Report to the Environment and Natural Resources
128th Legislature, First Session

Protecting Maine's Beaches for the Future: 2017 Update

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Executive Summary

This report is an update to the 2006 report, "Protecting Maine's Beaches for the Future" directed by H.P. 854/L.D. 1254, *Resolve to Further Study the Implementation and Funding of a Beach Management Program.* This report revisits the data and actions taken on the recommendations from the 2006 report, and reflects the views, opinions, and recommendations of the Integrated Beach Management Program (IBMP) working group established to review the 2006 report.

Maine's beaches bring over $1.6 billion into the state in tourism and create over 24,000 jobs. Maine's beaches provide vital natural protection from coastal storms, and habitat for a variety of threatened and endangered coastal wildlife species; however, the beaches are threatened by erosion. To keep the beaches healthy for storm protection, habitat, and recreational uses, Maine should consider the use of selective beach nourishment to help manage coastal erosion. A shift to a more proactive nourishment approach could potentially maintain beach health and storm protection in a more predictable cycle that is not solely dependent upon federal dredging budgets and projects. However, potential costs of nourishment are significant.

Four new recommendations of the IBMP work group for implementation and funding of a beach nourishment program are included in this report:

- Recommendation 1, *Identify a funding source to support one to five beach nourishment projects*

The work group and interested parties group agree that the most appropriate funding mechanism for the Environment and Natural Resources (ENR) Committee to consider would be a $10 million bond. This money would initially fund one to five nourishment projects. A consistent source of funding should be established upon successful completion of those projects under the new proposed nourishment program.

- Recommendation 2, *Implement a criteria-based beach nourishment proposal process*

Rather than setting nourishment priorities in advance to determine which beaches should be nourished, municipalities and other entities would submit beach nourishment project proposals in order to request funding for their project. An established committee would rank each proposal using defined criteria to determine which projects would receive funding.

- Recommendation 3, *Monitoring required for projects under this program*

Beach monitoring should be required of any project proposed so the state can gain a better understanding of how nourishment projects benefit the coast and to inform sound investment of public dollars.

- Recommendation 4, *Perform a Comprehensive Review of the Department's Beneficial Reuse Rules*

The existing Chapter 418 Beneficial Use of Solid Wastes rules regulate the permitting and beneficial use of non-hazardous, dewatered dredge materials. As the Department of Environmental Protection (DEP or Department) undertakes the major substantive rulemaking in 2017 for Chapter 418, the work group recommends the Department consider reviewing the testing requirements for the beneficial use of dredged material.

I. Introduction

a. Background

The original Beach Stakeholder's Group met during 2004-2006 to develop policy recommendations for beach management to the Legislature. In February 2006, the Beach Stakeholder's Group submitted a report entitled "Protecting Maine's Beaches for the Future: A Proposal to Create an Integrated Beach Management Program" to the 122nd Legislature (referred to as "2006 report"). That report focused on six specific elements (beach nourishment, wildlife habitat, storm-damaged property acquisition, hazard mitigation, education, and funding) of an Integrated Beach Management Program, and further specified 31 recommendations within those six elements. The full 2006 report can be found at:

https://www1.maine.gov/dacf/mcp/downloads/beaches/protectingmainesbeaches_feb06.pdf

In March 2016, the 127th Legislature passed H.P. 854/L.D. 1254, *Resolve to Further Study the Implementation and Funding of an Integrated Beach Management Program*[1]. The resolve directs the Department of Environmental Protection (DEP) and Department of Agriculture, Conservation and Forestry (DACF) to form a work group focusing on six key tasks including updating the 2006 report, developing recommendations regarding implementation of an integrated beach management program (IBMP), and identifying a funding source for the program. In April 2016 the DEP and DACF convened the Integrated Beach Management Program work group (referred to as "work group") to execute the resolve. In May 2016, representatives of Maine State agencies and organizations involved in development of the 2006 report convened at least monthly. One larger interested parties meeting, involving over 20 people from 15 organizations, was held in November 2016 to discuss the potential report recommendations.

This report summarizes the discussions and work done by the work group, updates the findings in the 2006 report, and offers options for funding a beach nourishment program for Maine for the Legislature to consider. Specifically, this report addresses six key areas as directed by the legislative resolve:

- Update the data and findings contained in the 2006 report
- Develop recommendations regarding implementation of an IBMP
- Develop a comprehensive beach nourishment policy that establishes priority areas
- Consider implementation time frames
- Consider a program for public access easements
- Identify funding sources to support implementation

[1]See appendix A for full language of H.P. 854/L.D. 1254

b. Work Group Members

The 2016 Integrated Beach Management Program work group consists of the following eight members:

Tina Zabierek, Work Group Chair
Department of Environmental Protection

Mark Bergeron, Bureau of Land Resources Director
Department of Environmental Protection

Robert Marvinney, State Geologist
Department of Agriculture, Conservation and Forestry

Lindsay Tudor, Wildlife Biologist
Department of Inland Fisheries and Wildlife

Robert Foley, Director
Save Our Shores Maine

Carolann Ouellette, Director
Maine Office of Tourism, Department of Economic and Community Development

Laura Minich Zitske, Director Piping Plover and Least Tern Project
Maine Audubon

Kathleen Leyden, Maine Coastal Program Director
Department of Agriculture, Conservation and Forestry

c. Interested Parties Group Participants

The work group held an interested parties meeting in November 2016 in the process of developing this report. The following is a list of the 15 organizations that participated in that meeting:

Conservation Law Foundation

Maine Tourism Association

Maine Innkeepers and Maine Restaurants

Maine Campground Owners

Ski Maine

Retail Association of Maine

Southern Maine Planning and Development Commission

Town of Wells

Lafayette Resorts

Surfrider Foundation

Seacoast Area Chamber of Commerce

Saco Shoreline Commission

Howe, Cahill & Company

d. Other Group Contributors

Several other staff members provided critical information to the work group. The group would like to recognize the following people for their contributions:

Marybeth Richardson, Southern Maine Regional Office Director
Department of Environmental Protection

Nathan Robbins, Climate Change Specialist
Department of Environmental Protection

Stephen Dickson, Marine Geologist
Department of Agriculture, Conservation and Forestry

Peter Slovinsky, Marine Geologist
Department of Agriculture, Conservation and Forestry

II. Updated Information for Maine's Beaches

a. Maine's Beaches are at Risk

As cited in the 2006 report, erosion problems in Maine are caused mainly by changes in sea level, regular and severe storm activity, changes in sand availability, and structures constructed prior to the enactment of Maine's Coastal Sand Dune Rules. In 2005, the Maine Geological Survey (MGS) established the Maine Beach MAPping (MBMAP) program which monitors and maps 33 of 41 of Maine's beaches over about 21 miles of sandy beach shoreline annually. Thus, the geological information in this report is more comprehensive than the 2006 report, as it is based on 10 years of mapping and monitoring using much more sophisticated instruments. Appendix C summarizes the horizontal shoreline change rates of southern Maine beaches monitored by the MBMAP program over the last 10 years. Also important to this discussion is a comprehensive chronology of significant events concerning Maine's beaches (Appendix B).

MGS estimates that on 43% of Maine's sandy beaches, the shoreline position is fixed due to armoring[2] which limits the ability of the dune systems to maintain themselves naturally. Thus, it is not possible to establish horizontal erosion rates on these beach segments using MBMAP techniques. The following are some additional statistics determined from MBMAP for Maine's 21 miles of measured shoreline:

- about 17% are stable or gaining sand
- about 41% have low erosion rates (less than 1 foot per year)
- about 24% have moderate erosion rates (between 1 and 2 feet per year)
- about 17% have high erosion rates (over 2 feet per year)

[2] The stabilized shoreline number comes from 16 additional miles monitored by the MBMAP program and are not considered in the other erosional percentages cited in this report.

b. Other Policies Related to Coastal Beach Management

The 2004-2006 Beach Stakeholder Group conducted lengthy discussions of retreat as one way to address chronic threats to the built environment in Maine's coastal beach and dune systems. Retreat is the idea of physically moving farther inland from the coastline. Specifically with regard to retreat, the 2006 report stated, "Relocating development away from erosive areas and/or acquiring properties that are at risk is the most direct and lasting response to shoreline erosion since it eliminates the immediate erosion threat." The 2006 report also acknowledged that, "Relocation of structures out of hazardous areas may not always be technically or economically feasible." The 2006 report recognized that an integrated beach management program would encompass several management strategies: allowing natural processes to occur, implementing hazard mitigation, and altering or enhancing the shoreline. The strategies are not mutually exclusive, and the application of each depends on local conditions.

The Maine Coastal Sand Dune Rules[3], which were revised as a result of the 2-year stakeholder process, govern development in Maine's coastal sand dune systems and contain many provisions related to retreat from hazardous areas that are prone to coastal erosion. Several of these are:

- All building reconstructions that do not meet the maintenance provision (<50% of the structure affected) require permits
- A project may not be permitted if it is threatened by erosion in 100 years, taking into account 2 feet of sea-level rise and a 100-year storm
- No new seawalls are allowed
- No new structures or additions in a FEMA V-zone (areas likely to be subjected to storm-induced waves) are allowed
- A building in the V-zone destroyed by waves may be rebuilt only one time
    - It must be moved back (landward) as far as practicable and,
    - It must minimize intrusion into the V-zone
- Buildings reconstructed on a frontal dune outside the V-zone must be moved landward to the extent practicable
- Reconstructions must be on a post or piling foundation in the erosion hazard area or frontal dune
- If the shoreline recedes to a point where any portion of a structure is within a coastal wetland for six months of the year, it must be removed

In addition to the Maine Coastal Sand Dune Rules, there are other DEP standards, including Shoreland Zoning and the Natural Resources Protection Act (NRPA), which may affect development in coastal sand dune systems. Municipalities may also have local zoning or land use ordinances that govern development along the coast.

[3] The most recent version of the Department's Chapter 355 *Coastal Sand Dune Rules* can be found at: http://www.maine.gov/sos/cec/rules/06/096/096c355.doc

The idea of adopting a "living shorelines" coastal management approach was examined during the 2016 IBMP work group discussions. "Living shorelines" are currently not clearly defined by the state. Some concepts associated with "living shorelines" (i.e. changing habitats from open water to coastal wetlands) are more challenging to permit through Maine's current regulatory structure; however, dune restoration and beach nourishment are considered to be "living shoreline" approaches that have been and can continue to be successfully completed in Maine.

c. Update to Southern Maine Beaches as an Economic Engine

Tourism is one of Maine's largest industries. According to the Maine Office of Tourism, in 2015, the tourism industry in Maine yielded $8.3 billion in total sales. The industry represented more than 98,000 jobs, $2.3 billion in earnings, and $554 million in tax revenues. In 2015, tourism in the Maine Beaches region yielded $1.6 billion in total sales and represented more than 27,248 jobs, over $500 million in earnings, and $155 million in tax revenues.

The Maine beaches region is the area including Kittery, Old Orchard Beach, and the towns in between. Although the Maine Beaches region does not include all of Maine's visited beaches, the above information from the Maine Beaches region clearly shows the vast economic impact the beaches have on the state.

Selected statistics show the relative importance of beaches to Maine's tourist market[4]:

- Overall visitation is highest for the Maine Beaches region followed by Greater Portland/Casco Bay and Mid-coast regions
- For 25% of overnight visitors to Maine, the Maine Beaches region is their primary destination; for 35% of day visitors to Maine, the Maine Beaches region is their primary destination
- In 2015, visitors to Maine Beaches spent $1.61 billion and in 2016 tourism was up 4.2% over the prior year
- An estimated 12 million visitors came to the Maine Beaches in 2015, a 3.8% increase over 2014 which is approximately 30.4% of all Maine visitors; 7.55 million of these are day visitors and 4.46 million are overnight visitors
- The Maine Beaches region has the highest percentage of repeat visitation of the 8 regions in Maine
- When analyzing interest and importance together, food/beverage/culinary, touring/sightseeing, and water activities rank highest among overnight and day visitors to the Maine Beaches region
- "Going to the beach" was the most frequently cited water activity among overnight and day visitors selecting this interest area

[4] According to the Maine Office of Tourism Department of Economic and Community Development estimated using DPA visitor expenditure estimates and the RIMS II Economic Impact Model; see Appendix E for 2015 Regional Tourism Estimates.

Property valuations for southern coastal Maine amount to about $3.95 trillion which provides $64 million in property taxes to the towns[5]. This applies strictly to the coastal properties east of Route 1 located in Biddeford, Kennebunk, Kennebunkport, Kittery, Ogunquit, Old Orchard Beach, Wells, and York.

d. Coastal Waterbird Habitat Concerns

As stated in the 2006 report, "Activities associated with beach management can have both positive and negative impacts on endangered and threatened species and their habitats." The Federal Endangered Species Act (ESA) requires protection of threatened and endangered species. In addition, the state maintains a list of threatened and endangered (T&E) species under the Maine Endangered Species Act (MESA). Piping plovers are listed as Threatened under ESA and Endangered under MESA. Least terns are listed as Endangered under MESA. Both species nest on sand beaches located in southern Maine.

Habitat loss and lack of undisturbed nest sites and roosting areas are the two primary factors jeopardizing populations of piping plovers, least terns, and other migratory shorebirds. Maine has over 20 species of shorebirds, including the federally threatened red knot that depend on Maine's coastal habitats to rest and refuel during migration from Arctic breeding grounds to South American wintering areas. The majority of these species are in severe population decline[6].

Historically, Maine had more than 30 miles of suitable nesting beaches that may have supported up to 200 piping plover pairs and thousands of migrating shorebirds[7]. However, construction of seawalls, jetties, piers, homes, and other structures along Maine's beaches has dramatically reduced the extent of suitable habitat. In Maine, the total number of piping plover pairs has ranged from a low of 6 pairs in 1983 to a high of 66 pairs in 2002[8]. Unfortunately, several years of severe spring storms, including the 2007 Patriots' Day nor'easter, eroded prime habitat for these birds. Loss of habitat coupled with unusually high predation rates and greater presence of dogs on plover beaches caused plover numbers to plummet to only 22 pairs in 2008. Since 2008, increased efforts in monitoring, outreach, predator control and law enforcement led to increasing piping plover numbers once again reaching a total of 66 nesting pairs in 2016.

The Scarborough River Dredge and Western Beach Nourishment Project, conducted in 2005 and 2015 respectively, are both good examples that clearly demonstrate the benefits of nourishment for coastal waterbirds. Piping plovers were absent at Western Beach from 1999-2004. In 2005 the Nourishment Project created ideal habitat conditions at Western Beach[9], attracting 2 pairs of piping plovers and 40 pairs of least terns in 2005. Piping plovers nested successfully at Western Beach

[5] According to the Maine Revenue Services Property Tax Division

[6] Andres, B.A., Smith, P.A., Morrison, R.I.G., Gratto-Trevor, C. L. , Brown, S. C. & Friis, C.A. 2012. Population estimates of North American shorebirds, 2012. Wader Study Group Bull. 119(3):178-194.

[7] Palmer, R.S. 1949. Maine Birds. Bull. Museum Comp. Zoology, Vol 102, Harvard Univ. Cambridge Ma 656 pp. 235

[8] Zitske, L. M., O'Brien, K., & Zitske, B. 2016. 2015 Piping plover and least tern project report for Maine. Maine Audubon, Falmouth, ME, USA. This reference is for all numbers related to piping plover in this report; the 2016 report with 2016 data is currently being developed.

[9] MGS has monitored Western Beach to show the geologic changes that have occurred there over time creating habitat conditions for coastal waterbirds. For more information, see the "Beach Nourishment at Western Beach Scarborough, Maine: Benefits for the Beaches and Birds" report published July 2006 at: https://www1 maine.gov/dacf/mgs/explore/marine/ sites/ jun06.pdf and https://www1.maine.gov/dacf/mgs/explore/marine/sites/jun14.pdf

during 2005-2009; however, beach erosion, human-related disturbance and predation led to unsuccessful nesting for plovers and terns during 2010-2014. Similar results occurred after the 2015 nourishment with two and three piping plover pairs successfully nesting in 2015 and 2016 respectively.

There is evidence that restoration of eroded beaches through nourishment improves habitat for nesting piping plovers and least terns and improves roosting and feeding habitat for migrating shorebirds.

e. Summary

Due to the reasons stated above, the 2016 IBMP work group discussion focused mainly on beach nourishment. The DEP Coastal Sand Dune Rules define beach nourishment as, "the artificial addition of sand, gravel or other similar natural material to a beach or subtidal area adjacent to a beach." Although beach nourishment is not a permanent fix, past nourishment projects in Maine have been successful in enhancing recreational beach space and wildlife habitat along with providing flood and storm protection[10]. Prior beach nourishment projects in Maine have solely been associated with the dredging of federal harbors as the beneficial reuse of dredged materials. Historically, much of the dredged material was not beneficially reused (i.e., dumped offshore) and lost to the system, not benefiting the beach in any way. This practice has shifted over the years to nearshore and onshore nourishment.

III. Updated Recommendations

This section addresses updates to the 31 recommendations from the 2006 report that were fully or partially accomplished.

a. Update on 2006 Report Recommendations: Accomplished

The following recommendations from the 2006 report were fully accomplished:

> **Recommendation 2, *Amend Coastal Sand Dune Rules to Establish Standards for Beach Nourishment***
> On June 8, 2006, the provisionally adopted rule mentioned in the 2006 report was adopted and put into effect.
>
> **Recommendation 7, *Estimate Funding Needs for Beach Nourishment***
> MGS created costs estimates for the amount of sand needed to nourish each beach in Maine. The cost estimates are based on an estimated need of 250,000 cubic yards of sand per mile. Funding needs are approximate and depend on the source of the sand, and the total 20-year nourishment cost assumes that nourishment is needed at all 41 beaches. Using these assumptions, Maine's current estimated need for nourishment of all beaches is about $249 million at a cost of $25 per cubic yard of sand. For more details on funding needs for beach nourishment, see the table in Appendix C.

[10] See Appendix D for a table of past nourishment projects.

Recommendation 8, *Work to Increase Mitigation of Erosion Control Caused by Federal Navigation Projects*

In the past, the City of Saco and the Town of Wells have worked with the United States Army Corps of Engineers (USACE) to limit erosion from federal navigation projects through beneficial reuse of dredged materials as beach nourishment from dredging of federal harbors. Future mitigation work at the Saco River northern jetty at Camp Ellis is dependent upon Section 111 mitigation funding in the 2014 Water Resources Reform and Development Act (WRRDA). Beach nourishment projects have also been performed in Kennebunk and Scarborough with sand dredged from federal navigation projects[11].

Recommendation 9, *Coordinate Beach Management Activities with Other Agencies*

Seafloor mining within state submerged lands involves collaboration between DACF and the Bureau of Parks and Lands (BPL). Agencies also coordinate on regulatory standards or criteria for extraction. For example, MGS (part of DACF) coordinated with USACE, United States Fish and Wildlife Service (USFWS), Maine Inland Fisheries and Wildlife (IFW) and DEP on the Wells, Kennebunk and Scarborough River projects, and also included numerous public and private dune restoration efforts for habitat restoration and considerations.

Recommendation 10, *Establish Best Management Practices (BMPs) for Shorebird Habitat Protection and Enhancement through Cooperative Agreements, Permit Conditions, or Landowner Agreements*

BMPs identified in the USFWS Piping Plover Atlantic Coast Population Recovery Plan, U.S. Shorebird Conservation Plan, and the Maine State Wildlife Action Plan for shorebird habitat protection and enhancement are incorporated in Piping Plover/Least Tern Cooperative Beach Management Agreements (BMAs). Additionally, IFW designated mapped Essential Habitat (EH) for piping plovers and least terns under MESA, and DEP rulemaking in 2007 designated shorebird feeding and roosting areas as Significant Wildlife Habitat (SWH) under the NRPA. BMPs are incorporated as recommendations to avoid or ameliorate anticipated negative effects on designated habitats during the SWH and EH permit review process.

Since the 2006 report, IFW, USFWS, and Maine Audubon have established Piping Plover/Least Tern BMAs with the Towns of Ogunquit, Wells, Old Orchard Beach, Scarborough, BPL and Prouts Neck Country Club (Scarborough). There are sixteen beaches located between York and Georgetown that are designated as SWH and 15 beaches are designated as piping plover/least tern EH.

Recommendation 18, *Enhance Educational Programs and Informational Outreach about Hazard Mitigation*

The MGS Coastal hazards webpage and online mapping portal[12] were created to easily provide information to the public and are updated as needed. The Maine Floodplain Management Program provides information and mapping updates for coastal flood hazards and ways to mitigate those hazards.

[11] See Appendix D for the history of Maine Beach Nourishment Projects table.
[12] The Maine Geological Survey Coastal Hazards web page and online mapping portal can be found at: http://www.maine.gov/dacf/mgs/ explore/marine/facts/coastal-hazard.htm

Additionally, there has been extensive outreach to Southern Maine municipalities as a part of the Coastal Hazard Resiliency Tools project and the Sea Level Rise Adaptation Working Group (SLAWG) of Saco Bay. Maine also holds a biennial State of Maine's Beaches Conference which brings together members of the public, non-governmental organizations, state agencies and interested parties to discuss current coastal issues. The Maine Coastal Community grant program has funded vulnerability assessments and adaptation planning efforts that involve residents and stakeholders. The Wells National Estuarine Research Reserve also formed the Coastal Training Program which provides technical assistance, trainings, and workshops for the public and interested stakeholders.

Recommendation 21, ***The Maine Coastal Program should coordinate the production and distribution of the following print materials as prepared by DEP, DOC (now DACF) and MGS (which now falls under DACF). All of these materials will be sent to town offices, local and regional planning commissions, and landowner organizations***

The Maine Coastal Property Owner's Guide to Erosion, Flooding and Other Hazards[13] was created through a collaborative effort between Maine Sea Grant, and MGS. This is an informative, detailed document for homeowners on how to best manage their beach property. The guide was distributed to town offices and homeowners in southern Maine beach areas and is also available online. Anecdotal evidence from Maine Sea Grant suggests its success as it is one of their highest publicly viewed web pages[14].

Recommendation 22, ***The Maine Coastal Program, DEP, DOC and MGS should collaborate with the University of Maine Sea Grant Program and the Coastal Training Program at the Wells National Estuarine Research Reserve to design and conduct a strategic marketing program to increase the use of best management practices and hazard mitigation by homeowners…***

The University of Maine Sea Grant Program, MGS and MCP collaborated on a social marketing effort and DVD on hazard mitigation and coastal municipality resiliency. These videos were also posted to the Maine Sea Grant website[15]. MGS also developed the Maine Property Owner's Guide to Managing Flooding, Erosion, and Other Coastal Hazards[16]. This comprehensive guide was provided to Southern Maine municipal offices to offer as a tool for homeowners and posted on the Maine Sea Grant website.

Recommendation 31, ***MCP is collaborating with MGS to produce the assessment section on coastal hazards that will direct the allocation of future NOAA funds for the MCP. Implementation of the recommendations of the Integrated Beach Management Program should be reflected as priority actions for MCP***

[13] A full version of the Maine Coastal Property Owner's Guide to Erosion, Flooding and Other Hazards can be found at: http://www.seagrant.umaine.edu/files/chg/11SlovinskyCHG.pdf

[14] Web analytics provided by Maine Sea Grant show this to be one of the most often visited of all of the Maine Sea Grant pages.

[15] MGS worked with MCP, ME Sea Grant, ME Coop Extension and Sea Grant to create the video series Building a Resilient Coast: Maine Confronts Climate Change found at: http://www.seagrant.umaine.edu/program/sarp

[16] Maine property Owner's Guide to Managing Flooding report written by MGS for Maine Sea Grant can be found at : http://www.seagrant.umaine.edu/coastal-hazards-guide

MCP/MGS work includes conducting over 40 vulnerability assessments, providing technical assistance to towns, making available a local grant program and piloting projects that look at flooding, erosion and storm surge at coastal state parks and historic sites. MGS requested funding from NOAA through a Project of Special Merit to support better monitoring of beach nourishment. If awarded, that funding may go towards establishment of a beach nourishment monitoring protocol for future nourishment projects.

b. Update on 2006 Report Recommendations: Partially Accomplished

The following recommendations were partially accomplished:

Recommendation 1, *Change Reactive and Opportunistic Nourishment Approach to Proactive Strategy*
The MGS has coordinated the placement of dredged sand for beach nourishment with the USACE dredging efforts (Wells, Kennebunk and Scarborough). Progress is being made toward conducting national and regional discussions about dredging priorities, beneficial use, and other foreseeable opportunities; however, no action has been developed at the state level.

Recommendation 5, *Clarify Opportunities for Use of Other Sediment Sources*
The state has identified upland sources of sand that are potentially available; however, the quantity and compatibility are not predetermined so availability and volumes remain unknown. DEP may require sampling and testing of materials from upland or marine sources for beneficial use on the beach for nourishment. MCP's Maine Coast Mapping Initiative, funded by Department of the Interior, Bureau of Ocean Energy Management (BOI/BOEM) is mapping sand deposits in federal waters. Main Coastal Mapping Initiative (MCMI) mapping is planned for state waters during the summer of 2017.

Recommendation 6, *Further Refine Priorities for Beach Nourishment*
The Maine Beach Mapping Program (MBMAP) calculates shoreline change rates along Maine's sandy beaches (Appendix C) that can help refine priorities, volumes and renourishment cycles. The State of Maine Beach Profiling Program (SMBPP) also monitors elevation changes at select beaches that can be used to help estimate nourishment longevity.

Recommendation 13, *Work with Existing Emergency Management and Conservation Programs to Enhance the Presence of these Programs in Beach Systems*
MGS staff participates on the State Hazard Mitigation Team which makes decisions about how the Federal Emergency Management Agency (FEMA) funding is utilized within the state. The Maine Emergency Management Agency (MEMA) periodically updates the State Hazard Mitigation Plan[17] which now includes information about coastal areas.

[17] The Maine Emergency Management Agency State Hazard Mitigation Plan can be found at: http://www.maine.gov/mema/mitigation/mema_mit_plans.shtml

Recommendation 15, *Create New Funding Sources*
This recommendation was explored through the 2015 L.D. 1254. The bill proposed a seasonal (between May 1st and October 31st) $1 per day fee on the rental of living quarters in any hotel, rooming house or tourist or trailer camp, to be deposited into the Beach Management Fund established by the bill. This bill was not passed as such due to the concerns of stakeholders in the tourism industry.

Recommendation 20, *Once the Maine Legislature has made final decisions on the changes to the NRPA and the Coastal Sand Dune Rules and accepted or revised the recommendations of this (2006) report, the MCP and DEP will conduct a series of meetings in the principal beach towns of southern Maine, during the summer months, designed to provide information and answer questions from local officials and the interested public.*
After the 2006 report was completed and accepted by the Legislature, the DEP began conducting education and outreach on coastal sand dune regulations every 2 years at the Maine Beaches Conference. This conference is held in the summer in southern Maine and is attended by representatives from non-governmental organizations, local officials, state officials, stakeholders and the interested public. The next Beaches Conference will be held in Wells in July 2017 and will for the first time be hosted jointly with partners from New Hampshire.

Recommendation 23, *…the MCP, in collaboration with the Maine Coastal Coalition, will work with USM's Center for Tourism Research and the Department of Economic and Community Development/Office of Tourism to raise funds for the study, with the goal of having an analysis completed by the fall of 2007.*
In 2009, then Maine State Economist M. Levert created updated statistics for the biennial State of Maine's Beaches Conference – including property values[18]. In 2014 Colgan and others, funded by the University of Maine NEST Project (National Science Foundation/ EPSCOR) surveyed beachgoers at locations in Saco Bay, Wells-Ogunquit, and the New Hampshire Sea Coast. As of April 2016, the results had not been published. The University of Maine School of Economics in 2015 (same funding source above) conducted a follow-up internet-based survey of a subset of those that participated in Colgan's in-person interviews[19]. Their work included exploration of visitation patterns, preferences for short and long-term visits, activities, lodging choice, opinion of beach management, beach safety and cleanliness. Although these studies provide insight into the economic standing and benefit of Maine's Beaches, they do not encompass the detailed, in-depth research recommended by the 2006 report.

Recommendation 25 *…The Beaches Advisory Group should make an annual report to the Legislature's Joint Committee on Natural Resources on The State of Maine's Beaches…*
The Beach Advisory Group reported out to the Legislature for two consecutive years before the requirement was changed to report every two years. The Beaches Advisory Group was

[18] The full Valuing Maine Beaches from Michael LeVert and David Douglass of the Maine State Planning Office dated July 2009 can be found at: http://www.seagrant.umaine.edu/files/pdf-global/09mbc/09MBClevert.pdf
[19] The Maine and New Hampshire Beachgoer Survey report can be found at: http://ddcbeach.sr.unh.edu/pages/resources/survey_documents/

not formally established but The State of Maine's Beaches report is compiled by the MGS and released biennially[20] in conjunction with the Maine Beaches Conference.

Recommendation 26 ***…Maine's natural resource agencies will develop coordinated programs for technical assistance to towns and homeowners to assist in the development of municipal strategies for beach management.***
MGS provides technical guidance to homeowners and municipalities on dune and beach management (including dune restoration and beach nourishment) and the need to balance local sand budgets. MGS has also provided technical assistance to communities that are developing Beach Management Plans, such as the City of Saco.

Recommendation 30 ***…the State Planning Office, in collaboration with the Department of Economic and Community Development and the Natural Resources Industries Steering Committee, should work together to design and carry out a workshop on methods for funding tourism infrastructure priorities.***
Former Governor Baldacci's State-funded initiative Fermata Inc. reported in several geographic areas. This study looked at infrastructure assets to build region-specific strategies for economic development.

Recommendation 31 …Implementation ***of the recommendations of the Integrated Beach Management Program should be reflected as priority actions for Maine Coastal Program.***
MCP/MGS completed numerous municipal vulnerability assessments, provided technical assistance to municipalities on storms, flooding, sea level rise, and erosion, and implements several competitive local grant programs to further municipal resiliency. They are also completing a pilot project looking at flooding, erosion and storm surge at coastal state parks and historic sites, and adaptation options for these sites. This will help provide transferable lessons for towns to implement better strategies in the future.

IV. 2016 IBMP Work Group Discussions and Recommendations

a. Discussions Regarding Creating a Comprehensive Beach Nourishment Program

Due to the positive environmental, economic and ecological impacts of Maine's beaches, the work group focused discussions on the implementation of a proactive beach nourishment strategy. Currently, the state's policy is one of coordinated beach nourishment as beneficial reuse of dredged materials in conjunction with USACE dredging of federal navigation projects (Appendix D). A shift to a more proactive nourishment approach could potentially maintain beach health and storm protection in a more predictable cycle that is not solely dependent upon federal dredging budgets and projects.

[20] To see all of The State of Maine's Beaches reports, visit: http://www.maine.gov/dacf/mgs/explore/marine/index.shtml

Appendix C shows MBMAP estimated shoreline change rates for each beach over the last 10 years with 'None' meaning the beach has been either stable or gained sand. 'Low' means that the beach is slightly eroding (up to about 1 foot per year), while 'Mod and High' means that the beach is eroding at moderate (1-2 feet per year) to high (greater than 2 feet per year) rates, respectively. For beaches that are substantially bound by seawalls and do not have measurable horizontal erosion rate, shoreline change rates are estimated using best available information. This information was added as an update to the 2006 report and to meet the H.P.854/L.D. 1254 requirement to, "…establish priority areas". The work group discussed different ways to prioritize Maine's beaches, but was only confident enough to rank the geological[21] qualities and wildlife habitat[22] of each beach. This is because there is not enough specific information on the economic impact from each individual beach to rank them against one another. Consequently, the work group moved away from detailed priority rankings of Maine beaches in favor of a program emphasizing the relative merits of nourishment projects.

It was difficult to begin a discussion on implementation of a beach nourishment strategy without a defined funding mechanism. Instead, the group approached the discussion as if an uncertain amount of funding would be available to support the proposed nourishment program. The group then looked to other states to see what strategies were used for beach nourishment.

The group modeled Maine's proposed program after Florida's program. Florida's Beach Management Funding Assistance (BMFA) program is administered by the Florida Department of Environmental Protection[23]. Florida's DEP does not take on the task of ranking each beach in terms of nourishment, economic or habitat needs; instead, Florida accepts beach nourishment project proposals from municipalities, counties, and certain state agencies. Then, those proposals are ranked using 30 predetermined, distinct criteria that are defined by the State[24]. The projects with the top ranking proposals are provided with funding for nourishment.

b. Funding Source Identification

The work group discussed funding sources at great length internally and with the interested parties group. The feedback was mostly positive; however, there were funding sources certain interested parties groups did not prefer. The funding options for the Legislature to consider are outlined in Appendix H and sorted from highest to lowest feasibility and desirability based on feedback from the work group and interested parties.

> **Recommendation 1, *Identify a funding source to support one to five beach nourishment projects***
> Nourishing southern Maine beaches is an enormous task, requiring an estimated $249 million over a 20-year period if all beaches were nourished regardless of erosion rate (Appendix C). The stakeholder group and work group identified a bond of $10 million to

[21] Geological ranking of beaches can be found in Appendix C, "MBMAP Shoreline Change Rate (to 2015)".
[22] Wildlife habitat ranking beaches can be found in the chart in Appendix F.
[23] For more information on the BMFA Program, visit http://www.dep.state fl.us/BEACHES/programs/becp/index.htm
[24] Florida's Criteria and scoring can be found in the Beach Management Funding Assistance Program, Local Government Funding Requests: Ranking Criteria for Beach and Inlet Management Projects dated August 15, 2013 and found at: http://www.dep.state fl.us/BEACHES/programs/becp/docs/ranking-methodology-62B36.pdf

fund one to five beach nourishment projects under this program as the most feasible funding option. Possible options for a bond are: an Environmental Bond for Maine's Beaches, Coastal Infrastructure Bond, Tourism Infrastructure Bond or to utilize money within the Transportation Bond for coastal improvements.

If a bond were to pass, upon successful completion of the approved projects, a consistent funding source for beach nourishment should be established.

c. Recommendations Regarding Implementation of a Comprehensive Beach Nourishment Program

Recommendation 2, *Implement a criteria-based beach nourishment proposal process*

The work group proposes that Maine consider a nourishment approach similar to Florida. Municipalities, counties and other interested parties would be given the opportunity to submit beach nourishment proposals. Those proposals would be evaluated by a committee against specific criteria.

i. *Proposals ranked using specifically defined criteria*[25]

The work group considered 11 potential criteria against which beach nourishment proposals could be evaluated. The following is a list of suggested criteria:

1. Severity of Erosion
2. Wildlife Habitat Value
3. Project Longevity
4. Recreational and Economic Benefit
5. Matching Funding Sources
6. Marine Resources
7. Applicable Design Standards
8. Access Opportunities
9. Threats to Developments
10. Future Change Considerations
11. All Other Considerations

ii. *Beach Nourishment Proposal Committee*

A committee of between 5-7 members is needed to finalize the criteria and monitoring requirements proposed in this report, and evaluate nourishment proposals when funding becomes available. The committee should be composed of members from a broad range of stakeholders as recommended by the Environment and Natural Resources Committee. If resources permit, more than one project could be approved by the committee. This committee should be comprised of members that are knowledgeable on the topic of Maine's beaches and/or beach nourishment.

[25] Appendix G contains a Beach Nourishment Proposal Ranking Matrix the work group created as an example which includes definitions of each criterion.

iii. *Pre-proposal workshop*
MGS and DEP should hold a public workshop for interested parties that may want to submit a proposal. MGS and DEP staff members would explain the defined ranking criteria, monitoring requirements (see Recommendation 3), and components of a model proposal.

Recommendation 3, *Monitoring required for projects funded under this program.*
To evaluate performance, monitoring will be a requirement of projects funded with state funds through this program. Monitoring data will inform future decisions about best nourishment practices and nourishment duration. At a minimum, monitoring would take place twice per year for a minimum duration of five years. Monitoring criteria would be site-specific and established through discussions with successful applicants.

Recommendation 4, *Perform a Comprehensive Review of the Department's Beneficial Reuse Rules*
The existing Chapter 418 Beneficial Use of Solid Wastes rules regulate the permitting and beneficial use of dredge materials. In the case of non-hazardous, dewatered dredge materials, there are testing requirements for certain compounds before beneficial use can be permitted. These thresholds may limit or prevent sand from being beneficially used for beach nourishment. As the Department undertakes the major substantive rulemaking in 2017 for Chapter 418, the work group recommends the Department consider reviewing the testing requirements for the beneficial use of dredged material.

d. Implementation Timeframes and Public Access Easements

With the proposed criteria-based program, implementation timeframes and public access easements would be considered within the criteria. The implementation timeframe would begin at the procurement of a funding source. Identifying the amount of money that can be distributed is a critical first step. The recommendations in this report are based on the assumption that a funding source has been secured. Once funding is secured, the timeframes can be considered in order to execute the proposed beach nourishment program. Public access easements are one criterion for consideration for the proposal process.

V. Conclusion

Funding beach nourishment activities would improve Maine's beaches. It would subsequently help maintain the environmental and geological integrity of Maine's sandy coastline, improve habitat for wildlife, and continue to bring billions of tourism dollars into the state. As directed by H.P. 854/L.D. 1254, this report reflects the work group's collective effort to update the 2006 report data and findings, recommend an implementation strategy for beach nourishment, develop a comprehensive beach nourishment policy, implement timeframes, address public access easements and identify funding sources for a successful beach nourishment program.

Appendix A: H.P. 854/L.D. 1254

LAW WITHOUT GOVERNOR'S SIGNATURE

MARCH 27, 2016

CHAPTER

66

RESOLVES

STATE OF MAINE

IN THE YEAR OF OUR LORD

TWO THOUSAND AND SIXTEEN

H.P. 854 - L.D. 1254

Resolve, To Further Study the Implementation and Funding of an Integrated Beach Management Program

Emergency preamble. Whereas, acts and resolves of the Legislature do not become effective until 90 days after adjournment unless enacted as emergencies; and

Whereas, this legislation must take effect before the expiration of the 90-day period in order to provide the working group created through this legislation sufficient time prior to the reporting deadline of January 31, 2017 to compile data on and develop recommendations for the implementation and funding of an integrated beach management program; and

Whereas, in the judgment of the Legislature, these facts create an emergency within the meaning of the Constitution of Maine and require the following legislation as immediately necessary for the preservation of the public peace, health and safety; now, therefore, be it

Sec. 1. Beach working group. Resolved: That the Commissioner of Environmental Protection and the Commissioner of Agriculture, Conservation and Forestry shall convene a working group to review the report titled "Protecting Maine's Beaches for the Future: A Proposal to Create an Integrated Beach Management Program," dated February 2006, prepared by the Beach Stakeholder's Group and submitted to the Joint Standing Committee on Natural Resources during the Second Regular Session of the 122nd Legislature, update the data and findings contained in that report and develop recommendations regarding the implementation and funding of an integrated beach management program and comprehensive beach nourishment policy that establishes priority areas and evaluates public and private funding sources, implementation time frames and public access easements. Consideration of priority status for beach areas under any beach management program recommended by the working group must, at a minimum, involve a review of both the environmental and economic significance of each beach area. If applicable, the working group shall identify specific funding sources to support the implementation of its recommendations; and be it further

Sec. 2. Report to Legislature. Resolved: That, by January 31, 2017, the Commissioner of Environmental Protection shall submit to the joint standing committee

of the Legislature having jurisdiction over environment and natural resources matters a report detailing the findings and recommendations of the working group established pursuant to section 1, including any suggested legislation, relating to the implementation and funding of an integrated beach management program. After reviewing the report, the committee may report out a bill relating to the report to the First Regular Session of the 128th Legislature.

Emergency clause. In view of the emergency cited in the preamble, this legislation takes effect when approved.

Appendix B: Chronology of Significant Events Concerning Maine Beaches

Year	Event
1979	Governor's Advisory Committee on Coastal Development and Construction formed in response to 1978 storms
1982	Coastal Barrier Resources Act (CBRA) passed by Congress, limiting federal funding for activities in certain coastal areas
1983	38 M.R.S. § 471-178 goes into effect and the Chapter 355 Coastal Sand Dune Rules were adopted (later incorporated into the Natural Resources Protection act or NRPA)
	Least terns listed as endangered and threatened species
1985	Piping plovers listed as endangered and threatened species
1987	First State Hazard Mitigation Plan completed
	Amendment made to NRPA to allow new seawall at Scarborough River in response to erosion from jetty
1988	Maine Endangered Species Act amended to provide for Essential Habitat designations
	Definitions added for frontal dune and back dune to Coastal Sand Dune Rules
1990	MGS produced the first Coastal Sand Dune Maps to delineate resources
1991	March storm damages homes in Camp Ellis
	Halloween storm (dubbed the "Perfect Storm") causes extensive damage along southern Maine beaches
1993	Coastal Sand Dune Rules amended to allow reconstruction in frontal dunes due to court challenge
1995	Essential Habitat designations made for piping plovers and least terns
	NRPA amended to allow emergency reconstruction of seawalls
1998	Improving Maine's Beaches report completed by the Southern Maine Beach Stakeholder Group
	Coastal Sand Dune Rules amended to include cobble beaches in definition of sand dune systems
1999	Legislation passed that grandfathers use of NFIP FIRMs for determination of V-zones
	US Army Corps dredge the Scarborough River and place material near Camp Ellis as nearshore disposal
	State of Maine Beach Profiling Program volunteer beach monitoring started
2000	First annual Maine Beaches Conference held in Saco
	Saco Bay Regional Beach Management Plan completed by the Saco Bay Planning Committee
	Agreement on plover management signed by ME Audubon, USFWS, ME IFW, and Wells
	US Army Corps dredges the Webhannet River/Wells Harbor and nourishes Drakes Island and Wells Beach
2001	First State of Maine's Beaches Conference held (held biennially)
	MGS releases Beach and Dune Geology Air Photo map series in support of Coastal Sand Dune Rules
2004	121st Legislature considers competing bills on Coastal Sand Dune Rules amendments and LD1849 passed directing the creation of the Beach Stakeholders Group
2005	US Army Corps dredges the Scarborough River and nourishes Western Beach
2006	*Protecting Maine's Beaches for the Future: A Proposal to Create an Integrated Beach Management Program* report completed by the Beach Stakeholders Group and submitted to the 122nd Legislature

	Coastal Sand Dune Rules revised and adopted by Legislature per work by the Beach Stakeholders Group
	122nd Legislature passes a Resolve forming the Beaches Advisory Group, which will provide an annual report on activities
2007	Maine Beaches Conference moved to biennial event in odd-numbered years
	Patriots' Day Storm causes flooding and damage along southern Maine beaches, especially at Camp Ellis and Wells Beach
2009	City of Saco removes Surf Street in Camp Ellis and replaces with a geotube; extensive dune reconstruction along Ferry Beach
	MGS and Maine Sea Grant release *Maine Coastal Property Owner's Guide to Erosion, Flooding, and Other Hazards*
	Maine Sea Grant releases *Building a Resilient Coast: Maine Confronts Climate Change* DVD
2010	Abnormally high sea levels combine with winter coastal storms to erode many of southern Maine beaches worse than 2007 Patriots' Day storm
	People and Nature Adapting to a Changing Climate: Charting Maine's Course report completed and submitted to 124th Legislature
2011	MGS releases revised Online Coastal Sand Dune Geology map series in support of Coastal Sand Dune Rules
	Coastal Sand Dune Rules amended to allow reconstruction of a structure from the back dune to the front dune in certain cases
2012	Coastal Sand Dune Rules amended to allow reconstruction in a frontal dune if dune is protected by seawall and structure is elevated
2014	US Army Corps dredges the Webhannet River/Wells Harbor and nourishes Drakes Island and Wells Beach
	US Army Corps dredges the Kennebunk River and disposes of material in nearshore near Goochs Beach
2015	US Army Corps dredges the Scarborough River and nourishes Western Beach
2016	127th Legislature passes HP 854/LD 1254 Resolve to *Further Study the Implementation and Funding of an Integrated Beach Management Program*
	Integrated Beach Management Program Work Group meets and creates update report to 128th Legislature

Appendix C: Beach Nourishment Volume and Cost Estimate

Beach Name	Municipality	Public Ownership**	Total Beach Length (mi)	Estimated Nourishment Length Need (mi)***	MBMAP Shoreline Change Rate (to 2015) *^*	Estimated renourishment cycle (yrs)	Estimated Single Nourishment Volume (cy) ****	Estimated Nourishment Cost ($Millions) *****	Estimated 20-yr Nourishment Volume (cy) ******	Estimated 20-yr Nourishment Cost ($Millions)
Reid - Mile Beach (S. Park)	Georgetown	Yes	0.7	0.3	None	20	75,000	1.88	75,000	1.88
Reid - Half Mile Beach (S. Park)	Georgetown	Yes	0.4	0.2	None	20	50,000	1.25	50,000	1.25
River Beach	Phippsburg	Yes	0.6	0.3	None-Low	20	75,000	1.88	75,000	1.88
Hunnewell Beach	Phippsburg	Yes	0.7	0.7	High	5	175,000	4.38	700,000	17.50
East Beach (S.Park)	Phippsburg	Yes	0.4	0.4	High	5	100,000	2.50	400,000	10.00
Popham Beach (S. Park)	Phippsburg	Yes	0.5	0.3	High	5	75,000	1.88	300,000	7.50
Small Point Beach	Phippsburg	Yes	1.5	0.2	None	20	50,000	1.25	50,000	1.25
Willard Beach	South Portland	Yes	0.4	0.4	Low	20	100,000	2.50	100,000	2.50
Kettle Cove (S. Park)	Cape Elizabeth	Yes	0.1	0.1	Low	20	25,000	0.63	25,000	0.63
Crescent Beach (S.Park)	Cape Elizabeth	Yes	0.8	0.4	Low	20	100,000	2.50	100,000	2.50
Higgins Beach	Scarborough	Yes	0.5	0.25	Mod	10	62,500	1.56	125,000	3.13
Scarborough Beach	Scarborough	Yes	1.4	0.5	Low	20	125,000	3.13	125,000	3.13
Western Beach	Scarborough	No	0.6	0.4	High	5	100,000	2.50	400,000	10.00
Ferry Beach	Scarborough	Yes	0.6	0.2	Low	20	50,000	1.25	50,000	1.25
Pine Point Beach	Scarborough	Yes	1.4	0.5	Mod	10	125,000	3.13	250,000	6.25
East Grand (to pier)	Old Orchard	Yes	1.6	0.5	None	20	125,000	3.13	125,000	3.13
Ocean Park (to Goosefare)	Old Orchard	Yes	1.4	0.5	None	20	125,000	3.13	125,000	3.13
Kinney Shores/Bayview	Saco	Yes	1.0	0.3	None-Low	20	75,000	1.88	75,000	1.88
Ferry (incl. S.Park)	Saco	Yes	0.7	0.7	High	5	175,000	4.38	700,000	17.50
Camp Ellis Beach	Saco	Yes	0.5	0.5	High	5	712,000	17.80	1,144,000	28.60
Hills Beach	Biddeford	No	1.0	0.5	Low	20	125,000	3.13	125,000	3.13
Mile Stretch Beach	Biddeford	Yes	1.3	0.5	Low	20	125,000	3.13	125,000	3.13
Fortune Rocks Beach	Biddeford	Yes	0.8	0.4	Low	20	100,000	2.50	100,000	2.50
Goose Rocks Beach East	Kennebunkport	Yes	0.7	0.7	Low	20	175,000	4.38	175,000	4.38
Goose Rocks Beach West	Kennebunkport	Yes	1.2	0.8	Mod	10	200,000	5.00	400,000	10.00
Goochs Beach	Kennebunk	Yes	0.6	0.6	Mod	10	150,000	3.75	300,000	7.50
Mother's Beach*	Kennebunk	No	0.5	0.5	Low	20	125,000	3.13	125,000	3.13
Great Hill Beach *	Kennebunk	No	0.3	0.3	Low	20	75,000	1.88	75,000	1.88
Crescent Surf Beach*	Kennebunk	No	0.7	0.4	Low	20	100,000	2.50	100,000	2.50
Parsons Beach*	Kennebunk	No	0.7	0.4	Low	20	100,000	2.50	100,000	2.50
Laudholm Beach	Wells	Yes	0.4	0.4	High	5	100,000	2.50	400,000	10.00
Drakes Island Beach	Wells	Yes	0.9	0.9	Mod	10	225,000	5.63	450,000	11.25
Wells Beach	Wells	Yes	1.2	1.2	Mod	10	300,000	7.50	600,000	15.00
Casino Cove*	Wells	No	0.6	0.6	Low	20	150,000	3.75	150,000	3.75
Fisherman's Cove*	Wells	No	0.4	0.4	Low	20	100,000	2.50	100,000	2.50
Moody Beach*	Wells	No	1.2	0.7	Mod	10	175,000	4.38	350,000	8.75
Ogunquit Beach	Ogunquit	Yes	1.4	0.7	Mod	10	175,000	4.38	350,000	8.75
Short Sands Beach*	York	Yes	0.2	0.2	Low	20	50,000	1.25	50,000	1.25
Long Sands Beach	York	Yes	1.3	1.3	Mod	10	325,000	8.13	650,000	16.25
Seapoint Beach	Kittery	Yes	0.4	0.4	Mod	10	100,000	2.50	200,000	5.00
Crescent Beach	Kittery	Yes	0.3	0.3	Low	20	75,000	1.88	75,000	1.88
TOTAL/AVERAGE	**N/A**	**N/A**	**0.8**	**0.5**	**Low-Mod**	**15**	**5,549,500**	**138.74**	**9,994,000**	**249.85**

Notes:

cy - cubic yards

* indicates that the beach is not surveyed as part of MBMAP; loss rates estimated

** Public Ownership - a yes in this category indicates that at least a portion of the beach is owned by the public; ownerhsip has not been verified.

*** Estimated nourishment length - the estimated length of nourishment needed for a likely project, *regardless of actual need (e.g., includes areas with a "None" shoreline change rate)*

^ MBMAP Shoreline Change Rate - calculated shoreline change rate of the length of beach estimated to need nourishment using data from the Maine Beach Mapping Program

None - beach is stable or growing

Low - shoreline change is -1 ft/yr or less

Mod - shoreline change is -1 to -2 ft/yr or more

High - shoreline change is -2 ft/yr or more

**** Estimated Single Nourishment Cycle - based on the shoreline change rate; None-Low or Low = 20 year cycle; Mod = 10 year cycle; High = 5 year cycle

**** Estimated Single Nourishment Volume - based on 250,000 cy per mile except for Camp Ellis Beach, which was estimated by the USACE for Section 111 project (beach fill only alternative).

***** Estimated Nourishment Cost - based on an average estimated cost rate of $25 per cubic yard of material

****** Estimated 20-year Nourishment Volume - Estimated Single Nourishment Volume multiplied by the Estimated Renourishment Cycle.

Appendix D: History of Maine Beach Nourishment Projects

Federal Navigation Project	Dredge Year	Volume Dredged (cubic yards)	Disposal Location	Intertidal Gain	Source
Scarborough River	1956	128,099	Onshore - Pine Point	Yes	1, 2, 3
	1962	150,000	Offshore	No	1, 2, 3
	1965	32,577	Offshore	No	1, 2, 3
	1969	47,000	Offshore	No	1, 2, 3
	1973	188,800	Offshore	No	1, 2, 3
	1975	9,090	Offshore	No	1, 2, 3
	2005	82,048	Onshore - Western Beach	Yes	4
	2015	116,325	Onshore - Western Beach	Yes	4
	Onshore	326,472			
	Nearshore	0			
	Offshore	427,467			
	Scarborough Total	753,939			
Saco River	1827	unknown	Unknown	Unknown	1, 2, 3
	1872	109,959	Unknown	Unknown	1, 2, 3
	1912	85,378	Unknown	Unknown	1, 2, 3
	1919	"large quantity"	Onshore - Camp Ellis	Yes	1, 2, 3
	1928	82,969	Unknown	Unknown	1, 2, 3
	1939	79,552	Unknown	Unknown	1, 2, 3
	1940	62,977	Unknown	Unknown	1, 2, 3
	1965	37,000	Onshore - Upland	No	1, 2, 3
	1969	87,354	Onshore - Camp Ellis	Yes	1, 2, 3
	1969	73,130	Onshore - Camp Ellis	Yes	1, 2, 3
	1973	37,000	Nearshore	Unknown	1, 2, 3
	1978	80,000	Onshore - Camp Ellis	Yes	1, 2, 3
	1978	50,000	Onshore - Camp Ellis	Yes	1, 2, 3
	1982	7,300	Onshore - Camp Ellis	Yes	1, 2, 3
	1992	13,079	Onshore - Camp Ellis	Yes	1, 2, 3
	1992	85,935	Onshore - Camp Ellis	Yes	1, 2, 3
	1992	24,990	Nearshore - channel	No	1, 2, 3
	1996	90,000	Nearshore (from Scarborough River)	No	5
	Onshore	458,788			
	Nearshore	151,990			
	Offshore	420,835			
	Saco Total	1,031,613			
Kennebunk River	2004	8,000	Nearshore - Goochs Beach	No	6
	2014	20,000	Nearshore - Goochs Beach	Yes	6
	Nearshore	28,000			
Webhannet River	1970, 1971, 1974	499,637	Onshore - Webhannet River Marsh	No	7
	2000	180,000	Onshore - Wells and Drakes Island	Yes	8
	2004	10,000	Nearshore - Wells	Unknown	6
	2012	10,000	Nearshore - Wells	Yes	6
	2014	5,000	Nearshore - Wells	Unknown	6
	2014	138,000	Onshore - Wells and Drakes Island	Yes	6
	Onshore	817,637			
	Nearshore	25,000			
	Offshore	0			
	Webhannet Total	842,637			
Overall Totals	Onshore	1,602,897			
	Nearshore	204,990			
	Offshore	848,302			
	Total	2,656,189			

References: 1-Program for the Study of Developed Shorelines, 1996; 2- Kelley and others, 1995; 3-Normandeau Associates, 1994; 4-M. Walsh, NED-USACE, 1 28 2016; 5-Kelley and Brothers, 2009; 6-E. O'Donnell, NED-USACE, 2-27-15; 7-Kelley and Anderson, 2000 8 MGS Site of the Month, 2001

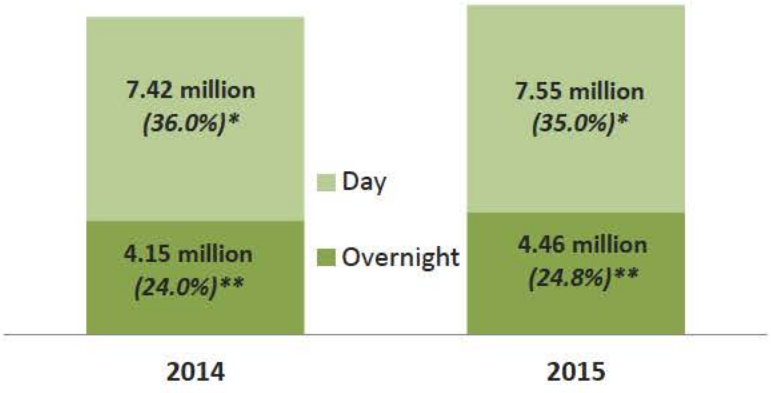
Appendix E: The Maine Beaches 2015 Regional Tourism Impact Estimates

The Maine Beaches

2015 Regional Tourism Impact Estimates

An estimated 12 million visitors came to the Maine Beaches region in 2015, a 3.8% increase over 2014 estimates.

2014 Total	2015 Total
11.57 million *(30.5% of All Maine Visitors)*	12.00 million *(30.4% of All Maine Visitors)*



** Percent of estimated total Maine day visitors*
*** Percent of estimated total Maine overnight visitors*

Year-over-year changes in visitation estimates fall within standard statistical margins of error and, therefore, should not be interpreted as absolute, significant fluctuations in visitation. Valid indicators of change include ongoing trends over multiple years, as well as noted statistically significant changes.

- *For the purposes of visitation and visitor expenditure estimates, only visitors on tourism related trips are included. Tourism related trips include: All leisure trips, VFR trips that are a general visit to see friends or relatives, a wedding, or a holiday visit, and business trips that are for a convention/conference/trade show or training/professional development.*

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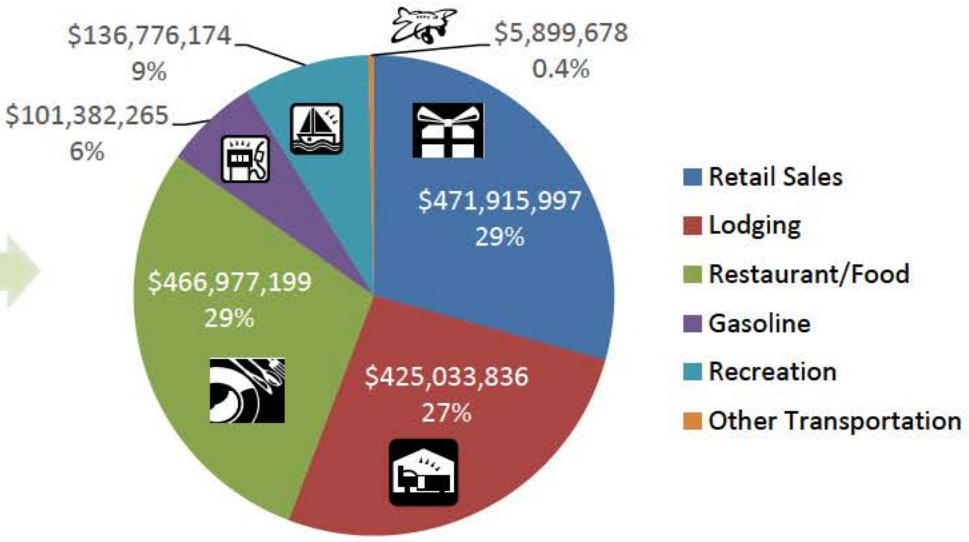
The Maine Beaches

2015 Regional Tourism Impact Estimates

In 2015, Maine Beaches visitors spent more than $1.6 billion, up 1.8% over 2014.

2015 Total

$1.61 billion



The $1.6 billion spent by visitors in the Maine Beaches supported…

Economic Impact begins when a visitor spends money in an area. The benefits to the local economy go beyond the basic impact of these dollars spent – these dollars create a chain effect. The effects of these expenditures are evident as the direct recipients of these expenditures in turn pay wages, earn income, and pay taxes. Further these direct recipients spend *their* income and thereby create more impact.

27,248 jobs

$ 500,397,726 in total earnings

$ 155,842,419 in total taxes

- *For the purposes of visitation and visitor expenditure estimates, only visitors on tourism related trips are included. Tourism related trips include: All leisure trips, VFR trips that are a general visit to see friends or relatives, a wedding, or a holiday visit, and business trips that are for a convention/conference/trade show or training/professional development.*
- *For the purposes of expenditure estimates, visitors are defined as all overnight visitors and all out of state day visitors on tourism related trips.*
- *Economic Impact is estimated using DPA visitor expenditure estimates, and the RIMS II Economic Impact model.*

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Appendix F: Criteria for Assigning Wildlife Habitat Values to Beaches for Nourishment Prioritization

Beaches were assigned a wildlife habitat value based on species diversity, abundance, and ability to manage and protect wildlife species during nesting, feeding, or roosting activities. Values assigned to beaches were based on wildlife suitability after nourishment. Priority was given to beaches that currently or historically support state or federally listed endangered species ***and*** have protection mechanisms in place including regulatory protection, cooperative beach management agreements, and/or municipal ordinances that protect listed species.

Beach Name	Wildlife & Habitat Rank
Reid	H
Hunnewell	L
Popham	H
Small Point	H
Willard	L
Crescent (Cape E.)	L
Higgins	M
Scarborough	M
Western	M
Ferry (Scar.)	L
Pine Point	M
East Grand	M
Surfside/Old Orchard	M
Ocean Park	M
Kinney Shores/Bayview	M
Ferry (Saco)	L
Camp Ellis	L
Hills	L
Fortune Rocks	M
Goose Rocks	M
Goochs	L
Great Hill	L
Parsons	L
Crescent Surf	H
Laudholm	M
Drakes Island	L
Wells	M
Moody	L
Ogunquit	H
Short Sands	L
Long Sands	L

Habitat Value assigned by total points: High Value >15 total points
Moderate Value = 10-15 total points
Low Value = 0-9 total points

A point system was used to rank the following criteria as High, Moderate, or Low wildlife habitat value.

Management Infrastructure (0-5 points):

- Area designated as Essential Habitat (EH) under Maine Endangered Species Act
- Area designated as Shorebird Significant Wildlife Habitat (SWH) under Natural Resources Protection Act
- Municipal or landowner cooperative beach management agreement
- Ability to conduct predator management for nesting piping plovers/least terns
- Effective leash ordinance

Piping Plover/Least Tern current nesting or historical nesting documented since 1981 (0-5 points):

- Consistent nesting success by greater than 4 pairs of piping plovers within the latest 5 year period (5 pts)
- Consistent nesting success by 1-5 pairs of piping plovers during latest 10 year period (4 pts)
- Consistent nesting success by 2-5 pairs of piping plovers within the latest 5 year period (3 pts)
- Consistent nesting success by 1-2 pairs of piping plovers during latest 10 year period (3 pts)
- 1-2 pairs consistently nesting during latest 5 year period but little success (2 points)
- Occasional nesting by 1-2 pairs since 1981 (1 pt)
- 0 pairs (0 pts)

Nesting habitat potential (0-5 points):

- functional dune providing foraging and nesting habitat
- Ability to migrate inland during sea level rise
- Natural shoreline (no development, jetties, seawalls, etc.)

Other wildlife:

- Areas designated as shorebird SWH for both roosting and feeding (3 pts)
- Areas designated as shorebird SWH roost (2 pts)
- Areas designated as shorebird SWH feeding (1 pt)
- Areas with documented use by federally listed Red Knots (1 pt)
- Areas with documented use by roosting or feeding by federally listed Roseate Terns (1 point)
- Areas with documented use by Salt Marsh Tiger Beetle a state species of Special Concern (1 pt)

Appendix G: Beach Norishment Proposal Ranking Matrix, Proposed Criteria and Proposed Definitions

Beach Nourishment Proposal Ranking Matrix

DRAFT FOR DISCUSSION PURPOSES ONLY

Decision Factors		Proposal #1	Proposal #2	Proposal #3	Proposal #4	Proposal #5
Criteria	**Max Points**					
Severity of Erosion						
Wildlife Habitat Value						
Project Longevity						
Recreational and Economic Benefit						
Matching Funding Sources						
Marine Resources						
Applicable Design Standards						
Access Opportunities						
Threats to Developments						
Future Change Considerations						
All Other Considerations						
Overall Scores	**0.0**					

Beach Nourishment Proposals: A number of proposals were submitted to the Beach Nourishment Proposal Committee to determine which proposals will be selected for funding. Each was ranked against the defined criteria below. The top proposal(s) will be granted funding to complete the proposed project(s).

Criteria	Definition
Severity of Erosion	Average erosional rate of project based on MBMAP and/or SMBPP (more points for higher rate)
Wildlife Habitat Value	Beaches are assigned a wildlife habitat value of High, Moderate, or Low based on species diversity, abundance, and capacity for conservation of wildlife species during nesting , feeding, or roosting activities.
Project Longevity	Estimated nourishment interval for this project area. (more points for longer interval)
Recreational and Economic Benefit	What is the percentage of linear footage of property within the project boundaries zoned commercial, recreational or public lodging establishment or the equivalent in the current local land use map?
Matching Funding Sources	Does project have local, county, state or federal matching funds? What percentage is funded through other sources?
Marine Resources	How will nourishment affect the fish habitat in the area?
Applicable Design Standards	Operation and maintenance standards, flood line standards, green ifrastructure, sustainability of design, etc. (Beach, dune, sand source/compatibility)
Access Opportunities	Does project have all required easements in-place, what are the time lengths of easements, elaborate on any access, ownership or easement issues, is this a public access beach?
Threats to Developments	Percentage of the project linear shoreline containing structures in the mapped EHA.
Future Change Considerations	Does project take actions to reduce the nourishment cycle over time by considering increased likelihood of more frequent and larger storm events, and erosion from sea level rise?
All Other Considerations	Dry beach witdth, red letter days, beach management plan, additional dune restoration projects, number of visitors, etc.

Note on calculation
The formula for scores uses a Sumproduct formula and has conditional formatting applied. Please check that the formula and conditional formatting includes the correct cell ranges if you add or remove any rows or columns.

Instructions: Select and insert a score of 0 to 10 for each criteria. Individual scores will be totalled to obtain overall score.
Keep the first column for status quo (i e. no change) and score the options against the status quo.

Appendix H: Compilation of Funding Options for Beach Nourishment

Program Name	Existing or Potentially New Program	Source of Funding	Eligible Activities	Potential Amount	Caveats/Notes
Environmental Bond for Maine's Beaches	New	State	Beach nourishment, sand acquisition, dune restoration, hazard mitigation, match federal funds	About $10 million	Could act as seed money, could provide state match for Federal funding
Coastal Infrastrucutre Improvement Bond	New	State	Beach nourishment, dredging of small harbors, improvement of areas of transportation for large and small craft	About $10 million	Could partner with DOT to improve small harbors along with beach nourishment efforts
Tourism Infrastructure Bond	New	State	Upgrades to parking, signage, façades, bathrooms, sidewalks, boat ramps, beach nourishment	About $10 million	Could partner with communities and industry
Transportation Infrastructure Bond for Coastal Improvements	Ongoing	State	Dredging of small and large state harbors, beach nourishment from dredged sand	About $10 million	Could with Department of Transportation to work out the details
Annual Appropriation from General Fund	New	State	Erosion monitoring, database development, land acquisition, beach nourishment, dune restoration	Unsure[1]	May be unlikely considering current fiscal climate
Dedicated Use of Fines and Penalties[2]	New	State	Erosion monitoring, database development, land acquisition, beach nourishment, dune restoration	Small	Fines/penalties typically go into general fund; shared burden of fee increases
User Fees Derived from Beach Fees, Parking, Building Permits	Existing	Local	Various, typically used for maintenance, clean up, lifeguards, security	Unsure	Could otherwise be used to provide local match for nourishment
Local Option Sales Tax*[3]	New	Local	Various, beach nourishment, dune restoration	Moderate	Requires approval by Legislature
Real Estate Transfer Tax	Existing	State	Erosion monitoring, database development, land acquisition, beach nourishment, dune restoration	Moderate	New use for current Maine Statute
Municipal Special Assessment District	New	Property Owners and Town	Capital improvements, signage, lighting, etc.	Unsure	Funding tied to increase in value resulting from improvements in the District
Municipal Appropriation or Bond	Existing	Local	Various	Unsure	
Community Development Block Grant	Existing	State/ Federal	Unsure	Unsure	Through DECD; For low - moderate level income areas
HMGP Hazard Mitigation Program (FEMA/MEMA)	Existing	Federal	Acquisition, retrofit, elevating, infrastructure protection, storm water management, minor flood control	<15% of grants awarded by FEMA (75%)	To help communities implement hazard mitigation measures following a Presidential major disaster declaration
FMA Flood Hazard Mitigation Program (FEMA/MEMA)	Existing	Federal	Acquisition, retrofit, elevating, infrastructure protection, storm water management, minor flood control dune restoration	Up to $100,000/ state	$50,000 for state plans, $25,000 for local; competitive grant
Congressional Authorization	Existing	Federal	Beach nourishment	Unsure	Cost sharing?
Navigation Projects	Existing	Federal	Beneficial reuse of dredge material, disposal of sand on beach	Unsure	Many not include all cost for studies, monitoring or testing
Internet Sales Tax*	New	State	Various	Unsure	Appropriate a small percentage to beach nourishment dedicated fund
Lodging Tax*	Existing	State	Various	Unsure	Could be used in combination with a local option sales tax

Collaboration with Land Trusts, Conservation groups	Existing	State/ Private	Land acquisition for conservation or recreation	Unsure	
Maine Outdoor Heritage Fund	Existing	State	Conservation of habitat & endangered species, acquisition and management of outdoor recreation sites and facilities, monitoring, education	Normally up to $20,000	Sponsored by certain state agencies

[1] Would request at least $5 million per year

[2] Such as but not limited to: Coastal dune system impact permitting fee, submerged land lease permit fee, and dune permitting fee, coastal enforcement monetary penalties directly into this fund

[3] This group would recommend that the tax is implemented year round versus the 2006 report which recommend a seasonal tax

* These were options not preffered by all members of the stakeholder group