maintenance and future update to Tidal Resilience Viewer to include field data collection information.
Communication and outreach	Y	Increasing technical assistance to municipal officials and landowners using the CoastWise Approach.

Enhancement Area Strategy Development:

1. Will the CMP develop one or more strategies for this enhancement area?

   Yes __X___
   No _____

2. Briefly explain why a strategy will or will not be developed for this enhancement area.

Wetlands are an integral part of the coastal environment, providing critical ecological function that benefits both natural and human communities. In Maine, wetlands are increasingly threatened both by coastal development and human alteration of the natural environment, as well as by sea level rise and erosion. Maine Coastal Program's management tools are appropriate for this area. MCP has worked effectively on wetlands issues in the past and will develop strategies for future enhancement of its work on wetlands. Lastly, the Maine Climate Council's Coastal and Marine Workgroup is advancing several strategies for consideration by the Council including: a blue carbon optimization strategy and a strategy to enhance protection, conservation and restoration of coastal habitats such that they continue to deliver ecosystem service like flood control.

Strategies

Coastal Hazards

Coastal Hazards Strategy 1: Develop Statewide Policy, Plans, and Regulatory Framework on Sea Level Rise to the Year 2120

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas *(check all that apply)*:

- ☐ Aquaculture
- ☐ Energy and Government Facility Siting
- ☒ Coastal Hazards
- ☐ Ocean/Great Lakes Resources
- ☐ Special Area Management Planning
- ☐ Cumulative and Secondary Impacts
- ☐ Wetlands
- ☐ Marine Debris
- ☐ Public Access

II. Strategy Description

A. The proposed strategy will lead to, or implement, the following types of program changes *(check all that apply):*

☐ A change to coastal zone boundaries;

☒ New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;

☒ New or revised local coastal programs and implementing ordinances;

☒ New or revised coastal land acquisition, management, and restoration programs;

☐ New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,

☒ New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.

B. *Strategy Goal:*

In 2019 the Maine Legislature, at the initiation of Governor Janet Mills, created the Maine Climate Council (MCC) and identified sea level rise and coastal storm damage as topics to examine in a new Climate Action Plan. By December 2020, the Council will have the beginnings of a policy framework for implementation. This Section 309 strategy will support a comprehensive coastal hazard plan for 5,400 miles of Maine coast, respond to the Council's efforts, do technical outreach, and provide public information. This strategy will work with the Council to take broad policies from the plan and develop them into more specific, actionable steps to address coastal hazards.

This effort provides the scientific foundation in support of both new policy and statewide hazard mitigation both temporally and spatially. In tandem with Coastal Hazards Strategy 2, this work will provide decadal assessments of sea level projections and probabilities from 2020 through 2120, guide the policy framework to focus on geographic areas of impact, and provide physical science for use by several MCC Work Groups. The MCC is now working only with projections to 2100, 80 years away.

This strategy will apply the most recent climate assessments related to coastal hazards to the next update to the Climate Action Plan expected to be in production by 2023. The Maine Geological Survey (MGS) will update the Sea Level Rise/Storm Surge Viewer with scenarios consistent with the next National Climate Assessment (NCA), a new NOAA National Tidal Datum Epoch (NTDE), and surge statistics from tide gauge data. Several specific tasks expected from Coastal Hazards Strategy 3 will complement this overall strategy. These efforts will provide a current scientific framework for regulatory development, rulemaking, and prioritizing actions to reduce coastal hazards, preserve coastal ecosystems, and manage commercial waterfronts.

The Council's Community Resilience Workgroup and its Coastal and Marine Workgroup identified a need for a coastal hazard overlay zone. A common geographic hazard area along the coast will be valuable for uniformity between state and municipal laws and regulations. Within a coastal hazard overlay zone, policies on sea level rise and coastal hazards can be applied evenly and consistently at both the state and municipal level. This Strategy will investigate a tiered approach within an overlay zone that combines risk from storm flooding and higher ocean levels. Geographic data from Coastal Hazards Strategy 3 and standards from Strategy 2 will help inform development of sea level rise policy on ecosystems, development, commercial activity, and public access, and economics within an overlay zone.

In addition, this strategy will include plans, as needed, in order to develop capacity at regional and local levels for implementing changes made on sea level rise policy in Maine.

III. Needs and Gaps Addressed

- The largest need is how to implement projections of sea level rise into policy, plans, and regulations. There is currently no consensus on what approach should be adopted.
- Projections of rising seas are based on greenhouse gas emissions and vary over ten feet or more by 2100. A policy framework based on probabilities and risk tolerance needs to be decided.
- Coastal flooding from potentially larger storm surges needs to be assessed and combined with sea level rise projections to identify future floodplains. Policy is needed for development within and managed retreat from future flood hazard areas. This information is not available from the retrospective FEMA Flood Insurance Rate Maps.
- Coastal change projections from erosion and accretion driven by higher sea levels and storm surges are needed to establish erosion hazard areas and possible development setbacks. Coastal processes, rates of sediment delivery to the intertidal zone, and land loss all factor into new approaches and regulations that consider living shorelines, hybrid engineering, and traditional hard structures. Projecting shoreline change is scientifically challenging without a major funding initiative. Work described in Coastal Hazards Strategies 2 and 3 is an affordable approach without a research team and an additional grant.
- Sea level projections will need to be revised for a new National Tidal Datum Epoch expected from NOAA in 2022-2023. This epoch provides the Highest Astronomical Tide (HAT) level upon which all Maine sea level rise projections are based. Recalculation of sea level rise will also update the curves and be able to provide projections to 2120, rather than from 2000 to 2100 available now.
- Status and trends in monthly and annual sea levels at tide gauges in Maine need regular updating. Recent analysis by MGS has compiled statistics that show tides are historically high in the last decade. The highest three years in over the last 100 in Portland were in 2010, 2011, and 2019 with almost all the records set in the last decade. Careful tracking of tide levels which

affect the frequency of nuisance flooding is critical to managing current flood hazards. These statistics have attracted the greatest attention of policymakers and are likely to influence legislation and regulation.

- The MCC will create a revised Climate Action Plan toward the end of this 5-year period.

IV. Benefits to Coastal Management

The primary benefit for coastal management is to expand awareness, preparation, mitigation, and anticipation of sea level rise for the entire Maine coast. Currently, only 3,600 acres within the Coastal Sand Dune System have regulations that deal with hazards from a 2-foot sea level rise. MGS estimates that a 1.6-foot sea level rise, projected for the year 2050 (from a 2000 level), and just 30 years from now, is expected to reduce Maine's dry beach area by 40% and convert 85% of the developed dune system into tidal wetlands. The 2-foot sea level rise standard used for Maine beaches and dunes is out of date, should be increased in concurrence with the Climate Council's guidance, and as such the current regulation underestimates the coastal hazard for an area that generated expenditures of $1.7 billion in 2018, a quarter of Maine's tourism revenue.

MGS has estimated that for every foot of sea level rise 7,400 acres of uplands become coastal wetlands. When a 100-year storm surge is added to a sea level rise of 3.9 feet (a 50% probability by 2100 relative to the year 2000) then 63,000 acres in Maine are affected. There is incomplete awareness of this expanding hazard in communities and there are a limited number (to date) of proactive community plans that integrate mitigation, adaptation, or avoidance planning for this expansive area.

Consequences of projected sea-level rise include loss of intertidal areas subject to a "public easement" which, as currently construed by Maine's highest court, provides the public rights of "fishing, fowling, and navigation" for both commercial and recreational purposes. This public easement reflects Maine's interpretation of the Public Trust Doctrine. The impact of sea-level rise on these public property rights, and their relationship to private property owners' rights and interests in shoreland protection measures are issues that merit further consideration by policy makers as stewards of Public Trust rights.

Ongoing economic analysis of sea level rise costs and benefits is being completed for the Climate Council based on MGS and NOAA projections. Results from this study will help drive decisions for hazard mitigation at the local and state level. The cost of protection, adaptation, and strategic retreat can be used to drive policy and management decisions. Rising tides will turn the 1% annual frequency storm into a 10% storm with a 1.4-foot sea level rise. Repetitive infrastructure damage is likely to occur with greater frequency and economic cost. Management decisions need to be made with each post-storm recovery effort and with expenditures of disaster assistance funds within a state hazard framework that anticipates avoiding repetitive losses and prolonged economic disruption.

V. Likelihood of Success

The likelihood of success is very high given Governor Mills' priorities and the attention to this subject through the inclusive and statewide effort of the Climate Council. There is more momentum focused on sea level rise and storm damage now than any time in the past 25 years in Maine.

The MGS coastal hazard products produced in the last 5 years have great credibility and have leveraged dozens of municipal planning and adaptation actions at the local level. Through a series of web applications and databases for tracking tides, shoreline change, engineering sufficiency, and living shoreline suitability, MGS repeatedly released multiple data sets used in hazard assessments, risk identification, and spatial visualization of coastal hazards. This approach will be advanced further in Strategies 2 and 3 below. These sources of information, along with more frequent nuisance flooding, beach erosion, and commercial losses, have led to heightened awareness and interest in hazard mitigation that supports both trust in science and willingness to minimize future economic disruption and job losses.

VI. Strategy Work Plan

Strategy Goal: Sea Level Rise Policy for Maine
Total Years: 5
Total Budget: $69,135

Year(s): FY2021-2023
Description of activities: Development of sea level rise policy for statewide implementation through the State Climate Action Plan and efforts of the Climate Council
Major Milestone(s): Selection of target sea level rise amounts over time for planning and regulatory use. Use of probability and statistics for both sea level rise projections and storm surge flooding levels in statewide analyses of hazards. Interagency and stakeholder outreach to scope and design a coastal hazard overlay zone. Boundaries of a hazard overlay zone are released. Municipalities adopt SLR projections in local hazard mitigation, resource protection, and land-use planning.
Budget: $39,980

Year(s): FY2024-2025
Description of activities: MGS provides technical and policy support to state agencies and municipalities and regional planning organizations.
Major Milestone(s): Updated data sets (Strategies 2 & 3) are applied in policy and regulations statewide. Timely updates of sea level projections for Maine are released and applied geographically in the MGS inundation viewer and, as appropriate, to update regulations. There will be updated coastal hazard assessments in the next Climate Action Plan of the Climate Council.
Budget: $29,155

VII. Fiscal and Technical Needs

A. Fiscal Needs:

Although intended to be performed in-house with NOAA and state resources, the cost of completing this strategy is likely beyond the limitations of Section 309 funding, particularly if assistance from consultants is needed.

B. Technical Needs:

This strategy will rely on support from NOAA and other federal agencies for updated geospatial data (digital elevation models, land cover), projections of sea level rise and probabilistic estimates beyond 2100. Continued support from NOAA CO-OPS for tidal data and from the National Buoy Data Center and National Weather Service will be critical.

Coastal Hazards Strategy 2: Revising, Creating, and Updating Coastal Hazard Statutory Language and Supporting Regulatory Mapping Products and Transferable Models

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas *(check all that apply)*:

- ☐ Aquaculture
- ☐ Energy and Government Facility Siting
- ☒ Coastal Hazards
- ☐ Ocean/Great Lakes Resources
- ☐ Special Area Management Planning
- ☐ Cumulative and Secondary Impacts
- ☐ Wetlands
- ☐ Marine Debris
- ☐ Public Access

II. Strategy Description

A. The proposed strategy will lead to, or implement, the following types of program changes *(check all that apply):*

☐ A change to coastal zone boundaries;

☒ New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;

☒ New or revised local coastal programs and implementing ordinances;

☒ New or revised coastal land acquisition, management, and restoration programs;

☐ New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,

☒ New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.

B. ***Strategy Goal:*** This strategy is to address identified deficiencies with existing Maine regulations and policy and to develop supporting mapping products. This strategy is broken into three different efforts, including:

- Develop and Implement Changes to the Coastal Sand Dune Rules (Chapter 355);
- Develop a definition of a Future Coastal Wetland; and
- Develop an updated procedure for mapping Maine's bluff coast and create a transferable Model Bluff Management District for Maine's Mandatory Municipal Shoreland Zoning

Develop and Implement Changes to the Coastal Sand Dune Rules (Chapter 355) and Coastal Wetlands (Chapter 310). In previous 309 efforts, MGS completed mapping of the coastal sand dune system for the rest of the Maine coastline, adding approximately 1,500 acres of new sand dunes. As part of this effort, MGS will collaborate with DEP and MCP to facilitate the inclusion of the full geographic extent of the beach and dune system protected under existing regulation. The goal of this strategy is multifaceted and incorporates several key efforts currently being discussed Climate Council: 1) update the definition and mapping of the Erosion Hazard Area (EHA) for the new maps, 2) develop best management practice standards for dune creation, restoration, and enhancement anticipating sea level rise, and 3) work with DEP in order to implement the new

maps and provide educational and technical assistance to DEP staff, regional planning organizations, and municipalities to help implement the changes.

The current Erosion Hazard Area is defined as:

> *Any portion of the coastal sand dune system that can reasonably be expected to become part of a coastal wetland in the next 100 years due to cumulative and collective changes in the shoreline from:*
>
> *(4) Historical long-term erosion;*
> *(5) Short-term erosion resulting from a 100-year storm; or*
> *(6) Flooding in a 100-year storm after a two-foot rise in sea level,*
>
> *or any portion of the coastal sand dune system that is mapped as an AO flood zone by the effective FEMA Flood Insurance Rate Map, which is presumed to be located in an Erosion Hazard Area unless the applicant demonstrates based upon site-specific information, as determined by the department, that a coastal wetland will not result from either (1), (2), or (3) occurring on an applicant's lot given the expectation that an AO-Zone, particularly if located immediately behind a frontal dune, is likely to become a V-Zone after 2 feet of sea level rise in 100 years.*

Maine's previously completed Coastal Sand Dune Geology Maps incorporated the mapped EHA. Newly mapped areas do not have a defined EHA, and in two of the southern coastal counties (Cumberland and York) with the most mapped sand dunes, preliminary FEMA Flood Insurance Rate Maps (FIRMs) have not been adopted. In addition, many of the areas of the Maine coastline where new FEMA FIRMs have been adopted, no longer are there AO-Zones, but Coastal A Zones. In addition, the Climate Council is releasing new recommendations on scenarios of sea level rise (likely to exceed the current 2-foot standard) that will need to be incorporated into the Coastal Sand Dune Rules. As a result, the definition of the Erosion Hazard Area, regulatory standards for shoreline change in 100 years, and site stability that restricts building size all need revision and mapping. In conjunction with Maine DEP, this effort will advance regulatory changes. A revised EHA definition will also complement the creation of a definition of a Future Coastal Wetland that considers sea level rise and its proximity to low-lying dunes.

Following significant changes to the Coastal Sand Dune Rules, technical assistance by MGS to DEP, regional planning organizations, and municipalities will be required in order create awareness and streamlined permitting.

Develop a New Definition of a Future Coastal Wetland and Complete Subsequent Mapping. Maine's Natural Resources Protection Act (Chapter 310, NRPA) currently defines a coastal wetland:

> "*… as all tidal and subtidal lands; all areas with vegetation present that is tolerant of salt water and occurs primarily in a salt water or estuarine habitat; and any swamp, marsh, bog, beach, flat or other contiguous lowland that is subject to tidal action during the highest tide level for the year in which an activity is proposed as identified in tide tables published by the National Ocean Service* (Title 38, §480-B)."

A statutory change is needed in the NRPA coastal wetland definition to adopt the upland boundary as the Highest Astronomical Tide (HAT) based on the current National Tidal Datum Epoch. The existing definition is burdensome because it requires adoption of new tidal datums annually. This is labor intensive and often requires surveyors and DEP to spend time on mapping elevations that change a tenth of a foot in a year. MGS and the Land Use Planning Commission of the Department of Agriculture, Conservation and Forestry have already adopted the HAT for mapping sea level rise hazards and present boundaries of coastal wetlands. Guidelines for Mandatory Municipal Shoreland Zoning Ordinances (Ch. 1000) would similarly change the Coastal Wetland and Tidal Waters definitions through rulemaking or a minor-technical change without rulemaking.

Coastal wetlands provide hazard mitigation through reduction in wave energy along upland shorelines and are critical to coastal ecosystems. Sea level rise and shoreline engineering may inhibit inland marsh migration, contribute to the submergence of existing salt marshes, and result in greater shoreline hazards in the future. Policy development is needed to identify and recognize the importance of coastal ecosystem migration and the importance of continued public trust rights in the future intertidal zone. This policy effort will be combined with identification of low-lying upland areas that can become future coastal wetlands and areas of increased coastal flooding as sea level rises. Protection of lowlands and wetland ecosystems will help preserve storm-buffering environments, reduce future hazards, and maintain ecosystem functions and values during marine transgression. This strategy will create a statutory definition of a Future Coastal Wetland and will update previously completed tidal marsh migration mapping efforts with scenarios consistent with recommendations and sea level scenarios from the Climate Council. It will also complement proposed revisions to the definition of the Erosion Hazard Area (EHA), and possibly be integrated with several of these overlays into a comprehensive *Coastal Hazard Area* from Strategy 1.

Develop an Updated Procedure for Mapping Maine's Bluff Coast and Create a Transferable Model Bluff Management District. Previously, Maine completed mapping of many of its unconsolidated bluff shorelines (which make up approximately 48% of the 5,400-mile Maine coastline) in terms of stability (stable, unstable, or highly unstable). These bluff maps specifically relate to coastal development under Mandatory Municipal Shoreland Zoning Act (Chapter 1000) in terms of helping define required setbacks from bluffs based on the mapped stability of those bluffs. Unstable and highly unstable bluffs require setbacks be determined from the top of the bluff, while stable bluffs require setbacks be determined from the highest *annual* tide. These requirements have been riddled with problems: bluffs are being stabilized with coastal engineering structures so that setbacks can be minimized; the "top of the bluff" is extremely difficult to determine and does not have a standardized methodology; and tide values used by surveyors change every year. Because most mapping was completed over 20 years ago, bluff stability designations on some of the maps have been questioned (either due to mapping methods or subsequent changes in shoreline conditions). Furthermore, the maps do not account for future conditions. This strategy will include developing updated bluff mapping procedures and protocols at several key demonstration locations in Casco Bay in order to develop a transferable method for updating the current bluff maps and determining setbacks. Working with several partner municipalities, this effort will also investigate the development of a transferable comprehensive bluff management district model that will solve problems with Shoreland Zoning

language, develop alternatives analysis that includes living shorelines, and guide development away from high hazard areas.

This effort will build on a previous Project of Special Merit Building Resiliency Along Maine's Bluff Coast completed in 2017 and a current (2020-23) project to install three pilot Living Shorelines treatments in Casco Bay (NOAA Resiliency Award to TNC). This Strategy will build capacity for understanding and implementing nature-based alternatives to hard shoreline stabilization along soft, sedimentary environments. Capacity needs to be developed across local, state, and federal levels for projects to become viable alternatives. This new approach requires improved coordination across all levels of government, consistent and conformable standards, efficient regulatory review, environmentally sound installation, and post-project monitoring protocols.

III. Needs and Gaps Addressed

Maine identified deficiencies in several Maine regulations, described above, which directly relate to improving municipal and state-level coastal hazards resilience, including the Coastal Sand Dune Rules (Chapter 355), Coastal Wetlands (Chapter 310) and Shoreland Zoning (Chapter 1000). This strategy is designed to address these identified deficiencies by developing revised or new regulatory language and definitions, developing a new, transferable bluff and landslide management district model, and completing supporting maps for dunes, wetlands, and bluffs.

IV. Benefits to Coastal Management

Benefits are multiple and focus on improving the management of key natural resources impacted by current and future coastal hazards: beaches and dunes, wetlands, and coastal bluffs. Improvements in regulatory language coincide with efforts by the Maine Climate Council. Development of a transferable model bluff management district will allow for better municipal and regional management of a resource which comprises almost half of the Maine coastline.

V. Likelihood of Success

Given the interests of the Mills administration and ties to work by the Maine Climate Council, the likelihood of success is high.

VI. Strategy Work Plan

Strategy Goal: Improve Statutory Language and Map Newly Defined Coastal Hazard Areas
Total Years: 5
Total Budget: $329,042

Year(s): FY2021-2025
Description of activities: Regulatory and statutory language that includes sea level rise for the statewide Coastal Sand Dune System and related erosion hazard areas in Ch. 355. Provide technical support for DEP to implement new rules.
Major Milestone(s):

a. New sea level rise standard(s) incorporated in rules
b. Improved Erosion Hazard Area definition with new SLR projection(s)
c. Development standards for new and reconstructed dune structures
d. Standards and BMPs related to SLR projections for dune restoration, enhancement, beach nourishment, and seawalls

e. Initial evaluation of areas where engineering structures will inhibit landward transition of the public easement.

Budget: $93,329

Year(s): FY2021-2025

Description of activities: Regulatory and statutory language revisions and resource mapping that includes sea level rise for present and future coastal wetlands. Provide technical support for DEP to implement new rules.

Major Milestone(s):

a. New sea level rise standard(s) incorporated into Ch. 310, 305, 1000
b. Future Coastal Wetland definition added to NRPA anticipating marsh migration from sea level rise
c. Development standards for areas within Future Coastal Wetlands
d. Adoption of newly mapped boundaries of the HAT and Future Coastal Wetlands
e. White paper on public trust rights based on revised Maine SLR projections.

Budget: $93,269

Year(s): FY2021-2025

Description of activities: Create new methodology for bluff mapping and bluff & landslide management district standards for Shoreland Zoning, Ch. 1000. Develop alternatives analysis for living shorelines in the permitting process. Provide technical support for DEP in implementation of new rules.

Major Milestone(s):

a. Defined transferable methodology for bluff mapping
b. Improved definitions for bluff and landslide hazards from erosion and SLR
c. Model language for Ch. 1000 on setbacks and development in a bluff district
d. Permit process that incorporates living shoreline alternatives
e. Increased capacity and coordination across local, state, and federal agencies
f. Bluff hazard overlay zone mapping protocol(s) for municipal adoption

Budget: $79,943

VII. Fiscal and Technical Needs

A. Fiscal Needs:

The cost of completing this strategy is likely beyond the limitations of Section 309 funding, particularly if assistance from consultants is needed.

B. Technical Needs:

Maine will need bathymetric lidar (or some other remote sensing) of water depths to identify MLLW, capture the full intertidal extent and evaluate future public trust rights, as well as a method to quantify public use.

Projects of Special Merit (Optional)

Build on the white paper referenced above (public trust rights under future SLR scenarios) and examine policy options for mitigation or compensation.

Coastal Hazards Strategy 3: Expanding, and Improving Key Coastal Hazard Decision-Support Products

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas *(check all that apply)*:

- ☐ Aquaculture
- ☐ Energy and Government Facility Siting
- ☒ Coastal Hazards
- ☐ Ocean/Great Lakes Resources
- ☐ Special Area Management Planning
- ☐ Cumulative and Secondary Impacts
- ☐ Wetlands
- ☐ Marine Debris
- ☐ Public Access

II. Strategy Description

A. The proposed strategy will lead to, or implement, the following types of program changes *(check all that apply):*

☐ A change to coastal zone boundaries;

☒ New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;

☒ New or revised local coastal programs and implementing ordinances;

☐ New or revised coastal land acquisition, management, and restoration programs;

☐ New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,

☒ New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.

A. ***Strategy Goal:*** This strategy is for Maine Geological Survey (MGS) to continue to provide key informational products on coastal hazards for the public and local, regional, and state decision-makers, and expand the scope of current products for other areas of the Maine coastline. These include:

- Expand the Maine Beach Mapping Program (MBMAP) on shoreline erosion
- Update the Maine Sea Level Rise/Storm Surge Viewer
- Expand the Coastal Structure and Dune Crest Inventory and Overtopping Potential Viewer and collaborate with MEMA and NWS for geographically refined flood warnings
- Expand the Living Shoreline Decision Support Tool
- Update and expand the Maine Beach Scoring System

Expand the Maine Beach Mapping Program (MBMAP) Shoreline Erosion Mapping. MBMAP is entering its 15th year of data collection. This program uses RTK-GPS to map and monitor specific features along most of Maine's larger beaches in York, Cumberland, and Sagadahoc Counties, including the approximate mean high-water contour, the edge of dune vegetation, along with elevations of the beach, toe of dune, and along coastal engineering structures. This information allows for calculation of beach and dune erosion rates, along with a determination of the dry beach width – a proxy for the buffering capacity of a beach. Data from MBMAP is currently used by consultants, engineers, municipalities, RPOs, and state and federal agencies in helping guide

property-to-community wide beach management decisions. This effort will include continuing annual collection of MBMAP survey data, expanding of MBMAP to include several key larger beach systems (several of which are part of the Coastal Barrier Resources System) not currently monitored, and updating of the viewer with data collected each year.

Update the Maine Sea Level Rise/Storm Surge Viewer. MGS updated the Maine sea level rise viewer in 2018 to reflect the latest range of sea level rise scenarios regionalized for Maine based on work by Sweet and others (2017) and the U.S. Army Corps of Engineers Sea Level Change Calculator. This task will include several key efforts. First, sea level scenarios will need to be revised for a new National Tidal Datum Epoch expected from NOAA in 2022-2023. Recalculation of sea level rise will also update the curves and be able to provide projections from 2020 to 2120 (rather than from 2000 to 2100). Second, depending on recommendations from the Climate Council, the scenario(s) in the viewer may need to be updated or developed further, as deemed necessary. Finally, MGS plans to update the viewer based on sea level rise scenarios developed for the 5th National Climate Assessment (expected in 2022). MGS will further develop tutorials on using the viewer.

Expand the Coastal Structure and Dune Crest Inventory and Overtopping Potential (CSDCIOP) Viewer. In 2020, MGS released a viewer which mapped the extent of coastal engineering structures and coastal sand dune ridges along most of the open coastline in York and Cumberland County (Kittery to South Portland). Using available LiDAR and GIS, the approximate crests of these features were extracted and then compared with the preliminary (new Flood Insurance Rate Maps have not been adopted yet in York or Cumberland County) 100-year base flood elevations. Preliminary analyses showed that the majority of coastal engineering structures and frontal dune crests were well below the 100-year base flood elevation. This information has major implications for management of engineering structures and sand dunes in the face of rising sea levels and is helpful in determining where dune restoration might be needed. This effort will include the development of an automated GIS process and a phased 5-year expansion of the data for the viewer with assistance from contractual services for remaining coastal municipalities in Cumberland to Washington Counties. This effort will include coordination with the Maine Emergency Management Agency and the National Weather Service to refine coastal flooding and splashover warnings. MGS will also develop tutorials on using the viewer.

Expand the Living Shoreline Decision Support Tool. In 2020, MGS released a decision support tool (LSDST) developed for Casco Bay communities (Cape Elizabeth to Small Point in Phippsburg) which mapped the suitability of shorelines for living shoreline applications based on a variety of factors, including: annualized fetch, nearshore bathymetry, landward shoreline type, seaward shoreline type, aspect, relief, and slope. Given several ongoing projects on living shorelines and a high-level of interest from engineers, coastal property owners and municipalities, this information is critical to aiding local stakeholders in the potential siting of these kinds of applications and helps provide a better understanding of the factors involved. MGS also worked with researchers at the University of Maine, Machias to expand the tool to the larger Machias Bay region. This effort will include the hopeful development of an easily reproducible GIS routine and a subsequent phased 5-year expansion of the development of the data for this LSDST for other selected key areas of the Maine coastline. MGS will develop tutorials on using the tool.

Update and expand the Maine Beach Scoring System (BSS) by integrating new datasets. Previously, MGS developed a pilot beach scoring system for Saco Bay that was meant to aid municipalities in determining locations along the coastline where management was warranted, and whether beach nourishment or dune restoration would be appropriate responses. The system included factors such as: historic shoreline change; shoreline type; dry beach width; total width; difference from BFE; and beach volume changes. The Beach Scoring System (BSS) will help inform decisions relating to beach nourishment and dune restoration at the municipal and state levels and complements the Living Shoreline DST for beach and dune enhancement areas. This effort will: 1) update the scoring system with updated and new data, including but not limited to: MBMAP data, sea level rise inundation data, new FEMA base flood elevation data (from adoption of new FIRMs, expected in summer 2020), and CSDCIOP data; and 2) expand the scoring system for larger, developed beach systems that are monitored as part of MBMAP. These efforts support beach management and decisions about economics and funding. The past Beaches Advisory Group generated reports based on the Beach Scoring System but did not create action plans. Scoring factors support beach management plans for beach nourishment and dune restoration from a property level to ecosystems that cross municipal boundaries. The current Project of Special Merit *Assessing Sediment Budgets in Support of Beach Nourishment and Coastal Community Resiliency* has generated nearshore beach maps that indicate suitable nearshore placement areas as an additional component for regional beach management plans.

III. Needs and Gaps Addressed

Efforts identified as part of this strategy will provide key coastal hazard information (erosion and inundation vulnerabilities and using information to develop appropriate responses such as implementing living shorelines or dune restoration) for a variety of stakeholders and decision-makers ranging from property owners to municipal officials, and state and federal agencies. There is a continued need to collect data and understand current impacts and trends of storm events and sea level rise on Maine's beaches and dunes. Data collection and analyses along with other factors (such as through MBMAP, CSDCIOP, LSDST, BSS, and the SLR Viewer) directly relate to the Coastal Sand Dune Rules, Shoreland Zoning, Coastal Wetlands, and other regulations. In addition, these data support recommendations arising from the Climate Council not only in terms of key data development, but also in implementation of adaptation strategies to sea level rise and storms.

IV. Benefits to Coastal Management

Data collected and analyses conducted as part of this Strategy are vital to understanding many of the coastal hazards (and appropriate responses) along the Maine coastline. This work provides key information for planning, resource protection, and additional regulatory efforts for many stakeholders, including: the general public; private property owners; businesses, engineers and consultants; local planning boards and communities; non-profit environmental organizations; regional planning organizations; and government agencies (DEP; DMR; IF&W; USFWS; NMFS; and USACE). These data and tools also support a variety of regulatory decisions in Maine, including: NRPA Chapters 305, 355, and 310; Shoreland Zoning; management of rare and endangered species habitat; and the design and management of beach nourishment and dune restoration projects.

V. Likelihood of Success

The likelihood of success for continuing and expanding the Maine Beach Mapping Program is high. In 2020, this program has already been in-place for 15-years, and Maine has invested in the

program by purchasing and maintaining two network-capable RTK-GPS receivers and employing a seasonal intern who is trained in RTK-GPS surveying and aids in surveying activities. MGS has the demonstrated capacity to continue and expand MBMAP and maintain the viewer with current data.

The likelihood of success for updating the Maine Sea Level Rise/Storm Surge Viewer, as needed, is also high. Maine has already released two versions of this viewer consistent with sea level rise scenarios from the third and fourth National Climate Assessments. MGS has the demonstrated capacity to complete this kind of mapping and has developed structured GIS-routines to aid in updating future scenarios.

The likelihood of success for expanding the Coastal Structure and Dune Crest Inventory and Overtopping Potential (CSDCIOP) Viewer is moderate. This effort is labor-intensive and requires significant manual GIS editing of several features (wall crests and dune crests) which is difficult to automate. MGS expects to be able to expand the viewer for Casco Bay and larger developed beach systems in Sagadahoc County. We will explore contractual options to automate the GIS routine and expand the data created to additional developed beach communities in other coastal counties in subsequent years.

The likelihood of success to expand the Living Shoreline Decision Support Tool is moderate. Like the overtopping tool (CSDCIOP), this effort requires substantial manual GIS work. Now that LiDAR data is available for the entire coast of Maine, we will explore options to automate the GIS routine and to expand it to select estuarine reaches along the Maine coastline for use across a wider geography.

The likelihood of success to update and expand the Maine Beach Scoring System (BSS) by integrating new datasets is high. The geographic scope of expanding the BSS is limited to those areas where MBMAP data is collected and there is readily available historical aerial imagery for long-term shoreline change analysis. This effort will be expanded to other publicly-accessible and managed beach systems in York, Cumberland, Sagadahoc, and Lincoln counties.

VI. Strategy Work Plan

Strategy Goal: Expanding and Improving Key Coastal Hazard Decision-Support Products
Total Years: 5
Total Budget: $574,410

Continue and Expand the Maine Beach Mapping Program (MBMAP) Shoreline Erosion Mapping
Year(s): FY2021-2025
Description of activities: MGS will continue to implement the MBMAP project with a seasonal summer intern and dedicated travel funds to support mapping efforts. MGS will expand the data collection to include several larger beach systems in Casco Bay, and Roque Bluffs State Park. MGS will update the MBMAP viewer annually with new beach, dune, and dry beach width changes. MGS will develop a tutorial on using the viewer.
Major Milestone(s): Continuation and expansion of the MBMAP. MGS will update the MBMAP viewer annually with new beach, dune, and dry beach width changes.
Budget: $66,635

Update the Maine Sea Level Rise/Storm Surge Viewer
Year(s): FY2021-FY2025
Description of activities: Years 1-2: Review of 5th National Climate Assessment SLR scenarios and scientific direction from Climate Council and NOAA OCM for relevant scenarios for Maine; update to coastal elevations based on a new NTDE when available. Years 3-5: Develop and release the updated viewer and tutorials for users.
Major Milestone(s): Updated sea level rise data and viewer for Maine's coastline.
Budget: $66,635

Expand the Coastal Structure and Dune Crest Inventory and Overtopping Potential (CSDCIOP) Viewer
Year(s): FY2021-2025
Description of activities: Years 1 and 2: Develop an automated methodology for expanding the viewer to other areas of Maine. Review product design with NWS, NOAA OCM, and MEMA. Compile and develop datasets, as needed. Expand the COSDCIOP to Casco Bay and Sagadahoc Counties. Year 3: Expand the COSDCIOP to select areas of Lincoln, Knox, and Waldo Counties. Year 4: Expand the COSDCIOP to select areas of Hancock County. Year 5: Expand the COSDCIOP to select areas of Washington County. Release an updated CSDCIOP viewer along with supporting tutorials as counties are completed.
Major Milestone(s): Development of a routine and expansion of the viewer to select areas of all coastal counties in Maine.
Budget: $66,635

Expand the Living Shoreline Decision Support Tool
Year(s): FY2021-2025
Description of activities: Years 1 and 2: Develop an automated methodology for expanding the LSDST to other areas of Maine. Compile and develop datasets, as needed. Expand the LSDST to selected geographic areas in Sagadahoc County. Technical review of data with NOAA OCM. Year 3: Expand the LSDT to selected areas of Lincoln, Knox, and Waldo Counties. Year 4: Expand the LSDST to selected study areas of Hancock County. Year 5: Expand the LSDST to selected study areas of Washington County. Release an updated viewer along with tutorials.
Major Milestone(s): Development of a routine and expansion of the viewer to select areas of all coastal counties in Maine.
Budget: $66,635

Update and expand the Maine Beach Scoring System (BSS) by Integrating New Datasets
Year(s): FY2022-2025
Description of activities: Years 1 -2: Compile and develop new datasets, as needed, for the BSS and develop an updated scoring methodology. Technical input/review from NOAA OCM. Years 3-4: Implement the BSS for beach systems in Kittery, York, Ogunquit, Wells, Kennebunkport, Kennebunk, Biddeford, Saco, Old Orchard Beach, Scarborough, South Portland, Cape Elizabeth, Portland (and island communities), Phippsburg, Georgetown, and Pemaquid. Year 5: Develop and release a Beach Scoring System Viewer on the MGS Coastal Hazards page.
Major Milestone(s): Development of a routine and expansion of the viewer to select areas of all coastal counties in Maine.
Budget: $66,635

VII. Fiscal and Technical Needs

A. Fiscal Needs:

The cost of completing this strategy is likely beyond the limitations of Section 309 funding, particularly if assistance from consultants is needed.

B. Technical Needs:

NOAA CO-OPS needs to provide Maine tide stations with a new National Tidal Datum Epoch and Highest Astronomical Tide relative to the NTDE. Based on correspondence with CO-OPS staff, the anticipated release of a new NTDE is in 2022 or 2023. Timely release of products in this Strategy will depend on the availability of the new NTDE and direction from the Maine Climate Council. Technical input and review from NOAA OCM on SLR scenarios with probabilities and evaluation of different coastal hazard viewers will be needed.

C. Projects of Special Merit (Optional)

5-Year Budget Summary by Strategy

Strategy Title	Anticipated Funding Source (309 or Other)	Year 1 Funding	Year 2 Funding	Year 3 Funding	Year 4 Funding	Year 5 Funding	Total Funding
1 SLR Policy	309	$12,853	$13,321	$13,807	$14,314	$14,841	**$69,135**
2 Regulations	309+ other sources needed	$72,910	$69,782	$66,730	$58,756	$60,864	**$329,041**
3 Hazard Products	309 + other sources needed	$122,363	$115,963	$114,722	$108,637	$112,726	**$574,411**
Total Funding	309 +other resources needed	**$208,126**	**$199,065**	**$195,259**	**$181,707**	**$188,431**	**$972,588**

Ocean Resources Strategy 1: Monitoring and Modeling of Ocean Habitat to Support Spatial Management Tools and Strategies in Shared Waters

VIII. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas *(check all that apply)*:

- ☐ Aquaculture
- ☒ Energy and Government Facility Siting
- ☐ Coastal Hazards
- ☒ Ocean/Great Lakes Resources
- ☐ Special Area Management Planning
- ☐ Cumulative and Secondary Impacts
- ☐ Wetlands
- ☐ Marine Debris
- ☐ Public Access

IX. Strategy Description

C. The proposed strategy will lead to, or implement, the following types of program changes *(check all that apply):*

- ☐ A change to coastal zone boundaries;
- ☒ New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;
- ☒ New or revised local coastal programs and implementing ordinances;
- ☐ New or revised coastal land acquisition, management, and restoration programs;
- ☐ New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,
- ☒ New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.

D. Strategy Goal: Using previously collected and new marine and coastal monitoring and assessment information, create and implement policy guidance to respond to changing ocean and coastal conditions; improve Maine's spatial management tools in order to inform future development and siting of facilities, specifically offshore wind and aquaculture, in shared ocean space; inform development of proposed changes to refine Maine's federal consistency review process, including potentially those regarding necessary data and information and geographic location description(s)

E. Strategy Approach:

A diversifying marine economy increases demand for ocean space. Siting evaluation processes often require ocean users to demonstrate the locations and frequency with which they utilize that space. DMR will work with multiple sectors to develop better data collection, management and analysis tools to inform applicants, regulators, and the public about existing uses and relative importance of areas for those uses.

MCP and its partners will identify and address coastal and marine data acquisition priorities and goals, develop data products for use in addressing high priority coastal management issues using

previously collected and new data acquisition, e.g. eelgrass decline, shifting habitats, invasive species, areas of significant habitat value. We will create formal and informal mechanisms to leverage limited resources through coordination with federal and state government, academia and not for profit organizations. This work will:

a. Provide critical data and information needed to accurately inform decision-making to address high priority coastal management needs (including offshore wind habitat availability for species vulnerable to climate change, and invasive species detection);
b. Create a mechanism for conveying management-oriented research needs to funders and academic researchers;
c. Assess the efficacy of how ocean and coastal data and data products are currently made available to stakeholders, including municipalities, regional planning organizations, and others, and formalize improved methods for data delivery and training and support for use of data products; and
d. Inform development of proposed changes to refine Maine's federal consistency review process, including potentially those regarding necessary data and information and geographic location descriptions.

We will accomplish these goals through increased coordination, prioritization of research, and assurance of compatible research methodologies. Specific spatial management goals using existing and newly collected data, based on *Emerging Issues* as identified in Phase II of this assessment, will be to explore offshore wind siting through the lens of reducing shared-space conflicts, and inform the selection and review of dredge areas and new disposal sites.

This work will complement or support the Governor's Energy Office under its Maine Offshore Wind Initiative, an effort to inform the state's participation in the BOEM Gulf of Maine Task Force. This may take a range of forms depending on the activity and areas in question, and the constituencies that need to be engaged. Staff time will be committed to increased outreach and communication to coastal communities and impacted stakeholders. Stemming from these outreach activities, specific projects to advance the strategy goals will emerge. For example, interest in siting offshore wind in the Gulf of Maine would benefit greatly from improved spatial characterization of fisheries activities. If potential areas of interest can be narrowed, it may be possible to work more closely with area fishermen to obtain finer-scale location data to improve understanding of vessel movement and fishing activity in an area of interest. For aquaculture siting, a specific bay that is experiencing significant growth in the sector may warrant aerial or other survey work to establish a baseline for annual fishing activity to provide context for regulators and new aquaculture businesses.

Finally, through this strategy MCP will work with Maine Geological Survey, the US Army Corps of Engineers, and other relevant partners by providing supporting information for dredge coordination and disposal siting. This work will support more dynamic and streamlined permitting, particularly in cases such as time-sensitive permits required to navigate Naval ships into and out of the Kennebec River, and for small communities that require maintenance dredging for access by commercial and recreational vessels. Regarding the siting of new disposal areas, during the last five years, MCP has worked with MGS and other partners to determine the depth of closure for sand transport at Maine's six most popular beaches, with the goal of being able site clean sand dredge materials within this zone in order to replenish on-shore beach areas with minimal impact on the local biological benthic habitat. In light of this goal, within the next five years, we will be actively

working with MGS and the US Army Corps of Engineers to relocate the disposal area for sand dredged from the Kennebec River closer to Popham Beach State Park

X. Needs and Gaps Addressed

While recent efforts have provided a great deal of marine habitat data along Maine's coast, there are still notable gaps for over two-thirds of Maine's coast with respect to basic information needed for well-informed and forward-looking ocean and coastal resource management. Critical ocean data gaps include bathymetry, habitat, water quality parameters, water column temperature profiles, and benthic species composition. This type of information is critical to the understanding of emerging issues and the development of science-based measures to address them.

In order to respond to the Ocean Resources stressors identified in Phase II of this strategy (changing ocean conditions to document and forecast temperature fluctuations and trends, SAV loss, benthic habitat changes, invasive species, "movement" of commercially important fish stocks due to changing habitat conditions, and ocean acidification) we must use existing data and in priority areas collect additional data to have a baseline understanding of present conditions and to build models forecasting changes. The response to these stressors cannot be based on speculation but must be based on sound science relying foremost on an accurate and robust depiction of marine habitat and baseline conditions. Understanding this, the Maine Climate Council's Coastal and Marine Working Group has identified in multiple strategies the need for marine mapping and monitoring. This strategy will help implement these anticipated recommendations of the Governor's Climate Council.

This strategy also addresses the third stressor identified in Phase II of this assessment, "managing competing uses of ocean space" by integrating information about a location, including the physical and biological characteristics of a space with the overlying issues of e.g. commercial fishing, aquaculture, offshore energy, and dredging. In this way, this strategy will address the identified emerging issues of offshore wind development and potential new dredge disposal areas.

Other priority needs and gaps addressed by this strategy vary to some degree with the fishery or activity in question. In the course of DMR's regulatory work, agency staff often encounter situations where user groups assert an adverse impact from an activity, but where there is little data to use to assess the extent of that impact to inform decision making. Furthermore, often there is not an adequate venue or opportunity to develop tools outside of the regulatory process, where interests might be focused more on improving available information and less on individual outcomes. These are typically localized issues best addressed with fine-scale data collection and analysis, but the approaches will have broader statewide application and potentially be scalable as well. For example, development of dredge haul routes often occurs without input from area fishermen who may be impacted by the regular transit through their grounds. MCP and DMR have been working with the USACE and MEDEP to develop a protocol for early outreach with local fishermen to identify a haul route that minimizes impact. While early efforts are an engagement strategy using remote meeting technology to share charts, a refined approach could benefit from localized data area on fishing activities, particularly around disposal sites, such as the Isle of Shoals North site.

To support these management needs, MCP will use previously and newly collected data (such as bathymetry, benthic sediment and habitat, multi-species distributions, and human use) to produce layered spatial use models. These products will build upon mapping efforts by MCP and others, and will provide a data-driven tool for policy and management shared-use decision making.

XI. Benefits to Coastal Management

Discuss the anticipated effect of the strategy, including the scope and value of the strategy, in advancing improvements in the CMP and coastal management, in general.

Sound data based on established protocols, addressing key topics, such as the primary factors contributing to changing ocean conditions in the Gulf of Maine, and occurring in priority areas of interest will enhance the scientific rigor, predictability, and efficiency of ocean resources management and related regulatory decisions, including those concerning siting of ocean-based development and resiliency preparedness. A central feature of this strategy is the assurance that data collected, either as a direct result of this strategy's funding or leveraged by other initiatives, are made readily available to coastal decision-makers and that data products derived from coastal and ocean data are usable by target audiences. This strategy will enhance our ability to support state, federal and non-governmental management and policy decisions.

This work will create opportunities for education, outreach and engagement for all interested users of ocean space. It will also improve decision support tools for stakeholders, regulators and the public as new ocean uses are introduced, expand, and impact existing uses. Ideally, this will lead to reduced user conflict, increased diversification in the marine economy, and greater economic resilience for coastal communities.

XII. Likelihood of Success

The likelihood of achieving this strategy's principal objectives is high and achievable in a 5-year time frame. MCP has cultivated partnerships with various ocean and coastal research institutions and built an ocean survey program from the ground up using various funding sources and in-kind contributions from its partners. Increased pressure on existing uses will make it increasingly necessary for concerned stakeholders to consider alternative approaches to ensure their uses are known and supported by data. Although wide-scale implementation of data collection, management and analysis may be challenging without additional resources, pilot-scale projects will be effective in beginning to effectuate social change. Finally, there has been recent legislative interest in increasing Maine's efforts in ocean and coastal monitoring. Stakeholders consulted during this Assessment and Strategy process confirmed that focus on collection and interpretation of data to address key information gaps and facilitation of the use of such data for decision-making and policy development implementation should be a major focus of the MCP's work during the next five-year period.

XIII. Strategy Work Plan

Strategy Goal: Increase the capacity for monitoring/assessment and the use of coastal and ocean data at the federal, state, regional and local level to respond to changing ocean and coastal conditions.
Total Years: 1-3

Total Budget: $49,000

Year(s): 1
Description of activities: Conduct outreach and education with coastal communities related to aquaculture; Support/follow early phases of stakeholder engagement strategy for Maine Offshore Wind Initiative; Identify opportunities to develop and implement specific projects to advance strategy goals
Major Milestone(s): Development of targeted projects to address information gaps
Budget: $25,000

Years: 1, 2, 3
Description of activities: Convene partners at DMR, DEP, NOAA, academics and non-profit organizations, municipalities, RPOs and others within the first year to identify coastal and ocean management needs, priority areas of interest and types of data needed, data derivatives, spatial management tools, and models that can be used in making ocean and coastal resources management decisions, and opportunities for collaboration on data collection and synthesis. Re-convene these partners periodically in Year 2 and 3 to determine new or shifted priorities.
Major Milestones: Identification of coastal management priorities and data needs; identification of specific data applications and data users; identification of high priority monitoring/research goals and data products; development of a data distribution plan for municipal and regional governments.
Budget: $24,000

Strategy Goal: Collect new marine habitat data including bathymetry, sediment, benthic fauna, and water chemistry information to support habitat assessments and forecast models, shared-space management and policy, and fisheries management
Total Years: 1-5
Total Budget: $480,000

Year(s): 1-5
Description of activities: In areas of interest developed through the first strategy, gather priority data, refine benthic habitat model, and assist with place-based special studies.
Major Milestones: Completion of data collection for priority areas of interest as agreed upon by partners, analysis of data gathered during field seasons and development of models and tools, and successful application of benthic habitat modeling in the development of DMR and other agency management.
Budget: $480,000

Strategy Goal: Development of Spatial Management Tools to Inform Marine Habitat Modeling and Shared-Space Uses such as Aquaculture, Offshore Wind Siting and Dredge Activities
Total Years: 2-5
Total Budget: $180,000

Years: 2-4
Description of Activities: Integrate all previously and newly collected data as appropriate into DMR policy and fisheries management, use data to inform other state agency priorities and regional marine planning, including offshore wind siting, aquaculture siting, and habitat

climate-forecasting models, and publicize data products to support information sharing, networking and collaborative projects.
Major milestones: Marine habitat information synthesized into reports and models for policy and management and used for multi-sector decision making
Budget: $135,000

Year: 5
Description of Activities: Use the results of habitat classification work to identify areas of concern for future consideration by marine policy makers for planning decisions, including but not limited to those regarding federal consistency review. Publicize data products to support information sharing, networking and collaborative projects. Determine the use and downloads of data and derivative models to inform the applicability and demand for the products.
Major milestones: Existing and newly collected data synthesized into models and tools that are publicly available and distributed.
Budget: $45,000

XIV. Fiscal and Technical Needs

A. Fiscal Needs: DMR will utilize staff resources, funded by General Fund or Other Special Revenues, to support additional needs to achieve this strategy.

B. Technical Needs: Contractors and technical advisory team members will supplement state agency staff.

XV. Projects of Special Merit (Optional)

- Shared-use decision making: using habitat and multi-species models to inform human use of ocean resources
- Modeling changing ocean conditions based on habitat availability and climate forecasts
- Research and disseminate findings on how adaptive management techniques can be developed/used in light of effects on species and communities from changing environmental conditions and applicable statutory and regulatory requirements.
- Developing marine habitat models based on mixed data-collection platform data: how bathymetry, backscatter, and sediment information collected using various methods can be used to create combined products.

Summary Funding Table

Strategy Title	Anticipated Funding Source (309 or Other)	Year 1 Funding	Year 2 Funding	Year 3 Funding	Year 4 Funding	Year 5 Funding	Total Funding
Increase the capacity for monitoring/assessment and the use of coastal and ocean data at the federal, state, regional and local level to respond to changing ocean and coastal conditions.	309 and Other	$33,000	$8,000	$8,000			$49,000
Collect new marine habitat data including bathymetry, sediment, benthic fauna, and water chemistry information to support habitat assessments and forecast models, shared-space management and policy, and fisheries management	309 and Other	$96,000	$96,000	$96,000	$96,000	$96,000	$480,000
Development of Spatial Management Tools to Inform Marine Habitat Modeling and Shared-Space Uses such as Aquaculture, Offshore Wind Siting and Dredge Activities	309 and Other		$45,000	$45,000	$45,000	$45,000	$180,000
Total Funding		$129,000	$149,000	$149,000	$141,000	$141,000	$709,000

Ocean Resources Strategy #2 - Coordinating Interstate and Regional Management Efforts in the Gulf of Maine and New England

XVI. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas *(check all that apply)*:

- ☐ Aquaculture
- ☒ Energy and Government Facility Siting
- ☐ Coastal Hazards
- ☒ Ocean/Great Lakes Resources
- ☐ Special Area Management Planning
- ☐ Cumulative and Secondary Impacts
- ☐ Wetlands
- ☐ Marine Debris
- ☐ Public Access

XVII. Strategy Description

F. The proposed strategy will lead to, or implement, the following types of program changes *(check all that apply):*

☐ A change to coastal zone boundaries;

☒**New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;**

☐ New or revised local coastal programs and implementing ordinances;

☐ New or revised coastal land acquisition, management, and restoration programs;

☐ New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,

☐New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.

G. Strategy Goal: Enhance collaborative efforts across state governments and with federal government partners to address cross-boundary issues that impact the Gulf of Maine, the Northeast region and its user communities through development of mapping and modeling products for use at the federal, state, regional and local level; using regional partnerships to advance the understanding of regional processes such as climate change and shifting habitats, and shared interests such as resource use and energy facility siting; and building formal partnerships and agreements on cross-boundary issues

H. Strategy Approach:

MCP will work with other DMR staff, MGS and other state agency partners to support the work of the Northeast Regional Ocean Council and its Ocean Planning Committee and Habitat Classification and Ocean Mapping Committee; the Gulf of Maine Council on the Marine Environment; and the Bureau of Ocean Energy Management Gulf of Maine Task Force. This includes participation in the Regional Offshore Science Alliance, the Regional Wildlife Science Entity, the MARCO/NROC/RODA Commercial Fisheries Data Project and Regional Association for Research on the Gulf of Maine (RARGOM). This active participation will result in specific products such as:

- Regional marine habitat mapping, including updated regional bathymetry and sediment maps

- New local, state, and regional data available on the Northeast Ocean Data Portal, including Maine's seafloor data, marine mammal and avian observations, and other layers relevant to cross-boundary issues as identified by regional interest
- Identification of regional research priorities and collaboration on projects to advance the understanding of resource use and climate change on regional trends

In addition, it is anticipated that there will be both formal and informal processes to identify cross-jurisdictional research priorities and coordinated regional stakeholder engagement opportunities (e.g. a regional federal fisheries stakeholder group).

XVIII. Needs and Gaps Addressed

Regional collaborative efforts address complex interjurisdictional issues and thus are resource-intensive, and hard to implement given limited staffing and other funding for state agencies and its nongovernmental partners. Several of the newly formed regional entities (i.e. Regional Offshore Science Alliance and the Regional Wildlife Science Entity) will focus their work on multijurisdictional data gaps and priority setting. The coordinated effort ensures that participants maximize their time and energy on development of actions, best management practices, and potential regional memorandums of agreement. For example, it is anticipated that ROSA may identify shared research needs and coordinate and coordinate design of research projects with government, fishing industry stakeholders and wind energy developers in order to achieve early buy-in from all stakeholders. This will help to ensure that results can be analyzed and used to inform management upon completion without delay or objection.

Other groups, such as an interjurisdictional fisheries working group being considered, will focus on stakeholder engagement at a regional scale. This will minimize burden on capacity-limited stakeholders, such as federally-permitted commercial fishermen, who would otherwise need to monitor disparate efforts by various jurisdictions. This will also limit the participation burden for state and federal partners who do not have additional staff to support this work, and facilitate information sharing between states and federal partners. It is anticipated that outcomes of such an effort could include best management practices for mitigating impacts on fishing activity in development of offshore wind construction and operations plans, or specific products such as transit studies.

The Ocean Resource Management Phase II Assessment identified the need to enhance the Northeast Data Portal with Maine spatial data to foster better regional approaches. Through this strategy, we will work to include these data to inform regional work and management decisions. MCP will provide newly-available coastal and marine mapping products, habitat information, and other CZM-driven efforts to regional partnerships to inform management, policy, and data-sharing goals. Additionally, this will include formalizing regional approaches for data and information management, and determining what needs and gaps exist that limit effectively working at the regional level.

XIX. Benefits to Coastal Management

Regional planning entities are a key mechanism for intergovernmental coordination on issues of regional significance. MCP's continued engagement ensures that Maine's interests are represented, issues of significance to our coastal communities are identified and advanced, and cross-jurisdictional sharing of best practices is facilitated. At a regional level, coordination on

development of research needs and priorities related to offshore wind energy development ensures that the highest shared priorities are visible when funding opportunities arise.

XX. Likelihood of Success

This is a highly achievable goal for the assessment period. Participation in regional coordination entities is supported at the agency and governor's office levels. Stakeholders and external constituents are supportive of intergovernmental coordination which minimizes burden for members of the public to participate, as opposed to having to participate in disparate state-specific processes in multiple jurisdictions.

XXI. Strategy Work Plan

Strategy Goal: MCP will engage in formal and informal processes to identify cross-jurisdictional regional stakeholder engagement opportunities (e.g. a regional federal fisheries stakeholder group) to identify priority issues for regional stakeholders.
Total Years: 2
Total Budget: $10,000

Year(s): 1-2
Description of activities: MCP will work with state and regional partners to identify cross-boundary issues that impact stakeholders in the Gulf of Maine, the Northeast region and its user communities.
Major Milestone(s): MCP, in collaboration with other DMR staff will determine what efforts should be developed and implemented to create work plans to address priority issues for regional stakeholders.
Budget: $10,000

Strategy Goal: Enhance collaborative efforts across state government to address cross-boundary issues that impact the Gulf of Maine, the Northeast region and its user communities through developing mapping and modeling products for use at the federal, state, regional and local level.
Total Years: 4
Total Budget: $40,000

Year(s): 1-4
Description of activities: MCP will work with state, regional, and federal partners to enhance regional marine habitat mapping, include new local, state, and regional data on the Northeast Ocean Data Portal, and identify regional research priorities and collaboration on projects to advance the understanding of resource use and climate change on regional trends.
Major Milestone(s): Updated regional bathymetry and sediment maps, inclusion of Maine's seafloor data, marine mammal and avian observations, and other layers relevant to cross-boundary issues as identified by regional interest available on regional data portals, and identification of regional research priorities and collaboration on projects to advance the understanding of resource use and climate change on regional trends.
Budget: $40,000

Strategy Goal: MCP will engage in formal and informal processes to identify cross-jurisdictional research priorities to facilitate shared collection, use and transfer of coastal and marine data, tools, and planning principles.
Total Years: 3
Total Budget: $15,000

Year(s): 3-5
Description of activities: MCP, in collaboration with DMR staff, MGS, and other relevant state partners will address cross-boundary issues that impact the Gulf of Maine, the Northeast region and its user communities, including the Northeast Regional Ocean Council and its Ocean Planning Committee, the Gulf of Maine Council on the Marine Environment, and the Bureau of Ocean Energy Management Task Force process.
Major Milestone(s): Inter-agency and regional data and tool sharing project deliverables, including but not limited to shared use of regional bathymetry to develop marine sediment and habitat maps, habitat classification tool refinement based on regional use, and transfer of management tools.
Budget: $15,000

XXII. Fiscal and Technical Needs

A. Fiscal Needs: Additional funding is being provided as in-kind staff and contract support from other agencies, and additional resources may be sought from outside funding sources.

B. Technical Needs: Partnerships with NOAA OCM and other NOAA offices have been invaluable in previous efforts and MCP/DMR welcomes/invites continued technical involvement from NOAA.

XXIII. Projects of Special Merit (Optional)

– Regional or inter-agency development of marine and coastal habitat classification refinement based on Gulf of Maine specific conditions

5-Year Budget Summary by Strategy

Strategy Title	Anticipated Funding Source (309 or Other)	Year 1 Funding	Year 2 Funding	Year 3 Funding	Year 4 Funding	Year 5 Funding	Total Funding
Engage in formal and informal processes to identify cross-jurisdictional regional stakeholder engagement opportunities to identify priority issues for regional stakeholders.	309 and other	$5,000	$5,000				$10,000
Enhance collaborative efforts across state government to address cross-boundary issues that impact the Gulf of Maine, the Northeast region and its user communities through developing mapping and modeling products for use at the federal, state, regional and local level.	309 and other	$10,000	$10,000	$10,000	$10,000		$40,000
MCP will engage in formal and informal processes to identify cross-jurisdictional research priorities to facilitate shared collection, use and transfer of coastal and marine data, tools, and planning principles.	309 and other			$5,000	$5,000	$5,000	$15,000
Total Funding		$15,000	$15,000	$15,000	$15,000	$5,000	$65,000

WETLANDS

Wetlands Strategy 1: Implement the CoastWise Approach through Trainings and Municipal Support Materials

XXIV. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas *(check all that apply)*:

- ☐ Aquaculture
- ☐ Energy and Government Facility Siting
- ☒ Coastal Hazards
- ☐ Ocean/Great Lakes Resources
- ☐ Special Area Management Planning
- ☒ Cumulative and Secondary Impacts
- ☒ Wetlands
- ☐ Marine Debris
- ☐ Public Access

XXV. Strategy Description

I. The proposed strategy will lead to, or implement, the following types of program changes *(check all that apply):*

☐ A change to coastal zone boundaries;

☒ **New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;**

☐ New or revised local coastal programs and implementing ordinances;

☒ **New or revised coastal land acquisition, management, and restoration programs**;

☐ New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,

☒ **New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.**

J. *Strategy Goal:*

MCP and its partners will work with existing (and identify new) partners to implement Phase II of the CoastWise Approach for tidal crossing restoration to deliver materials and hands-on trainings (developed during Phase I 2018-2020) geared toward engaging municipal road managers and/or contractors and professionals that frequently work with municipal clients.

K. Describe the proposed strategy and how the strategy will lead to and/or implement the program changes selected above:

Responsible and informed tidal road crossing design requires integration of multiple considerations, including public safety, ecology, and climate resilience. Yet a comprehensive and readily-applied set of best practices for planning, designing, and building tidal road crossings has remained lacking. In response, the Maine Coastal Program and its partners have worked together over the past two years to develop an innovative program: the CoastWise Approach for tidal road crossings. CoastWise synthesizes and will encourage best practices for planning, design, and construction of ecologically-supportive tidal crossings that are safe, climate-resilient, and cost-effective. CoastWise is innovative

in its balanced approach to restoration and support of adjacent marsh ecosystems, as well as factors influencing the local community's well-being over the long-term.

During this 5-year period, Maine Coastal Program and its partners will implement the outreach and training phase of CoastWise, including coordination and refinement of training modules, materials, and field workshops. The target audience includes municipalities, other road managers, engineers, and restoration practitioners. Outreach will primarily be delivered during community sessions that will involve day-long events for road managers and other interested parties. Content will focus on the impact of crossings on tidal ecosystems, crossing design best practices to improve resiliency to both these habitats as well as coastal community infrastructure, cost-effectiveness scenarios, and data collection methods, and engineering modeling, and participatory identification of design objectives related to key considerations linked to safety, ecological support, and climate resilience outcomes. Trainings will also include field workshops for users representing a range of technical abilities, including engineers, restoration practitioners, and/or road owners and their staff. Initial concepts for trainings include introduction to case studies and sites involving different crossing design characteristics, interpreting signs of impaired habitat, and recommended data collection methods.

Coastwise as originally scoped, will be a BMP/guidance approach, rather than a regulatory or incentive-based program. Recommendations presented by the Maine Climate Council to the Maine Legislature in January 2021, could potentially include suggested improvements in regulatory and non-regulatory and incentive-based approaches to tidal culvert restoration.

XXVI. Needs and Gaps Addressed

Through training road managers, engineers, and municipal planners in the best practices for restoring tidal crossings and providing guidance documents on these practices, more tidal crossings will be improved to allow tidal flow. This directly addresses the three Stressors identified during this assessment:

- Development & Land Use Change in Wetlands and Wetland Buffers that impact tidal flow and marsh migration corridors – by improving tidal flow at crossings and thus allowing for marsh migration;
- Sea Level Rise - by allowing current marshes to adequately keep pace with sea level rise by allowing for the full flow of sediment to marshes upstream of crossings; and,
- Changes in freshwater input and groundwater flows due to historical hydrological alteration & channelization and recent development – by providing information in trainings about these legacy effects, how they can be assessed at marsh sites, and how they may be addressed as part of tidal crossings projects.

Further, this strategy addresses Emerging Issues identified in the assessment including sea level rise and marsh migration and Blue Carbon. Blue Carbon refers to carbon that is sequestered by coastal ecosystems like salt marshes, seaweeds, and seagrass beds. The Maine Climate Council's Coastal and Marine Working Group has recently developed a Blue Carbon Optimization Strategy that specifically calls for improving the quality of existing tidal marshes and improving marsh migration pathways through the CoastWise Approach. The Strategy describes the vastly reduced potential of salt marshes to sequester carbon when their salinity is reduced below a certain threshold, specifically citing the impact of restrictive road, dam, and other marsh crossings as leading to restricted and impaired marsh ecosystems.

XXVII. Benefits to Coastal Management

Coastal marshes and streams need the full ebb and flow of the tides to remain healthy enough to provide benefits important to public well-being, healthy ecosystems, and species movement. At over 900 locations in Maine (over 90% of all tidal crossings), tidal flow is hindered and sometimes completely blocked by man-made structures like culverts, bridges and dams. These tidal restrictions are most often caused by road crossings often traditionally designed in a way that does not consider the need for marsh health and stream connectivity. Commonly, road crossings are undersized and perched above the marsh creek channel so they cannot adequately accommodate present or projected tidal flows and block the movements of fish and wildlife through the crossing for some or all of the tidal cycle. Tidal restrictions change the physical, chemical, and biological characteristics of a marsh. Depending on the degree of tidal restriction, impacts can include rapid, complete tidal marsh loss, reduced tidal sedimentation (preventing marshes to keep pace with sea level rise), and upstream methane and greenhouse gas emissions. With increasing rainfall and sea level rise, these traditional gray infrastructure crossings are also at greater risk of damage or failure since many have not been designed to withstand these changing conditions. This strategy will benefit coastal management by:

- Utilizing the work of a diverse group of partners that have developed best practices for tidal road crossing design
- Through direct outreach and engagement, implementing the practices to mediate or remove tidal restrictions while providing safe, low-maintenance, climate-resilient crossings
- Widely distributing information and directly training local and regional practitioners, engineers, and planners on practices that are standardized (yet adaptive), efficient, climate-tuned, and cost-effective
- Providing outreach and education to state and municipal officials on how to incorporate this information into decision-making, comprehensive plans, and management of coastal resources at the state and local level.
- This strategy, over-multiple years, will provide important information about the costs of the Coastwise approach as compared to historically used restoration practices.

XXVIII. Likelihood of Success

There is a high likelihood of attaining the strategy goal and program change. This strategy builds on a successful partnership of over 25 state and federal agencies, academic institutions, non-governmental organizations, and representatives from municipalities. Through the support of a NOAA Coastal Management Fellow during 2018-2020, the Maine Coastal Program has developed a solid and supported series of guidelines and project checklists to use for CoastWise trainings and tidal crossing restoration projects. This strategy directly follows that work and is the next step in implementing the CoastWise Approach.

There is an ever-increasing awareness on the part of the State and coastal municipalities for the importance of protecting both coastal marshes and vulnerable infrastructure to sea level rise, as evidenced by the work of Maine Climate Council. In addition to the Blue Carbon Strategy referenced above, strategies from other workings groups reporting to the Council reference the need to provide training and support to municipalities and infrastructure planners regarding tidal crossings. This CZM strategy directly addresses those needs.

Previous and current work undertaken by the Maine Coastal Program has shown the benefit of education and outreach at multiple levels based on best available science. This project will use that same method to achieve the program change proposed by this strategy. MCP has a long and

successful history of working with partners from a wide variety of constituencies; this strategy will employ that approach.

XXIX. Strategy Work Plan

Strategy Goal:
Coordination and implementation of CoastWise trainings and targeted community engagement sessions, including development and delivery of user-friendly outreach materials including online and print media, one-on-one engagement with community leaders and road owners, and advancement of local tidal demonstration projects using the CoastWise Approach.
Total Years: 5
Total Budget: $100,000

Year(s): 1
Description of activities: Pilot training modules will have been created and initial trainings will have been held as part of Phase I. During this Phase II, we will refine the content and style of workshops and online outreach documents based on feedback from the initial round of trainings. These will provide outreach and direct engagement as short reference tools during trainings and for broadly sharing the CoastWise Approach principles and tools with a wider audience.
Major Milestone(s): Materials utilized in the first round of trainings and outreach will be revised as needed to be tailored to user's needs.
Budget: $25,000

Year(s): 1-5
Description of activities: Outreach will primarily be delivered during full-day training sessions and field workshops. Content will focus on the impact of crossings on tidal ecosystems, crossing design best practices to improve resiliency to habitats and coastal infrastructure, cost-effectiveness scenarios, data collection methods, engineering modeling, and participatory identification of design objectives linked to safety, ecological support, and climate resilience outcomes. Outreach will also be targeted individually to road managers, design professionals, and restoration practitioners through individual engagement and at conferences such as the Maine Municipal Association's Annual Conference, Maine Stormwater Conference, and Northeastern Transportation and Wildlife Conference. Additionally, we will expand these trainings to include field workshops that focus on specific components of tidal crossing assessment, including rapid marsh health assessment. To jumpstart on-the-ground projects and local capacity building, we'll use training sessions to identify candidate projects in communities within the project area that may be used as demonstration projects.
Major Milestone(s): Full-day training sessions and field workshops will be refined during Year 1 and will continue through Year 5. Demonstration projects will occur based on opportunity, however, as of June 2020 three projects that will use the Coastwise Approach are currently being evaluated for construction.
Budget: $75,000

XXX. Fiscal and Technical Needs

A. Fiscal Needs:

CZMA Section 309 funding may be insufficient to fully fund this strategy work plan, however there are over 25 partners advancing the CoastWise Approach that have dedicated in-kind and cash match funding to the development of this effort and are supportive of continuing this support over the implementation of the Approach. Maine Outdoor Heritage Fund is a possible source of state funding and working draft strategies in the Maine Climate Council's working groups support funding for the implementation of CoastWise and tidal crossing projects.

B. Technical Needs:

The CoastWise Project is led by the Maine Coastal Program and guided by a Steering Committee that includes representative from: Maine Coastal Program, Casco Bay Estuary Partnership, NOAA Office for Coastal Management, USFW Gulf of Maine Office, Wells National Estuarine Research Reserve, Maine Coast Heritage Trust, and The Nature Conservancy. This Project convenes a partnership of 46 project participants representing 27 organizations from municipal, state, federal, and non-government sectors who have all contributed to the development of the innovative CoastWise Approach. The implementation and coordination of outreach for CoastWise will require a continuation of contracted support through Maine Coastal Program and through partner organizations.

XXXI. Projects of Special Merit (Optional)

Potential projects include:

- Demonstration tidal crossing projects to evaluate, design, or restore tidal flow
- Evaluation of the cost/benefit of Coastwise methods vs. others
- Identification of additional non-regulatory and regulatory approaches to tidal crossing restoration through evaluation of existing statutes, rules and programs, and design and presentation of new approaches to policymakers.

Wetlands Strategy 2: Data Collection, Modeling and Monitoring to Inform and Document Changing Marsh Conditions and Potential for Marsh Migration

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas *(check all that apply)*:

- ☐ Aquaculture
- ☐ Energy and Government Facility Siting
- ☒ Coastal Hazards
- ☐ Ocean/Great Lakes Resources
- ☐ Special Area Management Planning
- ☒ Cumulative and Secondary Impacts
- ☒ Wetlands
- ☐ Marine Debris
- ☐ Public Access

II. Strategy Description

A. The proposed strategy will lead to, or implement, the following types of program changes *(check all that apply):*

☐ A change to coastal zone boundaries;

☒ New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;

☒ New or revised local coastal programs and implementing ordinances;

☒ New or revised coastal land acquisition, management, and restoration programs;

☐ New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; and,

☒ New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local government, and other agencies that will result in meaningful improvements in coastal resource management.

B. Strategy Goal:

MCP and its partners will increase the State's capacity to monitor changes in tidal marshes through mapping and field data collection and assess how those changes might affect Maine's marshes' ability to keep pace with sea level rise. MCP and its partners will adopt methods to gather on-the-ground information about the degree to which tidal restrictions are impairing marsh ecosystem health and aquatic passage, including information specific to tidal crossings as well as marsh health. In addition to understanding the passive impacts of sea level rise, this will include work to determine the current amount of marsh acreage impaired and possibly emitting greenhouse gases because of impaired tidal flow and marsh subsidence, and the potential Blue Carbon potential (greenhouse gas reduction) of restoring tidal flow at these sites. These objectives will build upon and continue MCP's sentinel site work and Tidal Restriction Atlas.

C. Describe the proposed strategy and how the strategy will lead to and/or implement the program changes selected above:

It is necessary to understand and document how tidal marshes in Maine are responding to sea level rise in order to plan for and protect future marsh habitat areas. Some of the key components of this strategy will address the questions of whether current marsh habitat will keep pace with sea level rise, where marsh migration pathways are based on recent sea level rise scenarios, whether marsh migration is actually occurring or likely to occur, the degree to which restrictive tidal crossings are impairing marsh habitat and its ecosystem services (including carbon sequestration potential, and the specific scale of the problem that tidal restrictions are causing statewide based on field collected data.

Coastal Blue Carbon is a term that refers locally to the carbon that is sequestered by salt marshes and other coastal vegetation. These ecosystems are an order of magnitude more efficient at burying carbon per unit area than forests, yet when they are degraded, flooded with fresh water, or drained, they can become sources of carbon dioxide and other greenhouse gases (GHGs), including methane. Blue carbon management projects reduce GHG emissions and provide quantifiable and invaluable climate mitigation benefits through conservation, restoration, and creation of coastal tidal marsh ecosystems. These activities would additively ensure protection or restoration of important ecosystem functions that benefit coastal commercial use, landowners, and municipalities. However, the full carbon sequestration value of tidal marshes is dependent on tidal flow. Tidal restrictions change the physical, chemical, and biological characteristics of a marsh. Depending on the degree of tidal restriction, impacts can include rapid, complete tidal marsh loss, reduced tidal sedimentation (preventing marshes to keep pace with sea level rise), and upstream methane and greenhouse gas emissions. Restrictions also impede or block fish passage, yet sea run fish that travel from the ocean to the freshwater as part of their life cycle require these critical connections between habitats along the coast. Restoration and maintenance of these connections are vital to fish migration. Altered conditions can also make marshes more susceptible to non-native, invasive species (e.g. Phragmites) with a resulting cascade of ecological impacts.

By better understanding Maine's potential tidal marsh carbon sequestration potential based on the current habitat, future projected habitat, and ability to address tidal restrictions to allow for the improvement of current tidal marsh habitat and allow future marshes to form, we would be able to a) prioritize and implement conservation to protect critical habitat and critical habitat buffers, including marsh migration spaces, b) identify candidate areas for enhancement, restoration, and cultivation, and c) leverage and mobilize funds to the most appropriate actions.

During this 5-year period, MCP will work with our partners to advance the understanding of Maine's tidal marsh health, carbon sequestration, habitat restoration potential, and projected future marsh habitat, whether it be net growth or net loss. We will do this through field data collection of marsh health assessments (including information on vegetation, water levels, sediment accretion or loss, vegetated to un-vegetated ratios, salinity, and marsh elevations), of tidal restrictions (including field-verified restriction assessments based on existing protocols), and of greenhouse gas emissions and sequestration measurements. We will use this information to model current and future marsh health conditions, state-wide greenhouse gas sequestration, and site-specific restoration needs and potential.

III. Needs and Gaps Addressed

This strategy directly addresses the three Stressors identified during this assessment:

- Development & Land Use Change in Wetlands and Wetland Buffers that impact tidal flow and marsh migration corridors – by documenting the extent to which current marshes and migration areas are impacted by reduced tidal flow at crossings and excess freshwater;
- Sea Level Rise - by documenting and modeling how Maine's marshes are accreting or being lost to sea level rise; and,
- Changes in freshwater input and groundwater flows due to historical hydrological alteration & channelization and recent development – by understanding from actual observations how these legacy effects impact marsh health and Blue Carbon potential, how they can be assessed at marsh sites, and how they may be addressed as part of restoration projects.

Further, this strategy addresses Emerging Issues identified in the assessment including the impact and extent of tidal flow restrictions, sea level rise and marsh migration, anticipated changes in biodiversity in the coastal zone, and Blue Carbon. The Maine Climate Council's Coastal and Marine Working Group has recently developed a Blue Carbon Optimization Strategy that specifically calls for increasing Maine's monitoring capacity, stating that "current monitoring systems including imagery acquisition and mapping are not sufficient to comprehensively and accurately assess blue carbon stocks and sequestration potential; either currently or into the future as tracking of mitigation successes is necessary." This CZM strategy will work hand-in-hand with this State strategy to document current and future marsh health, carbon sequestration, and restoration potential.

IV. Benefits to Coastal Management

Coastal marshes are a critical component of the coastal ecosystem and provide benefits to both the natural and built systems. This strategy intends to better understand the health of, and the stressors impairing Maine's marshes in order to avoid and minimize (net) coastal marsh loss where possible and thus maintain ecosystem services. This strategy will increase understanding of how marsh systems are likely to change as a result of sea level rise, assess what functions, and at-risk species and habitats may be lost, and provide us with an opportunity to implement strategies that support the ability of the marshes to migrate where possible. While some marshes will not be able to migrate due to local topographic conditions and existing armoring of the marsh edge due to adjacent land development, and are likely to be drowned by sea level rise, there are places where the topography and soil characteristics are likely to support the landward movement of existing coastal marshes and transition of fresh water marshes to coastal marshes. With a more detailed understanding of existing and future conditions, we will be able to develop more realistic and successful strategies to support coastal marsh migration and potential development. This strategy will benefit coastal management by:

- Documenting the scale and degree to which the state's tidal marshes are impaired by human causes (e.g. tidal restrictions) and sea level rise;
- Improving assessment tools to measure impacts to tidal marsh functions, values, and ecosystem services;
- Improving marsh conservation and restoration techniques in support of no net loss of wetland functions and values; and
- Improve Maine's understanding of the science related to understanding the changes that will occur or what adaptation strategies are needed.

V. Likelihood of Success

There is a high likelihood of attaining the strategy goal and program change. This strategy builds on the successful development of 1) a statewide salt marsh monitoring effort by MCP during 2017-2020, which installed marsh elevation tables at 11 marshes spanning the coast, 2) a desktop tidal restriction atlas completed by MCP with the support of a NOAA Coastal Management Fellow, and 3) a partnership of state, federal, and non-governmental organization scientists and restoration practitioners who have identified creating rapid marsh health assessments as a necessary component to marsh restoration projects.

As stated above, the Maine Climate Council's Coastal and Marine Working Group have identified monitoring and modeling of the state's tidal marsh condition, tidal flow restoration potential, and future marsh migration scenarios as key to protecting and improving Maine's Blue Carbon stocks. Previous and current work undertaken by MCP has shown the benefit of basing management and policy development at multiple levels on best available science. MCP has a long and successful history of working with partners from a wide variety of constituencies; this strategy will employ that approach.

VI. Strategy Work Plan

Strategy Goal: MCP and its partners will adopt methods to gather on-the-ground information about the degree to which tidal restrictions are impairing marsh ecosystem health and aquatic passage, including information specific to tidal crossings as well as marsh health.
Total Years: 5
Total Budget: $50,000

Year(s): FY2021-2023
Description of activities: MCP and our partners will review recently developed field protocols for assessing tidal restrictions, such as the NH Tidal Crossings Assessment Protocol and the North Atlantic Aquatic Connectivity Collaborative (NAACC) Aquatic Passability Scoring Systems for Tidal Stream Crossings, to adopt a field protocol for assessing tidal flow restriction at the locations identified in the desktop- developed Tidal Restriction Atlas. Because of the large geography of the Maine coast compared to other New England states which have recently completed tidal restriction data collection, we anticipate that protocols will need to be slightly revised to include more desktop assessment when possible (e.g. using aerial images to assess presence of scour). In other cases, Maine partners have expressed the need to collect additional desktop and field information, for example a thorough desktop assessment of surrounding low-lying development.
Major Milestone(s): Adopted field protocol for assessing tidal restrictions in Year 1, field tested and revised in Year 2.
Budget: $20,000

Year(s): FY2023-2025
Description of activities: MCP and its partners will employ the field protocol for assessing tidal restrictions and revise the Maine Tidal Restriction Atlas to include this information. Because of Maine's long coastline and number of tidal crossings (over 1000), and based on time estimates for employing the New Hampshire Tidal Restriction protocol for 140 crossings (2 years) it is anticipated that we will not collect field information on all of Maine's crossings during this period, but will employ the protocol in distinct geographies and build partnerships to continue data collection after this period.

Major Milestone(s): Field data collected for a portion of Maine's tidal crossings, and included in the Atlas and made available online
Budget: $30,000. It is anticipated these activities will require additional funding from partners and other sources.

Strategy Goal: Understand marsh health, stressors, and anticipated changes through mapping, modeling and field data collection
Total Years: 5
Total Budget: $75,000

Year(s): FY2021
Description of activities: MCP will convene state and regional partners to discuss current marsh monitoring programs, recent analysis assessing regional data trends, and refined and expanded monitoring efforts that will better address questions about the impact of sea level rise, success of tidal restoration, and potential for marsh migration.
Major Milestone(s): Develop updated monitoring methods and locations. Partnerships developed with at least one interested municipality and land trust in representative regions to look at potential tidal marsh restoration projects, marsh migration impacts and possibilities.
Budget: $15,000

Year(s): FY2023-2025
Description of activities: MCP and its partners will increase the State's capacity to monitor changes in tidal marshes through mapping and field data collection and assess how those changes might affect Maine's marshes ability to keep pace with sea level rise.
Major Milestone(s): Develop updated State Tidal Marshes Characterization; available online, through scientific reports, and targeted outreach and education materials. At least one demonstration project completed for a tidal flow restoration project, marsh migration study, or other marsh restoration effort.
Budget: $60,000

Strategy Goal: MCP and our partners will work to determine the current amount of marsh acreage impaired and possibly emitting greenhouse gases because of impaired tidal flow and marsh subsidence, and the potential Blue Carbon potential (greenhouse gas reduction) of restoring tidal flow at these sites.
Total Years: 5
Total Budget: $50,000

Year(s): FY2021-2024
Description of activities: Through in-situ measurements at sentinel sites and marshes representing healthy and impaired conditions (including those where tidal flow is restricted by crossings), measure carbon sequestration and methane emission rates, and model these findings to represent a statewide estimate of marsh Blue Carbon potential. Target at least one site for pre- and post-tidal flow restoration monitoring. Present this information to the Maine Climate Council, relevant management and policy agencies, land trusts, and others for targeted restoration and conservation planning.

Major Milestone(s): Estimates of Maine tidal marsh carbon sequestration potential under current conditions and projected marsh migration scenarios, with estimates showing difference between tidal restricted and restored marshes.
Budget: $40,000

Year(s): 5
Description of activities: Present this information to the Maine Climate Council, relevant management and policy agencies, land trusts, and others for targeted restoration and conservation planning.
Major Milestone(s): Draft, review and publish information about findings; work with relevant parties to inform programs and policies
Budget: $10,000

VII. Fiscal and Technical Needs

Fiscal Needs: CZMA Section 309 funding may be insufficient to fully fund this strategy work plan, however we are actively working with partners that are interested in implementing these strategies through in-kind and cash match funding. Maine Outdoor Heritage Fund is a possible source of state funding and working draft strategies in the Maine Climate Council's working groups support funding for the implementation of these strategies.

A. Technical Needs: MCP will develop an advisory team including networked partners and external partner organizations. The advisory team and MCP staff will be supplemented with contractors as needed. MCP will work with the Maine Natural Areas Program, the Wells NERR and academic partners from the University of Maine and Bates College to monitor sediment accretion rates, greenhouse sequestration and emissions, water levels, and other in-situ measurements described above. MCP will contract for wetland functional assessments.

Projects of Special Merit (Optional)

- Collection of marsh and crossing information at tidal crossings
- Developing a method to rapidly document marsh health conditions at tidal restriction sites for restoration projects
- Measuring Blue Carbon potential in Maine's tidal marshes based on in-situ measurements and modeling

5-Year Budget Summary by Strategy: Wetlands

Strategy Title	Anticipated Funding Source (309 or Other)	Year 1 Funding	Year 2 Funding	Year 3 Funding	Year 4 Funding	Year 5 Funding	Total Funding
Implement the CoastWise Approach through Trainings and Municipal Support Materials	309 and partners	$27,500	$27,500	$15,000	$15,000	$15,000	$100,000
Data Collection, Modeling and Monitoring to Inform and Document Changing Marsh Conditions and Potential for Marsh Migration	309 and partners	$35,000	$35,000	$35,000	$35,000	$35,000	$175,000
Total Funding		$62,500	$62,500	$50,000	$50,000	$50,000	$275,000