

SACO BAY REGIONAL BEACH MANAGEMENT PLAN



**Saco Bay Planning Committee
February 2000**

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A. Introduction

Residents and tourists use southern Maine's beach areas for recreation, tourism and housing needs. These same beaches also provide habitat for various birds, fishes, clams and other species, including some that are endangered or threatened. Erosion from storms and sea-level rise often threatens coastal areas, including loss of or damage to homes, businesses, beaches and dunes. In particular, the federal jetty located at Camp Ellis has had a profound effect on the sand flow for *all* of Saco Bay, depriving the southern end of the bay of sand and creating an abundance at the northern end. The complex array of variables involved in beach management requires local, regional, state and federal coordination.

Beaches and dunes are currently managed by state agency rules administered by the Maine Department of Environmental Protection (DEP) that regulate all coastal dune areas in order to minimize loss of life and property and at the same time maintain adequate protection of the natural resource base. Under the current regulatory structure, local and regional beach management interests are not involved in the day-to-day development and administration of coastal sand dune policies.

The focus of this plan is to identify beach management issues at the local and regional levels in order to provide solutions that alleviate inconsistencies or misunderstandings between local, state and federal policy makers. If local, state and federal interests are managing beach resources from a common understanding of the issues at hand, all parties will benefit from the results of a cohesive management plan for southern Maine's beaches. Improving the quality of the region's beaches will provide buffer protection against storms, recreational opportunities for locals and visitors, and habitat for wildlife.

B. Executive Summary

Findings:

Natural Resources

- The Saco Bay region represents **9** miles of the **23** miles (roughly 40%) of sand beaches located in southern Maine.
- Saco Bay is currently a productive and important feeding and nesting habitat for piping plovers. Although habitat for least terns is present in Saco Bay, they have not nested in Saco Bay for several years. Both of these species are classified as endangered under Maine's Endangered Species Act. In 1998, **12** plover pairs nested (representing 20% of Maine's total plover population) on Saco Bay beaches.
- Soft-shell clam landings in Saco Bay totaled **483,500 pounds** in **1997** and **399,000** pounds in 1998.

Geological Processes and Sand Management

- The Saco River is the main source of sediment for Saco Bay, providing between **8,000** and **12,000 cubic yards** of sand annually to the bay.
- The federal jetty located in Camp Ellis at the mouth of the Saco River has caused considerable accelerated erosion in the immediate area due to the structure's design. This area continues to experience an annual deficit of about **12,000 cubic yards** of sand, which is transported to the northern end of Saco Bay at Pine Point in Scarborough at an equivalent rate. The present jetty was raised and tightened over the last 100 years and resurfaced, raised and tightened in 1968-69, which has caused considerable erosion of roughly 2000 feet of beach immediately adjacent to the structure. The jetty's current configuration also has eliminated the natural flow of sand between the Saco River and *all* the beaches of Saco Bay.

Sand Dune Regulation

- Maine's sand dunes are regulated by rules promulgated in 1988 under the state's **Natural Resources Protection Act**. The rules, administered by DEP, discourage development of dune areas that are prone to coastal storm damage or that have important habitat value. The rules currently do not include the necessary provisions to recognize the local and/or regional circumstances unique to some of the state's beach areas.
- DEP received **361 standard application** permits for activities in sand dunes in the Saco Bay region between 1989 and March of 1999. The department also received **171 permit-by-rule applications** for sand dune activities in the region between 1994 and March of 1999.

Economic Impact and Tourism

- In 1997 U.S. overnight travelers took an estimated **3.5** million trips to southern Maine's coast, of these **2.1** million travelers stayed overnight in the region and **1.4** million passed through the area (Longwoods International, 1998)
- Marketable pleasure trips in southern Maine, excluding visits to friends and relatives, totaled **1.1** million in 1997, representing about **30%** of total pleasure trips in Maine. Of these trips, **45%** of visitors came to tour the region and **27%** came to enjoy area beaches (Longwoods International, 1998).
- The seasonal variation in **retail and services employment** indicates the economic importance of beaches in southern Maine. The median increase due to seasonal variation for the retail employment sector is roughly **29%** higher during August when compared to March. The median increase for the services employment sector is roughly **34%** higher during August when compared to March.
- The seasonal variation in the **Other Retail** (includes items not found in department stores such as jewelry/leather, sporting goods, bookstores, gift shops, toys, crafts, etc.) and **Restaurant/Lodging** categories shows the impact of beach communities. The average annual taxable sales for the Other Retail category in the Saco Bay region between 1993 and 1998 was **77%** higher during the third quarter (July-Sept) when compared to the first quarter (Jan-Mar), ranging from **\$3.6** million to **\$6.4** million respectively. Average annual taxable sales for Restaurant/Lodging for the region during the same period was **458%** higher during the third quarter when compared to the first quarter, ranging from **\$6.8** million to **\$37.8** million respectively. A local option sales taxes accruing to municipalities in Saco Bay would generate roughly \$89,000 and \$178,000 annually, based on 1% and 2% of total annual average restaurant sales respectively.
- The total municipal valuation of the Saco Bay region (Saco, OOB, and Scarborough) is over **\$2.4** billion, of which roughly **\$503** million represents beach-related property. Thus beach-related property in Saco Bay accounts for nearly **21%** of total municipal valuation.

Summary of Recommendations from the Saco Bay Planning Committee

Recommendations:


The *Saco Bay Beach Management Plan* is the first of three regional management plans to be developed for southern Maine beaches between 1999 and 2001. The *Saco Bay Planning Committee*, consisting of 16 coastal stakeholders, was organized to address beach management needs within the region. The plan addresses the earlier recommendations of the state-level Southern Maine Beach Stakeholder Group in the report titled *Improving Maine's Beaches*, finalized in April, 1998.

The committee has identified specific actions to be taken in an effort to improve beach management in the Saco Bay region. In developing its recommendations, the committee focused on the following topic areas:

- Natural resources management;
- Geological processes / sand management;
- Regulatory analysis; and
- Economic impact analysis of beaches

The Planning Committee has determined that the single most important issue relating to beach management in the region is the disequilibrium of sand resources throughout the Saco Bay. As is evidenced by the conclusions of two comprehensive studies (Moreau, 1979 and Kelley et. al., 1995), the bay is sand starved due to the current configuration of the jetty on the northern side of the mouth of the Saco River. The previously mentioned studies indicate that the jetty has caused accelerated erosion of beaches and dunes in the immediate vicinity of Camp Ellis. Recent study has also determined that the Saco River is the main source of sediment to the bay, with very little sand from other sources reaching area beaches (Kelley et. al., 1995). Presently, the predominant currents in Saco Bay flow in a clockwise direction from south to north (Kelley et. al., 1995). This northward flowing current, coupled with a lack of new sediment to replace the moving sand, has resulted in a disproportionate balance of sand resources throughout the bay. The sand in the southern end of the bay is eroding at an accelerated rate due to modifications made to the existing jetty in Camp Ellis, causing loss of public and private property and investments. Sand is accreting at an accelerated rate at the northern terminus of the bay causing costly and time consuming dredging activities in order to keep channels open to navigation.


The Committee has determined that due to past and current rates of erosion and accretion occurring in Saco Bay, the plan for the bay must include both short- and long-term actions. The following actions identify the most effective methods for mitigating the erosion and accretion problems plaguing Saco Bay.

 **Emergency action:** *The Committee recommends immediate financial, technical and administrative assistance from the United States Army Corps of Engineers (USACOE) and State of Maine to be used to increase the regional capacity to nourish beaches with sand in the Saco Bay region until a long-term solution can be implemented.*

The following options for nourishing area beaches with sand have been identified by the Committee:

- 1. Purchase of a mobile hydraulic dredge that can move sand from the northern end of the bay to the southern end.*
- 2. Leasing dredge equipment that has the capacity to move sand resources throughout the bay.*
- 3. Hiring a dredging contractor to perform the necessary sand nourishment activities.*

*Furthermore, the Committee recommends the annual removal of **25,000 cubic yards** of sand from the accreted shorefront in the Pine Point area and peripheral areas outside the federal channel in the Scarborough River Inlet, the north side of the jetty located at Camp Ellis, or other mutually decided locations identified by the Committee, to be placed on eroding beaches in Camp Ellis, Ferry and Western beaches in Scarborough, and along the entire Saco Bay beach system on an as-needed, when-need basis. This action will help to protect beach areas from coastal storms and tidal surges long enough to implement the long-term goals of the plan.*

 **Long-term action:** *Due to the current configuration of the federal jetty located on the north side of the Saco River in Camp Ellis, natural sand replenishment from the Saco River has been eliminated and erosion from onshore waves is exacerbated due to the structure being too high and tightly surfaced to allow breaching. The Committee recommends that the USACOE modify the existing jetty by lowering the height from **17 ft.** above Mean Low Water (MLW) to **12 ft.** above MLW at the shoreward end. In addition the shoreward end of the jetty should be resurfaced to increase porosity in order to reduce the severity of storm waves that roll along the jetty at high velocities and scour sand from the beach. The Committee also recommends that the USACOE remove **1000 ft.** from the seaward end of the jetty to reestablish the natural flow of sand from the Saco River to the bay's beaches.*

The above long-term action is the preferred option recommended by the Planning Committee given existing data and analysis available to date. However, the Committee recommends an engineering analysis and feasibility study in conjunction with the above long-term recommendations, by an independent Engineering firm, for identifying the effects of modifications to the Camp Ellis jetty. If the engineering analysis and feasibility study of the Camp Ellis jetty is concluded within a reasonable period of time and alternatives are identified that accomplish the goals of the Plan, these alternatives will take precedence over the long-term actions recommended above.

The second most important issue identified by the Planning Committee is the local / regional review of beach resource management. Under the current framework adopted by the state, sand dunes in Maine are sometimes regulated without the necessary input from municipalities of beach regions in which dunes are located. Identification of land uses and natural areas in the Saco Bay region using digital Geographic Information System (GIS) mapping software will greatly enhance the

ability of local, regional and state planners to assess natural resource values for specific coastal areas, which can be translated into sound policies for managing dunes and beach systems in southern Maine.

Regulatory efforts to manage beaches in southern Maine will undoubtedly be improved if regulators and community interests increase discussions and interactions in order to obtain a better mutual understanding of the issues. Currently, misunderstandings exist regarding specifics of the rules presently in place, including the rationale for some rules. Therefore, a better understanding of the underlying reasons for existing sand dune rules, as they pertain to specific case examples, will provide greatly needed outreach and education to local beachfront business and residential property owners, municipal planners, environmental interests and state regulators.

While most of the recommendations made by the Committee can be implemented under existing rules and laws, a need exists to work with state regulators to reform the permitting process to allow regular beach nourishment when feasible. Existing permitting requirements for coastal sand dredging assume that beach conditions change over the short-term, and, as a result, unnecessary and repetitive applications are currently required. A clear policy on beach nourishment practices from Maine's state agencies will help clarify the feasibility of using this strategy as an alternative to so-called "hard" engineering structures such as concrete or wood seawalls. Nourished beaches can provide protection from coastal storms, habitat for endangered species, and improved public beaches.

Finally, the Planning Committee feels that if the disproportionate balance of sand in the bay is to be managed effectively, and the regulatory framework surrounding sand dune management is to be optimized, then a greater level of regional coordination is necessary. Regional coordination offers an opportunity for local, state and federal stakeholders in Saco Bay to identify interests in the bay and design a management strategy that can be locally driven for maximum effectiveness.

In conjunction with the three critical issues identified above that are paramount to improving the management of beach resources within the bay, the Saco Bay Plan is intended to promote the sustainable management of identified beach resources within the region. Based on the needs of coastal interests in the Saco Bay region and the current regulatory structure in place, the committee supports the following recommendations.

Natural Resources Management

Policy: Improve state and local capacity to manage natural resources within beach areas of Saco Bay.

Action:

1. Develop a cooperative agreement among stakeholders regarding protection of plovers and terns in the Saco Bay Region. This agreement should be modeled on the process recently undertaken by the Town of Wells to manage plover habitat. Issues of immediate concern identified by the Saco Bay Planning Committee include improved access to private property by wildlife managers when needed to protect nesting birds and a “leash law” to protect birds from pets during nesting season (April-August).
2. Develop a GIS-based computer mapping system for analyzing natural resources in beach areas as they relate to current land use patterns. The database should consider land ownership by parcel, conservation and open space areas, historical trends of building permits and existing development, and critical habitat area for fish and wildlife species.
3. Improve water quality in estuarine waters to increase the amount of acreage available for recreational and commercial shellfishing.

Geological Processes / Sand Management

Policy: Reduce the accelerated rate of erosion in Saco Bay resulting from the federal jetty on the north side of the entrance to the Saco River. The following actions will help reduce beach erosion in Saco Bay:

Actions:

1. Stabilize high erosion areas in Camp Ellis and Ferry and Western beaches in Scarborough through beach nourishment methods that utilize sand resources from accreted sand at Pine Point and non-federal areas of the Scarborough Inlet as well as the north side of the Camp Ellis jetty and areas inside the jetty, until long-term solutions can be implemented.
 - a) Purchase, lease or contract a mobile sand dredge for the Saco Bay region that has the capacity to transport at least 25,000 cubic yards of sand on an annual basis to stabilize eroding beaches.
 - b) Add 20,000 cubic yards of sand to the beach areas immediately adjacent to the Camp Ellis jetty annually.
 - c) Add 5,000 cubic yards of sand to Ferry and Western beaches annually.
 - d) Add sand to other eroding beach areas in Saco Bay on an as-needed basis.

2. Alter the existing federal jetty at Camp Ellis to reestablish a natural flow of sand from the Saco River to all the beaches of Saco Bay and reduce accelerated erosion in the immediate vicinity. The following modifications are recommended:
 - a) Roughen the shoreward end of the jetty and lower it from its current height of 17 ft. above (MLW) to 12 ft. above MLW to stop accelerated waves from attacking the beach and allow waves to breach the jetty during storm events.
 - b) Remove 1000 ft. of rock material from the seaward end of the jetty to allow sand flow from the Saco River around the structure and into Saco Bay.

Sand Dune Regulation

Policy: Improve the effectiveness of the state's coastal sand dune rules by reviewing beach management issues at the regional level. The following actions will allow regional oversight of permits with input at the local level:

Actions:

1. Appoint a permanent regional advisory committee to advise beach regulation and management issues in Saco Bay in accordance with existing state laws and rules. This committee should consist of 4 representatives from each town in the Saco Bay region, including one municipal planner, one elected town/city councilor, one at-large member representing the general public, and one representative from each local conservation commission. The advisory committee would consult with applicable state and federal agencies, private nonprofit environmental organizations, and local residents and business owners representing beach interests. The proposed committee would have no regulatory authority over DEP regulated sand dune permits, and the DEP would continue to act as the sole regulator of permits under the current regulatory structure established by the state's sand dune rules.
2. Develop clear state guidelines for routine beach nourishment strategies for Saco Bay beaches, including multi-year permitting for approved sand nourishment areas with adequate monitoring of geological and ecological impacts. These policies should incorporate long-term nourishment strategies that include annual sand replenishment in areas identified by this Plan.
3. Recognize different standards and definitions between the state's shoreland zoning guidelines, municipal shoreland zoning ordinances and the sand dune rules. This should include recognition that shoreland zoning ordinances and DEP sand dune rules share overlapping jurisdiction in coastal areas. In order to improve permitting enforcement at the local level, overlapping jurisdiction in sand dune areas should be clearly defined to permit applicants and local code enforcement officers during the permitting process. The State's Guidelines for Municipal Shoreland Zoning Ordinances currently require the adoption of stricter standards in cases of overlapping jurisdiction with other ordinances, regulations or statutes.

Economic Impact Analysis / Tourism

Policy: Improve local and state capacity to measure and assess economic impact of beaches and associated tourism. The following actions will assist with measuring economic impact:

Actions:

1. Promote a rigorous study of the economic impact of tourism to each of the beaches in Saco Bay, including market and non-market values as identified by surveying beach users during the tourist season.
2. Develop methods to provide analysis of existing taxable sales and employment data by industry for identified beach areas in Saco Bay, as well as other pertinent economic indicators for measuring the value of beach-related areas in Saco Bay and the economic impact of tourism in the region.

Table 1
Summary of Recommendations for Beaches in Saco Bay

Recommend. #	Category	Action	Implemented by	Cost	Possible Funding
2.1a	Natural Resources	Increased environmental monitoring	Local land trust, schools and conservation commissions	\$15,000	Gulf of Maine Council grant; Maine Coastal Program grant; USEPA grant
2.1b	Natural Resources	Increased awareness of cultural and economic issues	Saco Bay Advisory Committee	\$3,000	Gulf of Maine Council; Maine Coastal program grant
2.1c	Natural Resources	GIS database of coastal resources	IF&W, DMR, SMRPC	\$20,000	Maine Office of Geographic Information Systems
2.1d	Natural Resources	Cooperative management agreement for bird habitat	Municipal planners	\$5,000	Saco Bay municipalities
2.1e	Natural Resources	Increase shellfish habitat	Conservation and shellfish management committees	\$3,000	DEP; Maine Coastal Program
2.1f	Natural Resources	Part-time baykeeper	Saco Bay Advisory Committee	\$5,000	Municipal governments in Saco Bay
Subtotal				\$61,000	
3.1a	Geological Processes	GIS database of erosion and accretion	MGS and MOGIS	\$10,000	MGS
3.1b	Geological Processes	Study and alteration of Camp Ellis jetty	Private engineering firm; US Army Corps of Engineers	Study: \$200,000 Modifications: \$2,086,448	Study: State of Maine/Saco Bay municipalities Modifications: USACOE
3.1c	Geological Processes	Establish a dune in Camp Ellis	USACOE; Saco Bay municipalities	See section 3.7 beach nourishment cost analysis	Saco bay municipalities
	Geological Processes	Nourish Saco Bay beaches	Saco Bay municipalities	\$116,200 per year (See section 3.7 beach nourishment cost analysis)	USACOE; Saco Bay municipalities—local option sales tax
	Geological Processes	Secure a dredge	Saco Bay municipalities	\$250,000 average per year	Saco Bay municipalities
Subtotal				\$2,576,200	

Table 1
Summary of Recommendations for Beaches in Saco Bay

Recommend. #	Category	Action	Implemented by	Cost	Possible Funding
4.1a	Sand Dune Regulation	Create the Saco Bay Advisory Committee	Saco Bay municipalities	\$5,000 per year	Saco Bay municipalities; Maine Coastal Program matching grant
4.1b	Sand Dune Regulation	Establish state guidelines for beach nourishment	DEP, DMR, IF&W, MGS	Minimal	Current programs operating budgets
4.1c	Sand Dune Regulation	Develop consistent standards for shoreland zoning	DEP	Minimal	Current programs operating budgets
Subtotal				\$5,000	
5.1a	Economic Impact	Economic impact study of Saco Bay beaches	Muskie School of Public Service; Margaret Chase Smith Center	\$50,000	ME/NH Sea Grant Program grant; local option sales tax
5.1b	Economic Impact	Develop economic indicators for Saco Bay beach region	Maine Office of Tourism; Maine Dept. of Community and Economic Development	Minimal	Current programs operating budgets
Subtotal				\$50,000	
Total				\$2,692,200	

C. ACKNOWLEDGMENTS

This report is a cooperative effort between coastal municipalities in southern Maine, the Southern Maine Regional Planning Commission and the State of Maine.

The participating coastal municipalities in southern Maine and the Maine Coastal Program jointly fund the Southern Maine Regional Planning Commission's beach planning initiative.

We would like to thank the numerous local and state public officials as well as the members of the Coastal Resources Steering Committee and the Saco Bay Planning Committee for their valuable insight and contributions to the report. The Maine Geological Survey, Maine Department of Inland Fisheries and Wildlife, Maine Department of Marine Resources, and the Maine Department of Environmental Protection provided critical information during plan development.

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D. BACKGROUND

1.1 Overview

The beach areas of Saco Bay are undoubtedly valuable resources to the local community, statewide interests and out-of-state tourists. The bay's beaches are used for various activities, including housing, tourism, recreation and wildlife habitat. The natural beauty and abundance of diverse natural resources make beach areas highly desirable real estate to both humans and wildlife. It is this desirability that is at the root of the debate focusing on the management of beach resources in Saco Bay. Therefore it is critical that each stakeholders' interests and concerns are adequately addressed when contemplating the use and management of such a diverse resource. In order to be effective, beach planning efforts must identify the desired uses for beach resources and then assess the impacts such uses might have on coastal resources.

The Saco Bay system is defined by geological, environmental, cultural and economic considerations. The Saco Bay Regional Beach Management Plan (hereafter referred to as the "Plan") includes the area between Camp Ellis in Saco to the south and Prouts Neck in Scarborough to the north. The planning area represents roughly 9 miles of beachfront property, as identified in Appendix A.

Coastal resources management, however, is extremely complex due to the inherently dynamic nature of the coastal zone. Coastal areas, in particular sandy beaches, are especially vulnerable to erosion and subsequent flooding. From a purely geological perspective, the Saco Bay beach system has not changed dramatically since the modern day coastline evolved roughly 5,000 years ago. However, the changes to beaches can be rather dramatic if coastal areas once sheltered from flooding are now regularly inundated due to erosion. While natural systems such as sand dunes and coastal marshes have the ability to adapt to the changing coastal landscape over time, humans are less able to make such changes due to considerable economic and cultural investments in coastal areas.

Origin of the Saco Bay Plan

For many years issues surrounding the management and use of beaches in Maine have been contentious as state and local officials attempt to balance the needs of property owners, tourists, wildlife, and flood control. In February, 1997, the State Planning Office (SPO) and the Department of Environmental Protection (DEP) established the Southern Maine Beach Stakeholder Group, consisting of municipal representatives, property owners, state agency personnel and environmental advocacy groups to discuss coastal issues. The hope of the two departments was that sharing information and perspectives among those with differing views would lead to a common understanding that would result in policy changes at the state, local and federal levels regarding the management of beach resources.

After many months of information gathering and debate among its members, the Stakeholder Group issued its report and recommendations in April, 1998. Among the

recommendations in the report are two that address the development of long-term beach management plans. The Stakeholder Group recommended that:

- *Municipalities and state agencies should work with stakeholders, including land owners, environmental groups and business interests, to develop regional beach management plans that establish goals, policies, and recommended regulations that will guide how the beach resource will be managed. The Maine Department of Environmental Protection and the State Planning Office should participate in the development of the beach management plans to ensure that the proposed policies and regulations are consistent with the intent of state law, such as the Natural Resources Protection Act, and to monitor the results of the plans. DEP could, if warranted, change the administrative rules, recommend changes to state law, or delegate some authority to municipal or quasi-municipal authority that has established capacity to administer this law.*
- *The Southern Maine Regional Planning Commission should provide technical and organizational assistance for developing regional beach management plans and serve as a liaison with interested State agencies.*

The Stakeholder Group recommended that beach management plans address the following issues:

- Restoring or maintaining existing beaches
- Reducing risks to property
- Protecting wildlife habitat
- Enhancing the economic value of beaches
- Reforming beach regulation
- Improving regional coordination

In response to these recommendations, the Maine Coastal Program (MCP) is partially funding a coastal planner position at the Southern Maine Regional Planning Commission for three years (1999-2001) to implement these recommendations. In order to secure funding from the State Planning Office, the Southern Maine Regional Planning Commission, through the participating municipalities, must provide the remainder of the funds. To date, five of the 10 coastal municipalities invited to participate in the planning effort have committed to providing the remainder of the funds necessary through 2001. Participating communities include Wells, Kennebunk, Saco, Old Orchard Beach, and Scarborough.

Beach Management Planning

The Stakeholder Group has stressed the need for beach management planning to be done on a beach system basis and, with the input of coastal geologists, has identified eight beach management areas in mid-coast and southern Maine. (See map in Appendix B) Two of these beach management areas, Reid, Popham and Seawall beaches in Phippsburg and Georgetown, and Crescent Beach in Cape Elizabeth are beyond the scope of this proposal, leaving six management areas to be addressed. Some of these areas are completely within one municipality (such as Goose Rocks Beach); while one involves as many as four municipalities (the Saco Bay system extending from Hills Beach in Biddeford to Western Beach in Scarborough). Economies can be achieved when planning for the isolated beach systems such as Goose Rocks and Horseshoe Cove by grouping beach systems that share issues such as erosion problems with similar existing development densities that could be addressed with similar approaches. In order to be effective, a beach management plan must involve all of the stakeholders with an interest in a particular beach system. These include beachfront property owners, wildlife managers, municipal officials, tourism-oriented businesses, floodplain managers, environmental interests and emergency preparedness personnel, state and federal agencies and others.

As a result of the municipalities opting to participate in regional beach planning activities, three of the designated regions have been incorporated into the three-year beach planning project. Planning began with the Saco Bay region in January, 1999 and will continue in the Wells embayment in 2000, finishing with Scarboro Beach/Higgins Beach in 2001.

The management plans, once endorsed by the municipalities and appropriate state and federal agencies, should serve as the blueprint for the overall management of the beach system. These plans will be implemented by municipalities from their day-to-day sand maintenance to their land use regulations to long-term capital planning for harbor improvements. These plans will also be used by state agencies in the amendment or development of policies and regulations for beach maintenance and development on sand dunes. The plan should be reviewed, updated and amended, when necessary, by municipalities in Saco Bay to accommodate future changes.

Coastal Resources Steering Committee

During the summer of 1998, each participating municipality appointed a policy-level municipal official to a steering committee to oversee the work of the planner. This committee is in addition to the committees formed to produce each of the regional management plans. The purpose of the steering committee is to provide direction to the activities of the planner and to ensure that the needs of the participating municipalities are being addressed through the development of an annual work plan. The Coastal Resources Steering Committee, comprised of three municipal planners and two elected municipal officials, represents the long-term planning interests in the southern Maine beach regions. The Steering Committee will remain active throughout the three-year project. Table 2 lists the members of the Steering Committee.

Table 2

Coastal Resources Steering Committee Members

Name	Interest Represented	Affiliation
William Giroux	Planning Director	Town of Wells
Tad Redway	Town Planner	Town of Old Orchard Beach
Rich Roedner	City Planner	City of Saco
Rachel Phipps	Selectman	Town of Kennebunk
Sue Foley-Ferguson	Councilor	Town of Scarborough

Saco Bay Planning Committee

In January of 1999, the Saco Bay Planning Committee members were appointed with the assistance of the Steering Committee. The Planning Committee, consisting of 14 members, represents stakeholders in the Saco Bay region, including beachfront land owners, business owners, public citizens, environmental interests and municipal and state public officials. Biddeford is the only coastal municipality in Saco Bay that has opted not to participate in regional beach planning efforts. Table 3 lists the members of the Planning Committee. In addition to the listed members, the Planning Committee receives advisory assistance from DEP, SPO and, Maine Geological Survey (MGS).

**Table 3
Saco Bay Planning Committee Members**

Name	Interest Represented	Affiliation
Peter Angis	Waterfront business	Town of Scarborough
Leeann Hanson	At-large	Town of Scarborough
Dave Corbeau	Municipal official	Town of Scarborough
Joanne Kelly	Waterfront property owner	Town of Scarborough
Ron Michaud	Municipal official	City of Saco
Rick Milliard	At-large	City of Saco
Dick Manning	Waterfront property owner	City of Saco
Chris Braley	Waterfront business owner	City of Saco
Jerome Plante, Chairperson	At-large	Town of Old Orchard Beach
Dick Kessler	Waterfront business owner	Town of Old Orchard Beach
April Wernig	Municipal official	Town of Old Orchard Beach
Diane Fenton	Waterfront business owner	Town of Old Orchard Beach
Jody Jones	Environmental	Maine Audubon Society
Phil Bozenhard	Fish and Wildlife	ME. Dept. of Inland Fisheries and Wildlife

1.2 Mission Statement

The mission of the Saco Bay Planning Committee is to fulfill the recommendations of the Southern Maine Beach Stakeholder Group regarding the development of regional beach management plans for Saco Bay's beaches, considering geological, ecological, social and economic issues.

1.3 Vision

The Committee's vision is to protect beach resources in Saco Bay while at the same time providing adequate housing, recreation and economic opportunity for residents of the State.

1.4 Guiding Principles

- Maine's beaches are of **significant** importance to all residents in the State, providing ecological, social and economic benefits
- Regional beach management plans should adequately address the impacts to **all** parties in the Saco Bay region
- Beach planning activities should identify both **short-** and **long-**term goals, objectives and strategies for the region
- Recommendations should target **local, state** and **federal** coastal management interests
- **Multiple** funding sources should be identified for any strategies requiring a financial commitment

1.5 Statement of Commitment

The signatories to this report, the Saco Bay Beach Management Plan, agree that the goals and objectives included in the Plan represent the interests of the entire Saco Bay region. By signing below, each signatory endorses the Plan and will assist with implementing the Plan's recommendations to the greatest extent possible.

Saco Bay Planning Committee Members

Peter Angis

Leeann Hanson

Dave Corbeau

Joan Kelly

Ron Michaud

Richard Milliard

April Wernig

Richard Manning

Chris Braley

Jerome Plante

Richard Kessler

Diane Fenton

Phil Bozenhard

Jody Jones

1.6 Goals and Objectives

The committee has identified beach management issues of concern, providing goals and objectives for each topic identified as important to an effective and efficient overall management strategy.

OVERALL GOAL:

Develop a comprehensive beach management plan for the Saco Bay region.

Objective 1

Consider a system-wide plan that adequately addresses the impacts of all parties in the Saco Bay region.

Objective 2

Develop a planning strategy that identifies short- and long-term goals, objectives and recommendations for the Saco Bay region.

Objective 3

Target beach plan recommendations to ensure consistency with local, state and federal regulators and other interests.

GOAL 2:

Assess the regulatory issues pertinent to beach management in order to improve overall beach conditions.

Objective 1

Ensure that local and state land use regulations protect natural resources in Saco Bay as well as reduce risks to property resulting from coastal storms.

Objective 2

Identify pertinent laws and regulations in order to alleviate existing land use conflicts in beach areas.

Objective 3

Develop more flexible land use laws and rules in beach and dune areas in order to recognize the unique character of each beach within the Saco Bay region.

GOAL 3:

Identify and assess the geological processes occurring in Saco Bay.

Objective 1

Determine the amount and flow of sand within the Saco Bay region and the relationships to engineering structures and beaches.

Objective 2

Develop short- and long-term erosion abatement plans that are regionally derived and driven.

GOAL 4:

Identify and assess wildlife needs in beach areas of Saco Bay.

Objective 1

Ensure adequate habitat for wildlife populations, especially endangered or threatened species.

GOAL 5:

Assess and measure the economic impact of beaches in southern Maine.

Objective 1

Determine the number of visitors to Saco Bay's beaches, the income derived from visits, and both market and non-market values of the natural resources visited.

GOAL 6:

Identify and assess public access to beaches in southern Maine.

Objective 1

Maintain and enhance public access to beaches within the Saco Bay region.

GOAL 7:

Identify and promote educational needs relating to Saco Bay and possible programs to educate citizens about the bay and the need to monitor beach areas.

Objective 1

Promote active participation in volunteer, community-based beach monitoring and outreach.

E. NATURAL RESOURCES INVENTORY FOR SACO BAY

2.1 The Systems Approach

The Saco Bay system is a diverse marine, estuarine, freshwater and coastal wetland environment that is unique to southern Maine, providing habitat for several fish and wildlife species. In addition, the bay includes coastal habitat areas for terrestrial and marine species that are of both regional and national significance. The interconnectedness of the natural systems within the bay is truly regional in scope, and includes the coastal municipalities of Biddeford, Saco, Old Orchard Beach and Scarborough. The freshwaters that drain into the bay--first estuarine and eventually marine waters--cross political boundaries in several geographic areas. These cross-jurisdictional watersheds are an important component of the regional planning process for beach areas in southern Maine, as they help define critical habitat areas. Biddeford is not currently involved with beach planning efforts in Saco Bay, but their eventual participation would solidify regional beach planning activities. See the map in Appendix C for a visual depiction of the scope and nature of the region's watershed boundaries.

Since each of the municipalities within the Saco Bay system contains unique natural resources, it is important to adequately inventory and analyze the currently existing natural resource base for the region. The focus of the inventory is on beach areas, but also includes some inland resources due to the direct relationships between coastal and inland natural resources.

Saco Bay includes the largest sand beach system in the state of Maine. The ribbon of sand stretches from Hills Beach in Biddeford at the southern end of the system to Western Beach at Prouts Neck in Scarborough at the northern end, a distance of roughly 9.5 miles. The volume of sand within this belt of beach currently is 42 million cubic yards in the shoreface and 17 million cubic yards beneath the beach and dunes (Kelley et. al., 1995). The Saco River is the main source of sand to the bay, providing an estimated 8,000 to 12,000 cubic yards of sand to the bay each year (Kelley et. al. 1995)

Natural Resources in Saco Bay Beach Areas

The following natural resource inventory for each municipality in the system is represented in order of south to north, beginning with Saco in the South and ending with Scarborough in the north. The information in this inventory was gathered primarily from comprehensive plans as developed by each community under Maine's Comprehensive Planning and Land Use Regulation Act.

It is important to recognize the classification standards for waters within in Maine when assessing beach areas. Of particular interest to beach management planning are the classification standards used by DEP to rank fresh surface waters and estuarine/marine

waters, as identified in title 38 of the Maine Revised Statutes Annotated (M.R.S.A.), sections 465 and 465-B.

Fresh surface waters are classified by DEP according to four categories: AA, A, B, and C. Waters identified as AA are free-flowing waters that are in their natural state and no discharges of pollutants are allowed. Each of the subsequent classifications recognize the allowed uses such as fishing recreation, industrial process and cooling water supply, power generation, etc. Also, each classification from AA to C allow a lower level of dissolved oxygen content and a higher level of E. Coli bacteria from human origin, with some pollutant discharge allowed.

Marine and Estuarine waters are classified by DEP according to three categories: SA, SB and SC. Waters identified as SA are natural and free flowing and no direct discharge of pollutants is allowed. Again, each of the subsequent classification recognizes allowable activities such as recreation, fishing, shellfishing, etc. SA and SB waters, respectively, allow lower levels of dissolved oxygen and higher levels of E. Coli bacteria and other bacteria, with some pollutant discharge allowed.

2.2 Saco

2.2.1 Coastal Marine Landforms - Supratidal

Supratidal areas consist of environments immediately above the tide line. Dunes and vegetated strips, which in Saco lie between northern Ferry Beach and Kinney Shores total about 35 acres. Fresh-brackish areas are found in the Long and Short Pond areas and total less than 5 acres. Fresh-brackish marsh is found west of Long Pond and occupies less than 1 acre. There also is altered or man-made supratidal areas, including 20 acres in Ferry Beach/Camp Ellis and 20 acres in the northern part of Ferry Beach, Bay View and Kinney Shores. All of the man-made supratidal areas have displaced dune and beach-ridge systems.

2.2.3 Intertidal

Intertidal areas are found within the high and low tide lines. The Goosefare Brook area and its tributaries contain 50 acres of high salt marsh, with 55 acres of high salt marsh surrounding the Saco River. The intertidal areas also include less than 2 acres of salt pannes or ponds, which accumulate on the top of high salt marsh.

2.2.4 Beach Environments

The northern Camp Ellis area to the Goosefare Brook area consists of 35 acres of sand beach. Eagle Island off of Saco includes less than 1 acre of gravel beach, as well as 3

acres of boulder ramp. Ram Island, also off the coast of Saco, contains a small boulder ramp.

2.2.5 Mudflats

Saco has 55 acres of mudflats which are between Camp Ellis jetty and Goosefare Brook.

Rock ledges occupy about 15 acres, including around Eagle and Ram Islands.

Twenty acres of flood-tidal delta is found along the Saco River south of the first half of the rock jetty and Camp Ellis and west to Ferry Lane. There also are 2 acres of flood-tidal delta in the mouth of the Goosefare Brook.

Fifty-four acres of ebb-tidal delta are found seaward of the Camp Ellis jetty and 5 acres at the mouth of Goosefare Brook, between Ocean Park and Kinney Shores.

2.2.6 Subtidal

The subtidal areas contain very poorly sorted sand that is underlain by coarse glacial debris, ranging from 4-21 meters. There are two acres of subtidal environments seaward of Factory Island and another two to three acres between Chase Point and Glenmoven Circle.

Seaweed communities encompass 30 acres around Eagle Island, 20 acres around Ram Island and 5 to 10 acres on the ledges in between the two islands.

The upper shoreface area contains about 80 acres of sand that lies seaward of the beach and jetty. The upper shoreface is subjected to constant wave action. The lower shoreface, between the sand of the upper shoreface and the mud of the offshore environment, is only affected during storm events.

2.2.7 Estuarine Waters

The Saco River contains estuarine waters in a channel that is roughly 200 feet wide and grade from high to low salinity in a seaward direction. The Goosefare Brook also contains a similar estuarine channel.

2.2.8 Drainage Basins

Saco includes three major watershed areas. The Scarborough River and the Nonesuch River make up the Scarborough River watershed, flowing from south to north. A second watershed is the Goosefare Brook watershed, which lies between the Scarborough and Saco River watersheds. The Goosefare watershed flows southeast into Saco Bay at a point just north of Kinney Shores.

2.2.9 Marine Resources

Saco currently has an active fishing fleet consisting of 15-20 lobster boats, three draggers (groundfish and shrimp), and one gill-netter. The bulk of landings is lobster, with an average gross income of roughly \$50,000 per boat (personal communication with Don Abbot, Saco Harbormaster). The fishing fleet has continued to grow from about 5 boats in total in the early 1960's to 24 active boats in 1999.

2.3 OLD ORCHARD BEACH

2.3.1 Topography and Soils

Most of Old Orchard Beach is covered with marine sands and clays of the Presumpscot Formation. The depth of these marine deposits range from 20 to 100 feet. There are several areas of low depressions that have become swamp and tidal marsh. Old Orchard Beach's elevations range from sea level to 138 feet, making the entire town relatively low-lying.

The soils in Old Orchard Beach are not suited for on-site waste disposal due to their poorly developed characteristics. Most of the soils along the coast and in estuaries are from the Sulfilemists-Udipsaments Association. The Sulfihemists are located in tidal marshes and are deep, poorly drained organic deposits. The Udipsaments are relatively well drained and are formed from eolian (wind created) deposits that create stable dune areas.

2.3.2 Aquifers

One sand and gravel aquifer has been identified in Old Orchard Beach. This aquifer yields groundwater at a rate of 10 to 50 gallons per minute (gpm). Although there are several wells located in Old Orchard, the majority of water users obtain their water from the Biddeford and Saco Water Company.

2.3.3 Watersheds

Old Orchard Beach contains two major watersheds that drain into Saco Bay. Goosefare Brook watershed is located near the Saco town boundary and the Little River / Mill Brook is located in the northern section of town. All freshwater streams and tributaries that drain into tidewaters in Old Orchard are classified as class C waters by DEP.

All tidal waters in Old Orchard are classified as SB, except Goosefare Brook that is classified as SC. The only licensed wastewater discharge in the Goosefare Brook area is the town's sewer treatment facility.

2.3.4 Coastal Resources

The sand beach abuts dunes and vegetated beach ridges, as well as upper and lower shorefaces. There are several mussel bars located offshore of Old Orchard. Estuarine channels are found at Goosefare Brook and the Little River systems, including flood- and ebb-tidal deltas, high salt marsh and tidal-brackish and fresh-brackish marshes. Old Orchard boasts the largest amount of sand beach within the Saco Bay system, with 3.5 miles of sandy coastline.

2.3.5 Critical Areas

The state has identified four critical areas important for sustaining endangered or valuable plants. The endangered plants include creeping spike moss and butterfly weed. Two valuable tree species identified include midnight path tupelo and old growth white pine/hemlock.

The state has also identified coastal areas that are of significant state or national importance. These areas are identified as the entire Old Orchard Beach shoreline and the Goosefare Brook area from the coast to the Boston and Maine Railroad as being regionally significant. In addition the Little River Jones Brook marsh area was proposed as an area of local significance in the early 1990's.

MIFW has identified various wetlands and fisheries habitats in Old Orchard of high, medium, low, and unknown value.

Shorebird feeding and roosting areas are identified in Goosefare Brook and along the coastal areas adjacent to the Pier, Grand Beach, and Surfside.

2.4 SCARBOROUGH

2.4.1 Critical or Unique Habitat

The Scarborough River watershed is a major feature of the town and covers an area of 59 square miles. This area contains several locations that provide critical or unique habitat for rare species.

The parker's pipewort is a federally listed plant that is also considered a plant of "special concern" by the state. This species is found within the Nonesuch River watershed and resides below the high tide line in the intertidal zone. The Atlantic sedge is another

rare plant that is listed by the state as a threatened species. The juniper hybrid is on the state's "watch list" and is located in the Prouts Neck area. Also, luminous moss is on the state's list of unique natural plants and found in the Higgins Beach area.

There are two plant species that at one time inhabited areas of Scarborough but are now thought to be extinct. The salt marsh sedge and the stiff gentian were previously identified in the Nonesuch River and coastal watershed areas, respectively.

Both piping plovers and least terns are regular inhabitants of Scarborough's beach areas. These birds nest and feed in the Scarborough River and Scarborough Marsh, Pine Point Beach, and Western and Ferry Beaches.

2.4.2 Marine Wildlife Habitat

The MDIFW has identified three areas of marine wildlife habitat in Scarborough that are of national or state significance. Scarborough Marsh includes nesting willets and other shorebirds that use the marsh during annual migrations. Other areas of national and state significance with regard to wildlife habitat include areas around Prouts Neck and the section of coast from Scarboro Beach to Higgins Beach.

Areas of regionally significant marine wildlife habitat include the Scarborough shoreline of the Spurwink River and Shooting Rocks offshore of Scarboro Beach.

MDIFW owns and manages over 3,000 acres of Scarborough Marsh. U.S. Fish and Wildlife manages the federal Rachel Carson National Wildlife Refuge located along the Spurwink River and Higgins Creek.

2.4.3 Fisheries and Wetland Values

MDIFW has identified habitat value for fisheries and wetlands in Scarborough. Scarborough River, Jones Creek, Stuart Brook, Dunstan River, Mill Brook, Nonesuch River, Libby River, Stroudwater River, Red Brook and Spurwink River are all designated as important fisheries and wetland habitats. The Nonesuch River supports alewives, shad, smelt, sea-run brown trout and tomcod.

2.4.4 Shorebird Feeding and Roosting Areas

Shorebirds feed and roost (stop for rest) near the outlet of the Scarborough River where it flows into Saco Bay. There are also important sites at Pine Point, Higgins Beach and along the Spurwink River.

2.4.5 Coastal Dunes

Coastal dune systems, both frontal and back dunes, are located at Pine Point, Western Beach and Higgins Beach. While Pine Point is accreting due to sand that is transported from south to north in Saco Bay, Western and Higgins are both currently eroding.

2.4.6 Marine Resources

A historically important and productive shellfish bed known as Turner's Bar is located north of the landing at Ferry Beach. This resource has been degraded due to dredging activities in Scarborough Harbor over the years. In recent years this resource appears to be making a come back and may prove once again its potential as highly productive shellfish habitat.

The Scarborough Harbor bottom is generally medium to fine-grained sand that remains relatively unpolluted. The state's water quality classification system for marine waters indicates that the Scarborough River estuary is designated SB, meaning that water quality is relatively good but limited wastewater discharges are allowed.

The Prouts Neck Country Club is a relatively large undeveloped tract of privately held coastal land (133 acres) near the inlet to Scarborough Harbor, including a 1.5 mile stretch of sand at Western Beach.

2.4.7 Harvestable Marine Resources

Scarborough currently has active lobster and clam fisheries. Most of the lobster fishing is inshore, but some boats are outfitted for shrimping, groundfishing, scalloping or surf claming. Most fishing is seasonal (April to October) and most landings go to the Pine Point town landing. The number of commercial vessels in the harbor has nearly doubled between 1978 and 1991, totaling 64 vessels.

Claming has a deep-rooted history in Scarborough due to the large amount of clam flats located within the town. In 1972 the Scarborough River, where most of the productive flats are located, closed to "open" digging due to pollution, but remained open for depuration harvesting only. With reactivation of the Scarborough Shellfish Conservation Committee and creation of the Coastal Pollution Committee recently, several areas are currently opened to harvesting. Scarborough has 11 traditional clam digging areas.

The town of Scarborough routinely monitors water quality every two weeks as part of its shellfish management program. The Department of Marine Resources has identified 52 monitoring sites within the Nonesuch and Scarborough rivers, along the

shore to Goosefare Brook in Old Orchard Beach, and at Western and Ferry beaches in Scarborough. At least two point sources of pollution have been identified within Scarborough's shellfish areas. Both of these sources of pollution are the result of DEP-licensed Overboard Discharges (OVBD).

2.5 PIPING PLOVERS AND LEAST TERNS IN SACO BAY

The piping plover and least tern both use Saco Bay for nesting and feeding (see attached maps). While the piping plover currently nests on dunes and beaches in Saco Bay, the least tern was unsuccessful in nesting attempts in Saco Bay during the most recent breeding season (1999). However, historical nesting sites for least terns are previously recorded for Saco Bay. The bay's beaches offer excellent habitat for these species because of their desire to nest on open, sandy beach areas that are devoid of heavy vegetation. Unfortunately, this habitat is also prime recreational space for summer tourists and residents alike. However, with proper management, including education outreach to beachgoers, these two species can share beach resources with human recreational needs.

These species of plovers and terns are listed as endangered under Maine's Endangered Species Program. Endangered status means that the population trend for the species has decreased to levels that could eventually lead to extinction. Due to difficulties with adequate reproduction rates as well as the loss of habitat over the years, the Maine Department of Inland Fisheries and Wildlife (MDIFW) considers the species in need of special status in order to assist with nesting productivity.

These particular species, however, are not considered to be at risk of extinction according to the federal US Fish and Wildlife Service (USFWS), who lists piping plover as threatened and provides no designation for least terns. The threatened classification is less severe than the endangered classification, and extinction is less likely than for an endangered species. It is important to note that the USFWS considers the status of species based on nationwide populations, so this may account for the lower classification at the federal level. Since Maine's beaches are at the northern edge of the species habitat ranges, reduced productivity in terms of breeding pairs of birds should be assessed in relation to natural fluctuations in productivity levels.

2.5.1 Bird Populations

A majority of plovers and terns that nest in Maine use the southern beach areas to raise their young. Areas of nesting activity in Saco Bay include Biddeford, Saco, Old Orchard Beach and Scarborough. Other piping plovers also nest further south in Wells Bay and further north in the Phippsburg/Georgetown area.

The most recent nesting statistics for the entire state, compiled by Maine Audubon Society, indicate an increase for nesting pairs of plovers of 25 percent between 1997 and 1998, increasing from 48 to 60 pairs (about 200 pairs nest in the Canadian Maritimes). Nesting least terns appear to have had a less successful breeding season for 1998. The state's total least tern population increased from 50 nesting pairs to 80 pairs between 1997 and 1998, according to Maine Audubon's newsletter (Summer 1998). According to IF&W, however, tern productivity dropped to .14 young per pair, which is the fourth lowest drop in productivity in the last 22 years.

The Audubon Society's newsletter (Summer 1998) also records the 1998 piping plover population in Saco Bay at 3 active pairs at Fortunes Rock Beach in Biddeford and 1 active pair at Goosefare Brook in Saco. Scarborough has the greatest density number of active nests in Saco Bay, with 1 pair at Western Beach, 3 pairs at Scarborough Beach.

The total number of piping plover chicks recorded during volunteer monitoring in Saco Bay for 1998 was 10 (MAS, Summer 1998 newsletter). However, there are two nesting locations in Scarborough in which the number of chicks for 1998 remains unknown, and two locations, one in Old Orchard Beach and one in Pine Point, Scarborough, that recorded no chicks during 1998. Of the total number of chicks counted, 7 grew to become fledglings capable of flying. Again, the total fledgling count for Saco Bay includes no fledglings counted for the same two locations in Old Orchard Beach and Pine Point mentioned above.

In terms of beach management planning for Saco Bay, it is important to note that some plover pairs have to make multiple attempts to nest during the same season. The reasons for multiple nesting range from placement of nests too close to the tide line to invasion from other bird species to being flushed by human or dog activity on the beach. Therefore, these obstacles to successful nesting attempts must be considering when assessing the adequacy of bird habitat in coastal beach and dune areas.

2.5.2 Managing birds with humans and other wildlife

Piping plovers and least terns both use the beach to rear their young. The bulk of nesting occurs during the months of April and May, but nesting may continue well into the summer months if initial nesting attempts are unsuccessful (Atlantic Coast Population, Revised Recovery Plan, USFWS) Although plovers and terns both utilize beaches for nesting, each has slightly different nesting requirements. Plovers prefer sparsely vegetated sand dunes, sand spits or sand flats. Least terns, on the other hand, prefer to nest in barren sand spit areas. The terns' preferred nesting habitat makes them particular vulnerable to human interaction, domestic animals and other wild predators such as raccoons, foxes and grackles, among others.

Despite pressure from identified threats to bird nesting areas, plovers and terns can exist on southern Maine's beaches. The Maine Audubon Society, the MDIFW and the USFWS provide varied levels of protection for plovers and terns. In addition, the Nature Conservancy, Bureau of Parks and Recreation within the Maine Department of Conservation, and local coastal municipalities have participated in past efforts to protect plovers and terns (MAS, Summer 1998 newsletter).

The Audubon Society has been helping to protect plovers and terns in Maine since 1977, providing fencing and signage to protect birds from human activities and domestic and wild predators. Historically, Maine had more than 30 miles of beaches suitable for nesting plovers and terns (MAS information sheet). As a result of development over the last 50 years, however, Maine Audubon estimates that only about 9 miles of suitable nesting habitat remains in Maine. The Society also estimates that more than 200 pairs of piping plovers and 1,200 pairs of least terns may have utilized Maine's beaches for nesting and feeding habitat prior to World War II (MAS information sheet).

From a historical perspective, piping plover productivity has recovered from 6 nesting pairs in 1983 to over 60 pairs in 1998 (MAS, Summer 1998 newsletter and information sheet). Least terns, on the other hand, have declined in productivity, from 125 pairs with 114 fledglings in 1993 to a low of 80 pairs in 1998 (MAS, Summer 1998 newsletter and information sheet).

The MDIFW has designated essential habitat areas for piping plover and least terns. In 1988 the Maine Endangered Species Act was amended to address habitat loss, human intrusion and predation. As a result of the legislation, the commissioner of IF&W has the authority to designate "essential habitat" that will aid in the protection of endangered or threatened species. Essential habitat is defined as follows: "Essential Habitats are defined as areas currently or historically providing physical or biological features essential to the conservation of an Endangered or Threatened Species in Maine, and which may require special management considerations." Furthermore, the Act reads that "the Maine Endangered Species Act requires that no state agency or municipal government may permit, license, fund or carry out projects that would significantly alter the habitat or violate protection guidelines adopted for the habitat."

Designated Essential Habitat in Saco Bay includes dune areas at Fortune Rocks Beach in Biddeford, the Goosefare Brook area in Saco and Old Orchard Beach, and Pine Point and Western Beach in Scarborough.

USFWS habitat includes areas from Camp Ellis in Saco to Western beach in Scarborough. The federal designations were made as part of the Gulf of Maine Project, and identify *actual* and *potential* nesting and feeding areas for plovers and terns. These habitat designations cover more length of beach and dune than the Essential Habitat areas designated by the state (see maps in Appendix D).

Least terns are at the northern edge of their range in Maine and not listed federally as threatened or endangered. They prefer the sandy spits of land that jut out into the ocean usually at the mouth of an estuarine river. These habitats have historically been limited in Maine. Least terns have been declining all along the Atlantic coast mostly due to habitat loss. Piping plovers are federally listed as threatened, which means they are “likely to become endangered within the foreseeable future” (MAS personal communication).

2.6 Shellfish Resources in Saco Bay

There are three types of shellfish of recreational or commercial value in Saco Bay—soft-shell clams, surf clams and ocean quahogs. Each of these resources inhabits three distinctly different marine habitats in the bay. The soft-shelled clam is found in shallow mudflats within the ebb and flow of the tide. Surf clams are found in sandy areas just below the low tide line. Ocean quahogs, as the name implies, are found further offshore in deeper waters of the bay.

Although it is difficult to place a value on the shellfish resources in Saco Bay due to limited data collection, the Maine Department of Marine Resources (DMR) does provide statewide landing statistics for soft-shell clams. Total statewide landings for 1997 and 1998 were roughly 7.4 million pounds and 10.3 million pounds respectively. This represents an increase of roughly 40% between 1997 and 1998. The total landings for York County for 1997 and 1998 were 77,000 and 49,000 pounds respectively, a reduction of 55%.

Within York County, Biddeford recorded 3,300 and 17,000 pounds for 1997 and 1998, and Old Orchard Beach recorded 2,200 and 0 for the same years. In Scarborough, which is part of Cumberland County, the landings are considerably higher than Biddeford and Old Orchard Beach. Scarborough’s soft-shell clam landings for 1997 and 1998 are 478,000 and 382,000 pounds respectively, representing a drop of slightly over 25% between years.

2.6.1 Shellfishing areas in Saco Bay

Shellfish areas in Maine are classified for harvesting by DMR. In Saco Bay there are currently three classifications for shellfish harvesting, including open approved, closed prohibited and open conditional restriction.

Soft-shell clams are fished in the Hills Beach area, Biddeford Pool and the Scarborough River. The area off of Hills beach is classified by DMR as closed prohibited and no harvesting is currently allowed due to local point sources of pollution. The Pool is classified as open conditional restriction, indicating that only depuration harvesting is allowed. Depuration harvesting removes the clams from the pollution source and allows

them to be “cleansed” under pollution free conditions, usually in depuration tanks designed specifically for the task. The Scarborough River includes commercial soft-shelled clam harvests (this area also includes commercial quantities of mussels, with occasional quahog and flat oyster potential). At the time of writing, much of the main river is classified as open approved; however, two areas in the upper reaches of the tributaries that drain into the river are open with conditional restrictions.

Water quality monitoring sampling is undertaken in Scarborough on a regular basis. Under current DMR guidelines, water quality sampling is required at least six times per year. The Scarborough harbormaster, in conjunction with the Scarborough Shellfish Management Committee, provides water samples at 22 locations during summer months and 17 locations during winter months. Each of these sites is sampled at least every month and sometimes more often when needed to assess area closures after heavy rainfall events.

There are, however, two remaining sources of point source pollution within the Scarborough estuary. Both of these sources of pollution are licensed DEP overboard discharge systems. One remaining source of point source pollution is a commercial facility on US Route 1 at the head of the estuary. This discharge system has not been identified as an immediate concern since it is not located in an area of high shellfish productivity (personal communication, Scarborough Harbormaster). The other overboard discharge is a residential system that has diminished water quality in productive shellfish habitat. The Town of Scarborough and the DEP is currently negotiating a settlement with the landowner to eliminate point source pollution to this part of the estuary (personal communication, Scarborough Harbormaster).

Surf clams are harvested from roughly from Ferry Beach in Saco to Ocean Park in Old Orchard Beach. Recreational surf clam harvesting is often done by hand digging, while commercial harvesting is accomplished with small vessels using mesh draggers. At the time of this writing, much of the surf clam habitat in Saco Bay is currently open to harvesting. The area between the Old Orchard Beach pier and Prouts Neck is classified as open approved, as is the area between Camp Ellis and Goosefare Brook. The area between Goosefare Brook and the Old Orchard Beach pier, however, is classified as closed prohibited.

Ocean Quahogs are harvested in the deeper waters of the bay out to Stratton Island. Commercial harvesters drag the bottom for quahogs. Currently DMR classifies all ocean quahog habitat in Saco Bay as closed prohibited. The closed area is outlined by Prouts Neck to Stratton Island to Biddeford Pool.

2.6.2 Areas closed to harvesting

The areas closed to shellfish harvesting—Old Orchard Beach to Goosefare Brook and Camp Ellis to Biddeford Pool are closed due to high levels of fecal coliform resulting from sewage treatment plant outfalls. There are three municipal sewage treatment plants—

Old Orchard, Saco and Biddeford—which discharge effluents into Saco Bay. Another source of pollution is the University of New England sewage treatment plant.

The mudflats off Hills Beach and the flats within Biddeford Pool are currently opened for depuration harvesting only. Although the Pool has a municipal sewage treatment facility within its borders, the facility is designed to pump all effluent well out into Saco Bay. The apparent source of pollution in the Pool, however, is from poorly situated septic systems bordering the area.

2.6.3 Beach management impacts on shellfish resources

Impacts from beach management recommendations developed in the plan for Saco Bay could affect shellfish resources within Saco Bay. In particular, dredging bottom sediments and nourishing beaches with sand could create disturbances that lower the productivity of shellfish growing areas. Disturbances to bottom sediments can destroy shellfish habitat as well as dislodge shellfish and kill shellfish within the sediments that are dredged. Also of concern is the suspension of sediments in the water column resulting from dredging activities. Suspended materials can reduce the productivity of shellfish habitat due to the fact that shellfish are filter feeders and they require adequate water flow in order to feed and flush wastes.

Any proposed dredging or beach nourishment in the Saco Bay region should include review by DMR and local shellfish committees and/or harbormasters so that a thorough shellfish impact assessment can be performed.

NATURAL RESOURCES -- Recommendations

2.7 Recommendations

- 2.1a) **Policy:** Improve state and local capacity to manage natural resources within beach areas of Saco Bay

Action: Promote volunteer beach, wildlife and water quality monitoring by local residents with technical assistance from DEP, MIFW, MCP and MGS

There are three types of monitoring that are particularly pertinent to beach planning. The first is beach profile monitoring which records the movement of sand within the beachface in order to understand sand erosion and accretion rates. This type of monitoring records the vertical profile of beaches over time, and is currently underway in the Bay View area of Saco, where volunteers have been collecting data on a bimonthly basis. The Maine Geological Survey is offering a three-year beach profiling program for volunteers in southern Maine beginning in the 1999 season, including beaches in Saco Bay.

The second type of monitoring of significant importance to beaches is water quality monitoring. This type of monitoring is currently undertaken in Saco Bay to measure the quality of water as it relates to shellfish resources in the bay, as DMR requires monitoring to ensure an adequate level of protection against contaminated shellfish. However, coastal beaches in Maine are not monitored on a regular basis to ensure against the potential health effects on recreational beach users. Proposed legislation at the federal level is attempting to develop a program for monitoring water quality at federally owned or managed beaches.

The third type of monitoring identified as useful to overall beach management efforts is wildlife monitoring. IF&W, in conjunction with Maine Audubon Society, provides opportunities for volunteer monitoring to identify and record piping plover and least tern nesting activities.

Implemented by: local land trusts, conservation commissions and local schools

Cost: \$15,000

Possible Funding: (1) Gulf of Maine Council on the Marine Environment grants; (2) Maine State Planning Office Shore Stewards grants; (3) Federal Environmental Protection Agency watershed protection grants

- 2.1b) **Policy:** Recognize the importance of Saco Bay's natural resource base in conjunction with cultural and economic considerations

Action: Increase public awareness of the link between coastal resources and local culture and jobs by establishing a speaker's bureau of beachfront businesses, local residents, public officials, fishermen, etc. to attend local events

Implemented by: Saco Bay Advisory Committee (see Sand Dune Regulation Recommendations section)

Cost: \$3,000

Possible Funding: (1) Gulf of Maine Council on the Marine Environment grants; (2) Maine Coastal Program Shore Stewards grants

- 2.1c) **Policy:** Develop a system for ranking ecological importance of coastal resources in Saco Bay in order to promote conservation/preservation of coastal areas

Action: Identify local terrestrial and marine wildlife habitat needs in coastal areas with assistance from IF&W, DMR and SPO and rank them according to productivity and threats

This recommendation could include an assessment of significant fish and wildlife habitat areas in the Saco Bay region based on state-designated "essential habitat" locations and other publications produced by IF&W, DMR and SPO that identify other sensitive habitat areas. The analysis should include completion of GIS-based data of land uses and natural resource bases in Saco Bay. The database should consider land ownership by parcel, conservation and open space areas, historical trends of building permits and existing development, critical habitat area for fish and wildlife species.(this assessment should also include shoreline erosion rates; see recommendation 2.1a under Geological Processes section).

Implemented by: IF&W, DMR and SMRPC

Cost: \$20,000

Possible Funding: Maine Office of Geographic Information Systems

- 2.1d) **Policy:** Identify methods to enhance local, state and federal efforts to protect piping plovers and least terns

Action: Promote the development of a cooperative agreement to manage bird habitat for nesting, feeding and rearing young in Saco Bay

This recommendation should be modeled on the recent (July, 1999) agreement developed by the Town of Wells titled "A Cooperative Beach Management Agreement For Wells Beach and Drakes Island Beach." This document provides a

comprehensive, consensus-based approach to ensuring adequate usable habitat for bird nesting, feeding and roosting in Saco Bay.

The plan to manage bird habitat in Wells was developed under cooperative agreement between local associations, municipal representatives, and local, state, federal and non-profit environmental interests. This model offers the opportunity to develop a similar plan for managing bird habitat in Saco Bay, incorporating issues identified by the Saco Bay Planning Committee. The following topics are addressed:

- Beach infrastructure and maintenance
- Recreational activities
- Beach restoration, nourishment and maintenance
- Erosion control, dune creation, sand fencing, beach grass planting
- Public access
- State regulation
- Education and outreach
- monitoring

Due to the fact that roughly 94% of Maine's coastline is under private ownership, and many beachfront property owners reside out of state much of the year, nesting piping plovers and least terns are often at risk from threats by humans, pets and other wildlife because wildlife managers lack the necessary access to private property. Once a bird has nested on private property and is exposed to threats, wildlife managers often times find it difficult to contact property owners and obtain permission to assist nesting birds in a manner that is timely enough to save the birds.

The Planning Committee is particularly interested in two specific aspects of bird habitat management in Saco Bay. First, the Committee has identified the need to improve access for wildlife managers (i.e., Maine Audubon Society and IF&W) to private beach areas with nesting birds. The purpose of this effort is to increase the survival rate of nesting birds on private property throughout the bay. Second, the Committee has recognized the need to better control dog activity on beaches. Dogs often roam beach areas and disturb nesting birds. The Committee suggests that a leash law between the months of April and August would assist with diminishing the threat from dogs. These months represent the most productive bird nesting activity in Saco Bay.

Improved access to private land would require the establishment of guidelines for wildlife managers, volunteer monitors and citizens to assist with the implementation of necessary precautionary methods to ensure survival of birds nesting on private property in the Saco Bay region. Generally, such methods include "exclosure" of the immediate vicinity with temporary fencing to remove the threat of intrusion from pets, predators or humans. Under most circumstances a small amount of property would be protected for a limited amount of time (until the birds fledge from the nest).

Implemented by: Municipal planners from each community in Saco Bay

Cost: \$5,000

Possible Funding: Municipal governments in Saco Bay

2.1e) **Policy:** Increase the amount of acreage available for shellfish harvesting

Action: Increase volunteer water quality monitoring by local residents in shellfish growing areas with technical assistance from DMR, SPO, local land trusts and conservation commissions

Action: Remove pollution sources that threaten water quality in shellfish areas such as overboard discharges of sewage waste and eutrication (oxygen depletion) from excessive fertilization

Implemented by: conservation commissions and shellfish management committees

Cost: \$3,000

Possible Funding: (1)DEP Overboard Discharge Grant Program; (2) Maine Coastal Program Shore Stewards Program

2.1f) **Policy:** Establish a focused local presence in the Saco Bay region

Action: Establish a part-time baykeeper position to monitor activities in the region

This position could rotate every two years among each of the municipalities in Saco Bay. The position would be an appointment by the Saco Bay Advisory Committee. The baykeeper would monitor activities related to beach activities, including but not limited to point and nonpoint sources of pollution, wildlife habitat, sand dune development, and erosion and accretion of sand resources. These activities would be monitored as part of the every day work of an individual who works on the waters of Saco Bay on a regular basis. A fisher based in Scarborough or Saco is an example of a possible candidate for the position.

Implemented by: Saco Bay Advisory Committee

Cost: \$3000 annual stipend

Possible Funding: Saco Bay municipalities

F. GEOLOGICAL PROCESSES IN SACO BAY

The complex geological nature of the Saco Bay system coupled with the historical human alterations of coastal areas in the bay has produced a tremendous amount of study over the years. The most recent study, by Kelley et. al. (1995), *A Sand Budget For Saco Bay, Maine*, references twenty-five geological studies of the bay.

The earliest study dates back to a U.S. Army Corps of Engineers survey report done in 1886. The Corps' involvement with the geological processes in Saco Bay has been extensive up until their most recent "Section 111" feasibility study in 1992, which aimed to weigh the costs and benefits of removing or modifying the north jetty at the mouth of the Saco River. A 1979 study by Moreau offers an assessment of beach processes in Saco Bay, as well as possible management alternatives. Numerous other government and academic studies have focused on the geological processes that shape Saco Bay.

Since the bay has been studied extensively and much is known about the geological processes that affect the movement of sand within the system as a whole, this section of the regional beach management plan addresses the coastal geology issues that are known. In addition, this section attempts to frame the questions that remain to be answered.

3.1 How is Saco Bay defined?

Geologists at the Maine Geological Survey (MGS) for the specific purpose of improving the management of sand beaches in southern Maine previously defined Saco bay's regional parameters regarding geological delineation. The bay's natural rocky headlands, Fletchers Neck in the south and Prouts Neck in the north, clearly define the borders of the system from a geological perspective. The sand movement within these two headlands is greatly controlled by the existing landforms at either end of the system. Although not a closed system due to the addition of sediments that flow down the Saco River and into the bay, Saco Bay does not appear to be gaining sediments from sources outside the bay.

The sections of beach which lie between the south and north landform constraints mentioned above are located within four coastal municipalities which border the bay. The municipalities, from south to north, are Biddeford, Saco, Old Orchard Beach, and Scarborough.

3.2 What is the major source of sediment to Saco Bay?

A central issue of debate regarding the impact of the north jetty on the sediment supply of Saco Bay's beaches focuses on the origin and movement of sediment within the

system. The following question is central to the debate: Does the Saco River supply large amounts of sediment to the Saco Bay beaches or is it derived from glacial deposits offshore? And if the sediment is derived from the river, is the 6,630 -foot jetty on the north side of the mouth of the Saco River acting as a barrier to new sediment supply to the beach system?

The Army Corps contends that the sediment that feeds beaches along the bay is derived from glacial sand deposits, as opposed to the sediments flowing down the Saco River (Kelly et. al., 1995). These glacial sand deposits, according to the Corps, are located in the center of the bay and make their way landward toward the shore where local currents move sediment to the south towards Biddeford and north towards Scarborough. Thus, based on these findings, the Corps' contends that the north jetty at the entrance to the Saco River is not responsible for the accelerated erosion at Camp Ellis since the sand is derived offshore.

According to more modern studies performed by geologists from MGS, the source of sand to the Saco Bay System is not offshore glacial deposits but rather the sediments which travel down the Saco River and eventually into the bay (Kelley et. al., 1995). This finding is based on a recent discovery, resulting from technology advancements, which indicates that the glacial sediment deposits offshore in the bay are in fact much less extensive than previous studies indicated. In addition, the recent findings not only show that offshore glacial sediments are less than previously thought, but also that the upper and lower layers of the deposits contain fluvial sediments characteristic of sediments derived from the Saco River. Furthermore, recent studies indicate that the predominant shoreline currents flow from south to north, moving sediments from the Camp Ellis area to Pine Point. The type of sediment that is currently accreting in the Pine Point area is more closely aligned with the sand found on the shoreface near Camp Ellis than the glacial deposits found offshore (Kelley et. al., 1995).

3.3 How do beach systems function?

Beaches, similar to numerous other natural systems, are constantly trying to attain a state of equilibrium. The sand within a beach system is very fluid, accreting and eroding on a relatively short time scale when compared to other geological processes. This natural system of sand movement is a seasonal phenomenon that generally creates steeper beaches in winter and returns them to a gentler slope in the summer, at least in New England. The reason for this seasonal variation is the occurrence of winter storms that remove sand from the beaches and the relatively fair weather in summer that allows the sand to be transported back up onto the beach face. Figure 1 depicts the components of a typical beach profile.

Figure 1

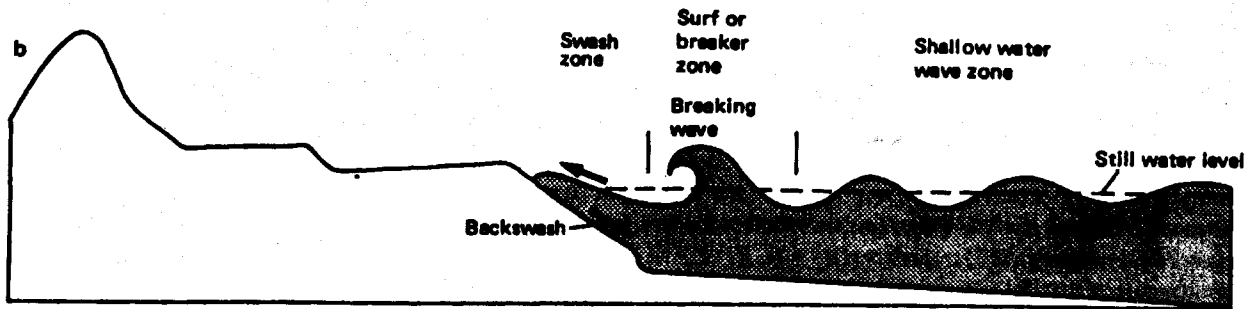
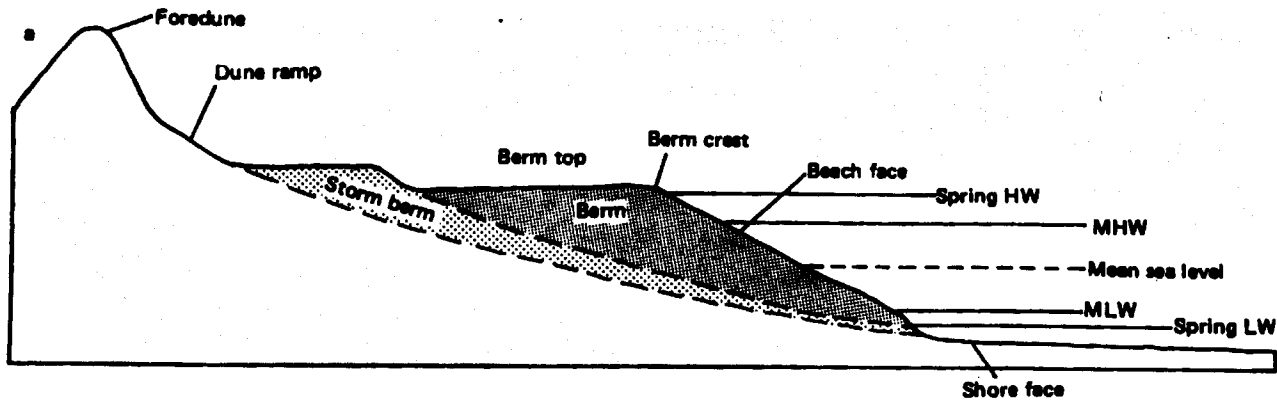


Figure 1

Source: Cain and Boothroyd, 1983

a) Beach and shoreface terminology. b) Wave and swash zones.

In reaction to rising sea-level (see section below) or increased storm activities, beaches will in fact migrate inland in order to maintain a constant state of equilibrium. But before beaches begin to migrate, the dune system must be breached. The natural sand dunes accumulate inland of the shorefront and act as a natural seawall, taking the impact of waves that make their way over the face of the beach.

It is this dune system that is crucial to regional beach management planning activities in Saco Bay. Without adequate dunes to protect the land and man-made structures inland of the immediate beach area, there will always be issues of erosion and flooding in the back dunes directly behind the frontal dunes. Studies and observation

indicate that man-made fortifications such as riprap and seawalls often *increase* a beach's rate of erosion (Kelley, 1989).

3.4 What are the beach management issues in each town?

3.4.1 Biddeford

The City of Biddeford has opted not to participate in the regional beach management process and therefore specific beach management issues in this geographic area are not addressed in this planning process.

3.4.2 Saco

3.4.2.1 Camp Ellis

The City of Saco has a considerable vested interest in the management of beach resources in the Saco Bay region. The City has been losing land mass in the vicinity of the Camp Ellis area, which is immediately adjacent to the north jetty at the mouth of the Saco River (see Appendix A). Repeated attempts to mitigate the impacts of years of severe coastal erosion in this area have had limited success, with each winter storm continuing to erode the shorefront at an accelerated rate.

The frontal dunes in the Camp Ellis area are heavily developed with residential housing. Coastal sand dune maps, created by MGS in 1990 and used by DEP for regulatory purposes, in the Camp Ellis area indicate at least 40 buildings on the frontal dunes. Several houses in this area have been lost to erosion caused by storms. The Camp Ellis Beach Erosion Study Committee (1997) estimates that 33 homes have been destroyed in the area since 1968 (See Appendix E).

Addressing the Camp Ellis erosion problem is a critical need in the overall beach management strategies for the entire Saco Bay system. Several prominent coastal geologists have demonstrated through numerous studies that the north jetty at the mouth of the Saco River is in fact responsible for the accelerated rate of erosion at Camp Ellis, and that modification of the jetty may reduce the rate of erosion in the southern end of Saco Bay (Moreau, 1979; Kelley, et al, 1995).

MGS has estimated that the Camp Ellis area would require at least an additional 6,000 cubic yards of sand per year added to the beach to stabilize the area (personal communication, MGS). MGS estimates that the total sand loss from the Camp Ellis area is 12,000 cubic yards per year. Since the Army Corps places roughly 6,000 cubic yards of sand on the beach in Camp Ellis each year on average from the Saco River, this indicates a net loss of 6,000 cubic yards. MGS has indicated that replacing the 12,000 cubic yards of

sand lost to erosion in Camp Ellis each year would help balance the sand resource so that no net loss results.

3.4.2.2 Ferry Beach/Bay View

The beach and dunes near Ferry Beach do not experience the same degree of erosion as occurs in Camp Ellis. Dunes in this area are relatively intact and in their natural state. Development in the dunes along this stretch of beach is mostly in the less intrusive back dune areas, as opposed to frontal dunes. Also, the presence of Ferry Beach State Park has limited access for development in this area. Coastal sand dune maps show only two structures in the frontal dune in this entire area.

3.4.2.3 Kinney Shores

Unlike the southern half of the stretch of beach between Camp Ellis and Goosefare Brook, the frontal dunes in the northern portion of the beach at Kinney Shores are well developed with several residential houses very close to the shoreline. Roughly 34 structures are located in the frontal dune in this area.

3.4.4 Old Orchard Beach

The beaches in Old Orchard Beach are currently relatively stable. The beaches are relatively wide when compared to other beaches in Saco Bay. Sand moving from south to north is uninhibited by natural geological landforms or man-made engineering structures, allowing sand transport to flow naturally with the shoreline currents.

The Ocean Park area immediately north of Goosefare Brook is a wide stretch of frontal dune that has about a dozen structures within it. Between Ocean Park and Old Orchard Beach almost all of the development is in the back dunes, with just a few structures partially in the frontal dune.

The area beginning at the Pier in Old Orchard Beach and extending northward to Grand Beach has the most structures in the frontal dune of any beach area in all of Saco Bay. Over eighty structures are within the frontal dunes, some of them large residential condominiums.

The stretch of beach from Grand Beach to the Scarborough River, including Pine Point in Scarborough, has most of its structures in the back dune areas, with about fifteen structures either wholly or partially in the frontal dunes.

Old Orchard Beach has experienced great success re-vegetating frontal dunes within its beach areas. Dune management plans prepared in 1979 and updated in 1986 have been the controlling factor in dune restoration efforts. The planting of beach grass and the use of protected fencing, coupled with an awareness campaign focusing on the

value of a healthy dune system, has helped stabilize the beaches in Old Orchard Beach considerably.

3.4.4 Scarborough

The Pine Point area of Scarborough is the spit of sand that juts out into the Scarborough River inlet. This section of beach has greatly accreted in the past fifty years or so due to the northerly flow of sand up the coast of the bay. During the 1960's the Army Corps constructed the jetty that is currently in place at the mouth of the Scarborough River in order to maintain a channel for navigation. Dredge spoils from the construction were placed on Pine Point area and major residential growth followed in the 1970's (Kelley and others, 1989).

Ferry and Western beaches are the most northerly beaches in Saco Bay, occupying the area along the north shore of the Scarborough inlet. These two beaches are relatively undeveloped and contain about four structures that are either wholly or partially in the frontal dunes. Both Ferry and Western Beaches are experiencing erosion, and dune restoration projects have been undertaken in the area.

3.5 Sea-level Rise

3.5.1 What does "sea-level rise" actually mean?

The concept of sea-level rise refers to increased inundation of coastal areas due to rising oceans. In simple terms, there are two types of sea-level rise that need to be considered. Some predictions could cause catastrophic flooding of coastal areas in Maine while others would have a relatively minor impact on the state's beach communities.

The first consideration to understanding sea-level rise is the increase in ocean elevation that has been documented over the last fifty years for all municipalities in Saco Bay. Historic measurements of sea-level rise for Maine's coastal communities translates into about 8 in / century or .08 in / year (SPO and others, 1994), depending upon the category of coastline affected (e.g., sand, wetland, rock, etc.), as less permeable shorefronts generally are more resistant to rising tides.

The international scientific community that predicts accelerated sea-level rise bases the second, and much more controversial, sea-level rise predictions on studies. Accelerated sea-level rise predictions are based on global climate change associated with the so-called "greenhouse effect," which is a result of increased carbon dioxide levels from pollution created via human activities (e.g., autos and power producing facilities). An estimate by the Intergovernmental Panel of Climate Change predicted an average rise in sea level of 26 inches by the year 2100 (SPO and others, 1994). This estimate could

conceivably add a considerable degree of urgency to sea-level planning strategies in Maine.

3.5.2 What effect will sea-level rise have on Saco Bay beaches?

The report titled *Anticipatory Planning for Sea-Level Rise Along the Coast of Maine*, identifies possible sea-level rise scenarios for salt marshes, bluffs and sand beaches (SPO and others, 1994). These areas are the most vulnerable to the erosion from anticipated sea-level rise. In order to represent the difference of opinions accurately concerning the degree of rise, the SPO study has calculated projected shoreline erosion based on 1.5 ft, 3 ft and 6.5 ft scenarios. Table 4 illustrates the resultant amount of shoreline retreat for each category of land.

Table 4
Shoreline Retreat Due to Sea-Level Rise
By the year 2100

Sea-Level Rise	1.5 ft	3 ft	6.5 ft
Salt Marsh	10 – 115 ft.	26 – 164 ft.	56 – 328 ft.
Bluff	49 - 148	49 - 148	49 - 148
Beach	164 - 492	328 - 984	656 - 1968

SPO, 1994

As an example of the type of analysis most useful to assessing the impacts of sea-level rise, Appendix E shows the above scenario for the Camp Ellis area. The map was produced as part of the sea-level rise study undertaken by SPO and others, 1994.

3.6 Options for managing erosion / accretion in Saco Bay

The following four options were evaluated by the Saco Bay Planning Committee for managing the erosion and accretion of sand resources in Saco Bay. By participating in regional beach management planning activities, the municipalities in Saco Bay agree to support strategies that optimize the overall management of the bay. Figure 2 on the following page provides aerial photographs of identified sources of sand that are available for beach nourishment activities within the bay. The options identified below offer the opportunity to share dredging resources (i.e., hydraulic dredge) used to transport sand between towns within the bay. Option 1 is the preferred choice endorsed by the Planning

Committee for managing sand resources in Saco Bay. The remaining three options are listed according to priority as identified by the Planning Committee.

Option 1

Modification and/or partial removal of the jetty located at the north side of the entrance to the Saco River, as well as providing sand nourishment to stabilize Camp Ellis and Western Beach.

It is believed by the Saco Bay Planning Committee that this would greatly reduce erosion in the Camp Ellis area while at the same time provide an adequate supply of sand to the remaining beach areas in the bay. It also is estimated that the supply of sand now accreting in the Pine Point area would be reduced from current rates of accretion. This strategy might assist with reducing the amount of sand that currently fills the inlet to the Scarborough River, thus providing an additional benefit. However, the Camp Ellis area would require immediate sand nourishment and dune restoration to replace the large volume of material lost due to accelerated erosion over the years. Western Beach also should be considered for sand nourishment since this area is currently experiencing accelerated erosion. Any beach nourishment or dune restoration projects must include proper vegetation and fencing to assist with stabilization, as described by guidelines recommended by the Maine Geological Survey.

Modification of the northern jetty at Camp Ellis refers to either “roughing” the surface of the existing jetty, lowering the height of the jetty, removing a portion of the outer end of the jetty or some combination of all three strategies.

Roughing would involve reworking the stones at the shoreward end of the jetty so that some water and sediment during storm events could breach into the Saco River. Currently, the surface of the jetty is so tightly surfaced that it directs waves along the length of the jetty and accelerates erosion at the shoreline. This resurfaced area of the jetty was not part of the original structure and was added in 1968-69 in an attempt to reduce sediment overflow into the Saco River harbor and reduce the threat of a breach at the inshore end of the jetty (USACOE, 1992).

Lowering the height of the jetty would serve the same purpose as reworking stones, allowing waves and sediment to breach the jetty rather than attacking the shoreline. The height of the jetty at the shoreward end was modified by increasing the height from 15 ft. MLW (above mean low water) to 17 ft. MLW at the same time the resurfacing took place (USACOE, 1992). The Army Corps of Engineers raised the shoreward end of the jetty in an obvious attempt to eliminate sand overflow into the Saco River navigation channel. It is recommended that the height of this section of the jetty be reduced from 17 ft. MLW to 12 ft. MLW.

Figure 2
Sources of Sand Available for Beach Nourishment in Saco Bay

Finally, shortening the offshore end of the jetty would allow sand to migrate from the Saco River into Saco Bay, offering a natural replenishment of sand to the Camp Ellis area as well as the rest of the Bay. The jetty was lengthened by roughly 850 ft. in 1936-37, resulting in its current overall length of 6,630 feet (USACOE, 1992). This addition of material was intended to reduce shoaling at the entrance channel to the Saco River (USACOE, 1992). Removing roughly 1000 ft. of the offshore end of the jetty would provide an opportunity for sand to migrate from the river to the bay.

Figure 2
Sources of Sand Available for Beach Nourishment in Saco Bay

Source: Scarborough Harbormaster—Fall, 1999.

Top--Sand accumulation at the mouth of the Scarborough River off Pine Point.

Bottom—Accelerated erosion and potential borrow site adjacent to the Camp Ellis jetty in the Saco River.

Option 2

Accreted sediment in the lower reaches of the Saco River and along the harbor side of the jetty be transported to the north side of the jetty to nourish erosion at Camp Ellis. Also recommend sand nourishment from accreting areas of Pine Point to eroding area of Western Beach.

Regular transport of sand from the areas in the Saco River, and along the accreting side of the jetty, to the eroding side would assist with slowing accelerated erosion in Camp Ellis. Also regular transport of sand from Pine Point to Western Beach would balance the sand supply in the northern end of the bay.

Option 3

Sand from the Pine Point area be used to nourish the south end of the bay in the Camp Ellis area. Also recommend sand nourishment from accreting areas of Pine Point to eroding area of Western Beach.

This strategy would replace sand and sediment being lost in Camp Ellis and assumes that the jetty is unchanged from its present configuration. Since the Committee believes that the sand in Camp Ellis is routinely transported northward towards Pine Point, nourishment of the beach in this manner would simply replace lost sediments. Accretion in the Pine Point area, as well as for points in between possibly, would most likely be reduced. Western beach, as an eroding beach, should also be eligible for sand nourishment from Pine Point. This option would require a slow phase-in of sand nourishment efforts in order to determine an adequate equilibrium of sand that is reasonable and acceptable to all interests in the region.

Option 4

Erosion and accretion be left to nature's forces.

This approach to managing coastal areas would require a policy of retreat in areas subject to considerable rates of erosion, since coastal flooding and erosion during storm events would continue. Under the current scenario, assuming the Saco jetty remains intact, this would mean that Camp Ellis and Western Beach areas would continue to erode, most likely at accelerated rates. The area of accretion, Pine Point, would most likely continue to gain sand at the expense of Camp Ellis and other coastal communities in the southern end of the bay.

The Maine Department of Environmental Protection currently regulates sand dunes in an effort to reduce coastal hazard threats and reduce the impact of development on sand movement within coastal dune systems (see section G. Regulatory Considerations

in Saco Bay below). These regulations adopt a policy of retreat for eroding areas by restricting development activities in coastal dune areas and preventing rebuilding of structures badly damaged by coastal erosion. Although the Saco Bay Planning Committee does not currently support additional retreat strategies without further discussion, two voluntary options have been identified for eliminating or reducing the impact of erosion due to sea-level rise in the event that Option 1 proves to be inadequate.

One identified option is to retreat from the area to a reasonable extent away from the rising waters. There are two possible approaches to retreat from coastal areas prone to flooding and damage due to storms and sea-level rise. The first policy focuses on the removal of structures that are currently threatened by coastal erosion. This approach could include the buyout of properties that are likely to be damaged or destroyed within the next 50 years, for instance, by coastal processes. The second method addresses the problem from a long-term approach by slowly acquiring properties that are damaged beyond a certain percentage of market value or that submit repetitive damage claims to FEMA under the Federal Flood Insurance Program. The acquired properties under both scenarios should be based on a willing buyer / willing seller program. That is, property sellers would have to agree to sell their property to a buyer offering a competitive market value. The potential exists for municipal, state and federal governments, or some combination thereof, to develop a cooperative program to purchase threatened properties.

Another option is to improve the flood control measures for existing properties in the flood zone. One method of reducing the threats to properties already within the coastal flood zone is to redesign properties that are prone to damage using construction methods that reduce the chances of storm related damage from flood, wind and erosion hazards. This includes raising structures above potential flood elevations and moving them inland where possible; breakaway basement walls; and reinforced walls, roofs and foundations that can withstand the impact of high winds and flooding waters. The City of Saco has used funds granted by the Federal Emergency Management Agency under the Flood Mitigation program to reduce the impact to structures located in flood zones. To date, Saco has spent \$78,250 on four flood mitigation projects, including three structure elevations and one foundation rehabilitation (pers. communication with R. Roedner, Saco City Planner).

3.7 Cost Analysis for Beach Nourishment Dredging in Saco Bay

The options for nourishing beaches in Saco Bay are based on two determinations made by the Saco Bay Planning Committee. First, the amount of sand to be transported annually within the bay is 25,000 cubic yards, although the capacity to move additional sand in the future in other areas of southern Maine must be considered. Second, the period of time considered in each of the calculations includes the annual cost as well as cost projections over a ten-year period. In addition to the short- and long-term costs, the cost of each option for beach nourishment also is presented as a per cubic yard cost. However, as in any cost analysis, it is important to consider all factors in relation to the lowest per cubic yard of sand cost. For instance, some of the options offered provide limited usefulness in terms of transporting sand to other areas of southern Maine due to design inadequacies. Thus the figures in this cost analysis should be viewed in light of the Saco Bay Planning Committee's goals and objectives for the entire region.

Trucking sand from upland sources

The City of Saco has identified the following costs associated with trucking sand from an upland site to beaches in Saco Bay (Camp Ellis Beach Erosion Study Committee, 1997). The City currently owns three dump trucks, each with a 6-yard capacity. It is estimated that each truck could make 6 trips per day between the upland site and the beach. Therefore, this results in a total per day moving capacity of 108 cubic yards of sand. Under this scenario, this option would require roughly 231 days to complete.

The costs of labor and equipment to the city are \$55/ hr., or \$1155/day. Upland sand is estimated to cost \$7/cubic yard, resulting in a total sand cost of \$175,000.

Total Annual cost: \$441,805

10-year cost: \$4,418,050

Per cubic yard cost: \$17.67

Contract Dredging Using Traditional Equipment

Prock Marine, a local dredging contractor, has provided estimates of the costs associated with traditional bucket and scow dredging in Saco Bay. If sand is placed close enough to the beach to nourish the beach face, a 350 cubic yard capacity scow would be used to place sand in the intertidal zone. It is estimated that dredging 25,000 cubic yards would require four to six weeks of operations, excluding delays due to rough weather.

Moving sand from within a mile or so of the Camp Ellis jetty would cost between \$12-\$14/cubic yard, ranging from \$300,000 to \$350,000 annually. If sand is transported between Pine Point and Camp Ellis for instance, a distance of roughly 7 miles, the cost is estimated to be \$13.50-\$15.50/cubic yard. Under this scenario, moving sand from Pine Point would cost between \$337,500 and \$387,500 annually.

Total Annual cost:

Low-\$300,000-\$350,000

High-\$337,000-\$375,000

10-year cost:

Low- \$3,250,000

High- \$3,560,000

Per cubic yard cost:

Saco River jetty area-\$12-\$14

Pine Point area-\$13.50-\$15.50

Purchasing a Custom Hydraulic Dredge

The dredge purchase proposed by the Camp Ellis Beach Erosion Study Committee (1997) is a self-propelled hydraulic dredge with a sufficient capacity to transport at least 25,000 cubic yards of sand throughout Saco Bay each year. The proposed dredge's specifications are a 60ft. x 12 ft. seagoing barge with a 30-inch pipeline that could pump sand onto the beach in as little as 30 inches of water. Additionally, the dredge would have a nozzle for spraying sand onto the beach where needed.

The estimated purchase cost of a new vessel of this nature is roughly \$525,000 based on similar small dredges currently manufactured by dredge builders in the U.S., plus an additional \$6,000 for shipping. Although similar dredges are available in the \$300,000 - \$400,000 price ranges, they are not oceangoing vessels, as needed in Saco Bay and other possible sand dredge locations in southern Maine. Therefore, an oceangoing vessel with all the specifications necessary for efficient and economical dredging needs to be custom-designed by the manufacturer, increasing the purchase price. Additionally, the following estimated capital expenses and annual operating costs must be incorporated into the price:

Initial Capital Expenses:

Dredge	\$500,000
Pipeline 2000 ft @ \$8/ft	\$16,000
Discharge Hose	\$2,200
Shipping	\$6,000
Total capital costs:	\$524,200

Annual operating expenses:

Insurance	\$20,000
Salary and Benefits (two persons)	\$83,200
Maintenance	\$3,000
Fuel	\$10,000
Total operating expenses:	\$116,200

Annual cost: \$246,604 annual average (from table 4 above)

10-year cost: \$1,233,022 plus 5 additional annual payments of \$116,200 equaling \$581,000 for a total of \$1,814,022 over 10 years

Per cubic yard cost: \$9.86

Table 5

**Dredge Purchase Interest Payments
Total Amortized Over 5 Years @8%**

Year	Principal	Interest	Payment
Year 1	\$104,840.00	\$41,936.00	\$146,776.00
Year 2	\$104,840.00	\$33,549.00	138,389.00
Year 3	\$104,840.00	\$27,175.00	132,015.00
Year 4	\$104,840.00	\$16,775.00	121,615.00
Year 5	\$104,840.00	\$8,387.00	113,227.00
Total	\$524,200.00	\$127,822.00	\$652,022.00

Table 6

**Total Annual Dredging Payments
Including Annual Operating Expenses**

Year	Payment	Operating Expenses	Total
Year 1	\$146,776.00	\$116,200.00	\$262,976.00
Year 2	138,389.00	\$116,200.00	\$254,589.00
Year 3	132,015.00	\$116,200.00	\$248,215.00
Year 4	121,615.00	\$116,200.00	\$237,815.00
Year 5	113,227.00	\$116,200.00	\$229,427.00
Total	\$652,022.00	\$581,000.00	\$1,233,022.00

Leasing Dredge Equipment vs. Purchasing

It is important to note that dredging equipment currently available for lease is not oceangoing and unable to dredge any area of Saco Bay other than inside the Saco River at Camp Ellis. Therefore, leased dredging equipment would be limited in scope regarding additional dredging needs in Saco Bay or other beach areas in southern Maine.

The estimated cost for leasing the necessary dredge equipment averages roughly \$16,000 for 30 days of use, plus a \$12,000 annual, round-trip shipping fee. Based on an estimate of transporting 800 cubic yards per day (or 100 cubic yards per hour), it will take at least 31 dredging days to transport 20,000 cubic yards of sand over the jetty and onto the beach at Camp Ellis, equating to \$28,000 in leasing fees and shipping. Additionally, the leased equipment will require the same annual operating expenses as the purchased equipment, totaling \$128,200 each year, as well as the following initial capital expenses:

Initial capital expenses:

Pipeline 2000 ft @ \$8/ft	\$16,000
Discharge Hose	\$2,200
Total initial capital expenses	\$18,200

Annual operating expenses:

Insurance	\$20,000
Salary and Benefits (two persons)	\$83,200
Maintenance	\$3,000
Fuel	\$10,000
Shipping	\$12,000

Total operating expenses: \$128,200

Total Annual cost: \$146,400

10-year cost: \$1,464,000

Per cubic yard cost: \$5.86

GEOLOGICAL PROCESSES --Recommendations

3.8 Recommendations

3.1a) **Policy:** Develop methods for measuring erosion and accretion of sand resources

Action: Promote GIS-based mapping capabilities to assess erosion and accretion rates of sand dunes and beaches in southern Maine

Implemented by: MGS and Maine Office of Geographic Information Systems (see recommendation 1.1a in the Natural Resource Inventory section)

Cost: \$10,000

Possible Funding: MGS

3.1b) **Policy:** Recognize the impact of coastal engineering structures on the sand budget of Saco Bay

Action: Alter the existing jetty at Camp Ellis in order to reestablish a flow of sediment between the Saco River and the beaches of Saco Bay with oversight and assistance from the Army Corps, DMR, IF&W, DEP and the Camp Ellis Beach Erosion Study Committee

Specific actions include roughing the shoreward 1000 ft. of the jetty, lowering the inshore end of the jetty from 17 ft. MLW to 12 ft. MLW, and shortening the jetty on the seaward end by 1000 ft. These actions will assist with reestablishing a flow of sediment between the Saco River and the beaches of Saco Bay. Oversight and assistance from local, state and federal interests will ensure that stakeholders' concerns are met.

Implemented by: (1) Engineering study by private contractor
(2) Army Corps of Engineers to perform work determined by engineering study

Cost: \$200,000 for engineering study (best available estimate)
\$ 2,086,000 million for jetty modifications (based on USACOE section 111 study: \$475 / linear ft. for roughing and lowering; \$1345 / linear ft. for jetty removal; \$1,820,000 cost is inflated between 1992-1999 using the GDP deflator)

Possible Funding: (1) State of Maine/local governments—engineering study
(2) Army Corps of Engineers—jetty modifications

3.1c) **Policy:** Develop a regional beach nourishment strategy based on current and estimated future rates of erosion and accretion

Action: Establish a dune in Camp Ellis that is at least 1700 ft long, 50 ft wide and 7 ft deep. MGS has estimated that the total amount of sand needed to create a dune that would provide adequate protection against erosion is roughly 260,000 cubic yards (personal communication, MGS). The dune created would also need adequate planting (e.g., beach grass) of vegetation and fencing to stabilize the sand, as described in guidelines by the Maine Geological Survey. It is noted by MGS that this action must be in conjunction with modifications to the jetty in order to be an effective barrier against erosion, and dune placement would have to be above current mean high water for planted vegetation to survive and stabilize the dune.

Action: Transport 25,000 cubic yards of sand from the following potential borrow pit areas, as determined feasible by local, state and federal regulators: offshore the end of the Pine Point jetty, offshore the end of the Camp Ellis jetty, and inside the Saco River immediately adjacent to the inshore end of the jetty. This should include 20,000 cy to be placed on the beach in Camp Ellis and 5,000 cy to be placed on Western Beach on an annual basis in order to equalize sand resources within the bay.

A routine sand nourishment strategy would require regular monitoring by MGS, in conjunction with local volunteer monitors, to ensure that the intended results are achieved.

Implemented by: (1) Army Corps of Engineers during routine maintenance dredging (represents about 6,000 cubic yards per year on average); (2) Saco Bay municipalities (see next section)

Cost: See section 3.7 Cost Analysis for Beach Nourishment Dredging in Saco Bay

Possible Funding: Saco Bay municipalities

Action: Purchase, lease or contract a mobile sand dredge that has the capacity to transport sufficient amounts of sand to stabilize erosion on Saco Bay beaches

Implemented by: Saco Bay municipalities

Cost: Estimated annual costs:

Lease—\$146,400 per year but limited to protected inland waters

Purchase--\$246,604 for 5 years and \$116,200 per year thereafter

Contract--\$350,000 per year

Possible Funding: Saco Bay municipalities

G. REGULATORY CONSIDERATIONS IN SACO BAY

4.1 Introduction

Managing Maine's beaches and all of the associated natural resources encompasses numerous federal and state laws and regulations. There are, however, two state laws that are at the crux of beach management issues in Maine: the Natural Resource Protection Act and the Mandatory Shoreland Zoning Act. Both of these acts were developed in order to protect the unique natural resources found within Maine, including coastal areas. In particular to coastal areas, the acts also protect the public against coastal hazards from storm events, erosion and sea-level rise. The applicable sections of each of these resource protection laws, as they relate to managing beach areas in southern Maine, are described below. While the NRPA is administered under state law and the rules promulgated by DEP, the Mandatory Shoreland Zoning Act offers guidelines for municipalities that opt to enact local shoreland zoning ordinances. Appendix F describes inconsistent standards and definitions between the state's model shoreland zoning ordinance and DEP's sand dune rules.

This regulatory section also includes a description of Maine's Municipal Floodplain Management Program. Similar to the Shoreland Zoning Act, the Municipal Floodplain Management Ordinance is a model for communities opting to adopt a local management ordinance to regulate development activities in floodplain areas.

Finally, this section of the plan also addresses federal entity interaction with the permitting process as it relates to regulation of beaches. The US Army Corps of Engineers is the lead agency responsible for all activities occurring in "navigable waters" of the United States. All marine waters below the mean high tide line are within the jurisdiction of the Army Corps. The applicable sections of federal law and the permitting process for dredging and beach nourishment activities are identified below.

4.2 Natural Resource Protection Act (NRPA)

The NRPA (Title 38 MRSA, Sections 480-A to 480-Y) protects the state's natural resources from the impacts of development. While the Act also is aimed at protecting inland resources such as freshwater wetlands, great ponds, and fragile mountain areas as well as coastal resources, the obvious interest concerning beach management is primarily the coastal related aspects of the law. The Act protects coastal wetlands and coastal sand dune systems and is administered by DEP.

DEP rules, *Chapter 355: Coastal Sand Dune Rule*, regulate activities in sand dune areas in order to implement the intent of the law as it pertains to this resource. Once rules are adopted by DEP and reviewed by the legislature, if necessary, they have the force of

law. These rules were adopted for the following reasons: (1) increase restrictions on the location, size and density of development activities in order to prevent future flood hazards and interference with sand supply and movement due to sea-level rise and subsequent shoreline retreat; (2) ease restrictions on development activities which have no significant environmental effect; and (3) increase the clarity of the rules.

It is important to note that the sand dune rules currently contain a variance section for a narrow range of specific activities related to building reconstruction or replacement and seawall construction or maintenance. Any variances to the rules must demonstrate that there is no alternative to the proposed project, that the design or site characteristics of the project conform to the intent of the rules, that the project will not harm real or personal property, and that all other provisions of the NRPA are met. The variance section of the rules offers an opportunity to allow greater flexibility to property owners.

4.3 Sand Dune Permit Requests in the Saco Bay Area

Sand dune permits are issued by DEP in two ways. The standard application requires a full review by DEP staff. The applicant prior to receiving the standard permit from DEP may perform no work. The standard application procedure is designed to ensure that DEP has the opportunity to review applications for sand dune activities that may have a greater than negligible effect on the natural dune system. Standard applications are required for any activities in sand dune systems that do not qualify under the permit-by-rule process as described below.

The second way for an applicant to obtain a permit is through the permit-by-rule (PBR) process. This process allows an applicant to assume a permit is approved if DEP does not respond within 14 days of receiving the application. The PBR is effective for a period of two years from the date of approval. However, only certain activities that have a minimal impact on the dune system may be approved through the PBR process. DEP assesses the location of each project in order to determine whether or not a permit-by-rule is applicable, including the type of resource being affected (i.e., great pond, river, stream, etc) and if the activity will have an impact on IF&W designated essential habitat.

In terms of activities in coastal areas, the PBR process is applicable to four specific areas:

1. Riprap: along the shoreline for stabilizing erosion in coastal wetlands. This does not include sand dunes.
2. Piers, wharves and pilings: in coastal wetlands. This applies to pile-supported structures in water dependent uses.
3. General permit for selected activities in sand dune systems: these must also be in compliance with the sand dune rules. The activities include the following:
 - Replacement of existing seawalls

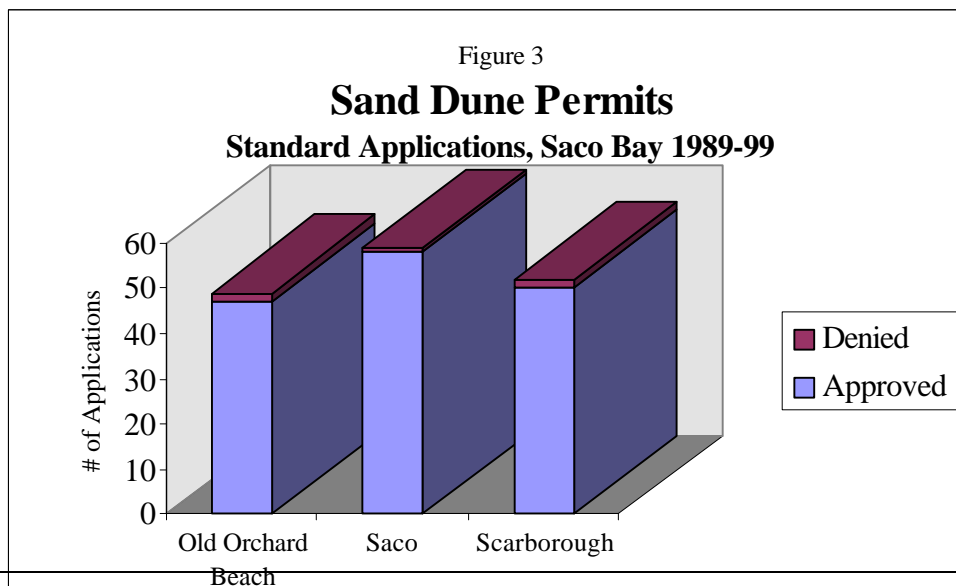
- Dune restoration
 - Beach nourishment
 - Walkways and driveways; open fences and decks in back dunes
 - Movement of sand and cobble from the front of buried seawalls using machinery
 - New development or additions in back dunes, non-flood areas (“C” zone)
 - These permits do not apply to single family dwellings in “A” or “B” flood zones or any structures in “V” zones
3. General permit for maintenance dredging previously approved by DEP. The following criteria apply:
- Only in coastal wetlands
 - Must be disposed of outside a Resource Protection District and in conformance with Maine Solid Waste law
 - The area must have been dredged within the last 10 years
 - The area must not be within 250 feet of significant wildlife habitat

4.4 Standard Permit Applications

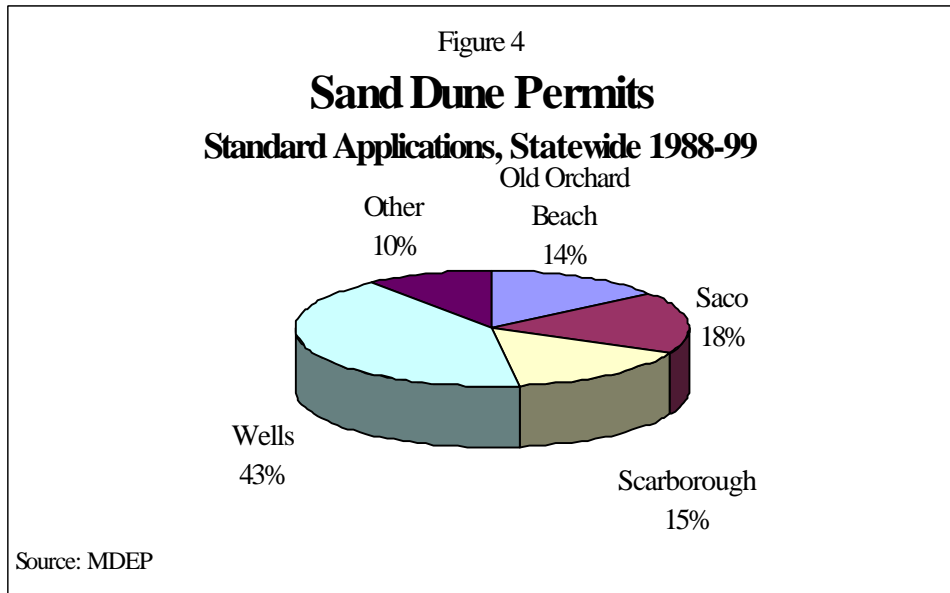
Between October of 1988 and January of 1999, residents of Old Orchard Beach submitted a total of 47 standard permit applications to DEP for activities in sand dunes. The Town of Old Orchard Beach submitted two of the standard applications. The DEP, approved 45 (or 96%) of those application and denied two,

Residents of Saco submitted a total of 58 standard sand dune permit applications between March 1989 and March 1998. Of these applications, 57 (or 98%) were approved. Thus DEP denied roughly 2% (or one application) of standard applications from residents of Saco.

The Town of Scarborough submitted six standard applications to DEP between December 1988 and November 1998. Residential homeowners in Scarborough submitted



a total of 44 applications during this period. Of the 50 applications submitted by the town and residents in Scarborough, 48 (or 96%) were approved.

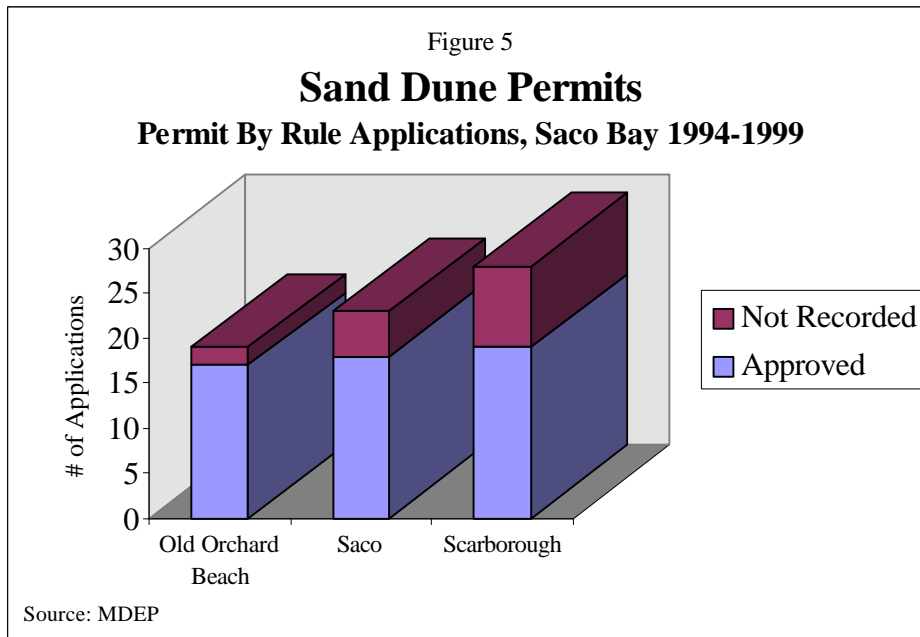


In summary, the towns of Saco Bay (Saco, Old Orchard Beach and Scarborough) submitted 155 standard sand dune permit applications to DEP over the ten-year period spanning 1989 to 1999, as depicted in figure 3. DEP approved 150 (or 97%) of the total standard applications submitted during this period. As illustrated in figure 4, sand dune permit applications for the entire state for the same period totaled 395. (Note: The Other category in Figure 3 includes 40 permit applications from Biddeford, which are not included in the totals for Saco Bay.

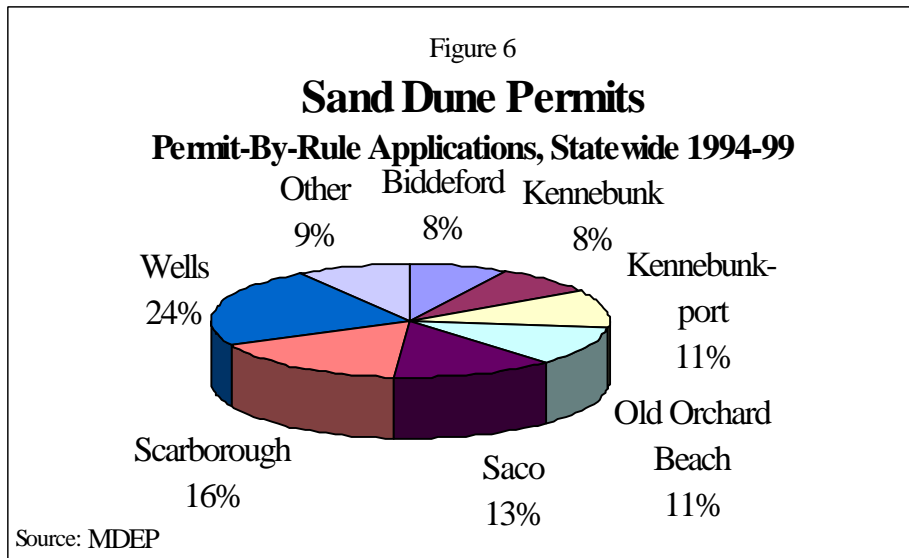
4.5 Permit-by-rule Applications

The residents of Old Orchard Beach submitted a total of 19 PBR applications between April 1995 to August 1998, including one application from the Town of Old Orchard Beach. Two of the 19 permits submitted to DEP are not recorded as approved by DEP.

PBR applications submitted by residents of Saco included 23 applications between October 1994 and March 1999. Five of the 23 applications submitted in Saco are not recorded as approved by DEP. The City of Saco submitted one application.



Between January 1994 and March 1999, 109 sand dune PBR applications for the Saco Bay region (Old Orchard, Saco and Scarborough) were submitted to DEP. Of the total PBR applications submitted, 16 were pending DEP action at the time of writing, representing roughly 15% of the total applications. Figure 5 shows PBR applications.



Statewide, there were 171 sand dune PBR applications submitted to DEP between January 1994 and March 1999. Figure 6 shows statewide PBR applications. Of the total PBR applications submitted, 129 (75%) have been approved. The remaining 42 permits are not recorded as approved, representing 25% of statewide PBR applications. However, the unrecorded permits do not necessarily mean that they were denied by DEP.

4.6 Specific activities permitted on sand dunes

Consideration of the types of development activities that actually took place in sand dune areas of Saco Bay is critical to understanding the impact of such activities. In order to adequately assess the types of activities permitted by DEP, following categories have been selected for review: New houses/buildings, additions/decks, dune restoration, seawall/riprap repair, and miscellaneous.

Table 7
Sand Dune Permits By Activity
Approved Standard Applications, 1989-98

	New houses / buildings	Additions / decks	Seawall/riprap repair or install	Misc.
Saco	11	15	6	3
Old Orchard	6	5	0	5
Scarborough	4	13	14	2
Total	21	33	20	10

Source: MDEP

Of the 361 standard licenses issued by DEP between 1989 and 1998, 21 of them were for new houses constructed in dune areas of the Saco Bay region, representing roughly 6% of approved applications. During this same period, 32 building addition permits (this includes 4 garages) were granted by DEP, representing about 9% of total approved applications. Also, 20 seawall/riprap repairs or installations were undertaken in the region, representing nearly 6% of total applications. Finally, miscellaneous activities

approved by DEP include a driveway, pool, pool house, wooden walkway, shed, patio, parking area, two ocean outfalls, and an emergency vehicle ramp to the beach. The miscellaneous activities constitute less than 2% of total approved application. There were no dune restoration projects approved under standard application procedures. Standard permits by activity are listed in table 7.

In total the categories mentioned above represent about 23% of the total standard applications approved over the last ten years or so. The remaining 278 applications, or 77%, approved by DEP fall into three classifications. First, the activity simply replaced an existing structure. Second, the sand dune permit application was transferred to another individual or entity. Third, the permitted activity remains unknown or unrecorded by DEP.

Table 8
Sand Dune Permits By Activity
Approved PBR Applications, 1994-99

	New houses / buildings	Additions / decks	Dune restoration	Seawall/riprap repair or install	Misc.
Saco	5	5	2	0	1
Old Orchard	1	3	0	0	5
Scarborough	10	4	2	4	0
Total	16	12	4	4	6

Source: MDEP

Of the total PBR applications approved by DEP between 1994 and 1999, 16 were for new houses/buildings (including 1 building), representing nearly 15% of total PBR applications. The additions/decks category includes a total of 8 permits, or 7% of permits issued, divided equally between the two types of structures. The PBR permits in the Saco Bay region included 4 dune restoration projects and 4 seawall/riprap repair or installation projects, each representing slightly fewer than 4% of total PBR applications. Table 8 provides a list of PBR permits by activity.

In summary, the above categories of PBR applications account for roughly 30% of the total PBR applications approved in the Saco Bay region over the last 5 years or so. Again, the remaining 76 applications, representing 70% of the total approved PBR applications, were issued for projects that replaced existing structures or remain unknown or unrecorded by DEP.

4.7 Mandatory Shoreland Zoning Act

The Mandatory Shoreland Zoning Act (Title 38 MRSA, Sections 435 to 449) protects the state's shoreland zones including streams, rivers, lakes and tidal waters regarding water quality, wildlife habitat, shore cover, public access, commercial fishing and maritime activities, among others. Coastal shorelands are the focus of beach planning efforts to develop sound beach management plans and will remain the focus of this report.

The Act requires municipalities to adopt shoreland zoning ordinances that are at least as strict as the state's model shoreland zoning ordinance. In general, the Act regulates activities on all land within 250 feet of ponds; non-forested freshwater wetlands that are larger than 10 acres; rivers with watersheds of at least 25 square miles in drainage area; and coastal wetlands and tidal waters. The shoreland zone also encompasses all areas within 75 feet of the high-water line of certain streams. The Act includes building size and setbacks and establishes resource protection, general development and residential zones. See Appendix B on page 16 for a visual description of the shoreland zone.

shoreland zoning ordinance does not include the state’s recommended Limited Residential District, Limited Commercial District, General Development District, or Commercial Fisheries/Maritime Activities District. Table 9 provides a comparison of municipal shoreland zoning in Scarborough to state shoreland zoning guidelines.

Table 9	
Municipal Shoreland Zoning Ordinance Category	Variance from Mandatory Shoreland Zoning Act Guidelines
Non-conformance	Only non-conforming conditions resulting from shoreland zoning supercede local ordinance.
Reconstruction or Replacement	Does not include 50% of market value requirement for reconstruction or replacement of damaged buildings.
Resource Protection District	Includes freshwater wetlands not rated “high” or “moderate” value by IF&W but substantially connected to Resource Protection District areas.
Shoreland Overlay	Local zoning ordinance rather than shoreland zoning governs

District	these areas.
Minimum lot standards	Resource Protection is 30,000 sq. ft. Stream Protection District is governed by local ordinance. Minimum shore frontage in the Shoreland Zone is 100 ft. and minimum lot width is 100 ft. within 100 ft. of high water line.
Principal and Accessory Structures	Parking area size standards subject to local ordinance.

4.9 Saco Shoreland Zoning

Saco’s zoning ordinances specify Shoreland Development Districts as Resource Protection, Limited Residential, Limited Commercial, General Development, Marine Business and Residential, and Saco River Corridor. Although the town does not designate a Stream Protection District, the Resource Protection District includes the state’s guidelines for stream protection.

This analysis did not identify any substantial differences between Saco’s municipal shoreland zoning ordinance and the state’s shoreland zoning guidelines.

4.10 Old Orchard Beach Shoreland Zoning

Old Orchard Beach’s shoreland zoning ordinance designates a Shoreland Overlay District that contains a Resource Protection Subdistrict, Shoreland Activity Subdistrict, and Stream Protection Subdistrict. Table 10 compares municipal shoreland zoning to state shoreland zoning guidelines.

Table 10	
Municipal Shoreland Zoning Ordinance Category	Variance from Mandatory Shoreland Zoning Act Guidelines
Applicability	Shoreland zone is only 100 ft. horizontal distance from freshwater wetlands.
Reconstruction or Replacement	Does not include 50% of market value requirement for reconstruction or replacement of damaged buildings.

4.11 Overlapping Regulatory Jurisdictions of the NRPA and Shoreland Zoning Act

Several areas of inconsistent standards and definitions have been identified by DEP regarding the overlapping regulatory jurisdictions of the NRPA and Mandatory Shoreland Zoning Act. DEP has indicated that the differences between the two acts have a minimal

impact on the effectiveness of regulation, since both local shoreland zoning ordinances and state sand dune rules require that the more restrictive regulations be administered in cases of conflict. Provisions in ordinance and state rule also require compliance with *all* local, state and federal regulations. DEP does suggest, however, that any changes to improve the overall consistency of the two acts should be made at the local level by amending shoreland zoning ordinances (personal communication, DEP) The intent of amending local shoreland zoning ordinances is to recognize the additional protection afforded to sand dunes and shoreland areas independently, due to their unique characteristics. Therefore local ordinances could specifically identify stricter standards or differing definitions within sand dunes and shoreland areas in cases of overlapping jurisdiction. See appendix F for a complete listing of inconsistent standards and definitions between the two acts.

4.12 Municipal Floodplain Management Ordinance

The Maine State Planning Office's Floodplain Management Program has drafted model municipal floodplain ordinances to be used by towns. Although the model ordinances are fairly standardized for each community, there is opportunity to customize ordinances to meet the particular needs of any given municipality. All of the towns participating in the regional beach management planning process (Saco, Old Orchard Beach and Scarborough) have enacted Floodplain Management Ordinances.

A municipal floodplain management ordinance identifies areas within a city or town that are prone to flood hazards as identified by Federal Emergency Management Agency (FEMA) flood maps (see National Flood Insurance Act of 1968 section below and Appendix G). The ordinance also establishes a Flood Hazard Development Permit system for construction or development in identified flood areas. This permit system ensures that development standards in flood zones are adequate to protect against substantial losses of structures. The permit requires a site plan of the proposed development, including services such as sewer and water, base flood elevations, and lowest floor of the structure, among others.

4.13 Municipal Floodplain Ordinance Compliance with the State's Model Ordinance

Municipal floodplain ordinances in enacted prior to 1994 are currently not in full compliance with the Maine Floodplain Management Program, which in turn complies with the FEMA requirements. Floodplain management ordinances enacted after 1994 but not updated according to amendments in 1997, 1998 and 1999, are encouraged to update their ordinances. However, updates to floodplain ordinances after 1994 are not mandatory for state compliance. The Maine Floodplain Management Program has provided updates for 1987-96, 1997, and 1998. Updates for 1999 will be available soon.

The three municipalities involved in regional beach management planning (Saco, Old Orchard Beach and Scarborough) are in compliance with state's floodplain management ordinance updates to varying degrees. Saco's ordinance was last updated in 1996 and thus incorporates important updates between 1994 and 1996. Old Orchard Beach's floodplain ordinance was last updated in 1993. Therefore, the 1994 mandatory updates have not been incorporated into the existing language of the ordinance. Scarborough has the most up-to-date floodplain management ordinance of the three towns, having been updated in 1997.

For the most efficient and effective municipal floodplain management strategies, it is recommended that each municipality in Saco Bay considers updating their ordinances to reflect the latest changes recommended by the Maine Floodplain Management Program. If it were an option for the municipality, the state would prefer "stand-alone" floodplain ordinances to ordinances that are incorporated into municipal-wide zoning ordinances. Stand-alone municipal ordinances allow much more efficient review by the Maine Floodplain Management Program since each section reference is identical to the state's model ordinance, unlike incorporated ordinances that require greater analysis to interpret varying section numbers.

4.14 The Importance of Updated Floodplain Management Ordinances

There are two major impacts to municipalities that are not in compliance with updates to their floodplain ordinances. First, structures within the municipality may be subject to higher federal insurance premiums due to the lack of compliance, since the Community Rating System used by the FEMA uses this as a criterion. Second, the lack of compliance may affect the level of disaster relief assistance granted by the FEMA during flooding events. The federal government also uses municipal floodplain ordinances as a criterion when assessing disaster assistance needs.

4.15 National Flood Insurance Act of 1968

The National Flood Insurance Act of 1968 provides relief to coastal property owners whose investments are damaged due to flood events. The National Flood Insurance Program (NFIP) is voluntary and provides insurance to anyone who lives in a community that participates in the NFIP. Contrary to popular belief, this program is self-supporting in terms of its financial obligations to cover disaster relief. That is, the premiums collected from participants are adequate to pay the losses sustained during flood events. Communities also may participate in the Community Rating System (CRS), which

allows for reduced insurance premiums if communities agree to take additional steps to reduce flood damage.

FEMA is the federal agency responsible for administering the NFIP, creating Federal Insurance Rate Maps (FIRM's) to be used for assessing the risk associated with insurance policies in coastal flood zones. These maps identify Special Flood Hazard Areas (SFHA's) which delineate the 100-year floodplain, indicating a one percent chance that property within the area will flood in any given year.

Each town in Saco Bay has been mapped by FEMA. The most recent maps for the area were developed in 1984. However, the agency is currently re-mapping parts of the Maine coast in order to accurately reflect the flooding capacity of coastal areas. For example, the town of Wells was re-mapped recently (1999) and it was determined by FEMA that several houses which were previously determined to be in a relatively safe zone are now considered to be in high hazard areas. It is anticipated that other coastal areas of Maine will be re-mapped in the near future.

There are four different zones identified on FEMA flood maps: "A", "B", "C", and "V" zones. The A-zone identifies area of land that will theoretically flood during the so-called 100-year flood. The B-zone is that area that will flood between the 100-year and 500-year floods. The C-zone is an area of minimal flooding. The V-zone is the high velocity zone in which waves at least three feet in height will directly impact any structures within its confines.

4.15.1 V-zone Designation

First, if a structure is located in the V-zone it means those property owners in these areas will have to pay higher insurance premiums due to the greater risk associated with storm events and flooding. Second and most importantly, Maine state law places considerably greater restrictions on development activities in designated V-zones due to the fact that they are often located within the sand dune system. Therefore, if a property owner's designation changes from the A-zone to the V-zone, for instance, dune rules greatly reduce the types of development that can occur in coastal dune areas.

4.16 Issues Related to Beach Management and Sand Dune Rules

As written by DEP, the sand dune rules currently in place provide a framework that is designed to address threats to the resource. In doing so, the rules consider sand dunes in their natural, undisturbed state, regardless of the degree of development which has already occurred on the dunes. This lack of flexibility often makes sand dune regulation a difficult endeavor for both the regulator (i.e., DEP) and the regulated (i.e.,

coastal municipalities), since many areas of the southern Maine beach region are in fact well-developed suburban/urban communities.

For example, much of Old Orchard Beach's development is located within the frontal and back dune system and includes residential homes and commercial facilities with town-owned sewer and water systems. Western Beach in Scarborough, on the other hand, is relatively pristine with minimal development as a result of having a single landowner limiting development on the beach. The sand dunes rules, from an administrative point of view, would subject permit applications for dune activities in both of these areas to the same set of criteria when evaluating whether or not a particular activity is acceptable in light of the goals of the NRPA.

Since the intent of the sand dune rules is to preserve the integrity of natural dune systems, while at the same time minimize the hazards to shorefront homes, it may be possible to devise a system of development "offsets." Such offsets could be used to counterbalance development and conservation needs by allowing the most important beaches, in terms of natural resource value, to be conserved. If development activities were restricted to less important natural areas (areas that have low natural resource value either naturally or man-induced), then both development and conservation interests may benefit.

In order for a system of development and conservation offsets to be successful in terms of protecting sand dune resources, it is crucial that a thorough inventory of the most productive and necessary dune systems is compiled. This inventory could then be ranked according to each dune system's importance as it relates to geological and ecological conservation issues.

The ranked inventory could also become the basis for a local/regional beach zoning scheme that classifies the types of land uses in dune/coastal areas that should be permitted. This type of zoning scheme would allow municipalities the opportunity to concentrate development activities in areas that are already densely developed. Beach zoning could identify uses similar to existing shoreland zoning ordinance by creating zoning based on resource protection districts, limited development districts, general development districts, etc.

4.17 Specific Issues that Inhibit Effective Management of Dunes

Although Maine has some of the strictest sand dune management policies in the nation, the current regulatory scheme may not be the most efficient way to manage sand dune resources in Saco Bay, as well as other beach regions in Maine. The current resource protection strategies for sand dunes within Saco Bay are based on state-level laws and rules that require a great deal of staff time and associated costs to enforce. DEP has sole responsibility for developing and enforcing the rules that conserve and/or preserve sand

dunes in Maine. This state-level mandated approach, like several other similar state-level regulatory efforts, has met resistance at the local level. Municipal officials, residents and business interests sometimes find it difficult to abide by laws and rules that have been created or supported by state regulatory agencies without adequate input from the local community.

For example, state regulators are often disconnected from the geographic areas they regulate. In the case of sand dune regulations, individuals at the municipal level often feel that DEP regulators do not adequately reflect the thoughts and interests of the local population. Municipal interests in Saco Bay also feel that the rules created for the bay lack the flexibility needed to protect dunes systems and associated natural resources while at the same time provide housing and jobs for local residents and recreational opportunities for locals and visitors.

4.18 Current Regulatory Scheme and Incompatibility with Local Concerns

Local interests view beach management activities in Saco Bay as state mandated rules that are solely concerned with conservation issues and do not include concerns of local residents who work and live in the area. As a result of their discontent with the current regulations in place, local interests have in at least three instances used the political process to circumvent sand dune rules by enacting laws that supercede DEP rules.

In at least two instances, legislation has been passed that denigrates the intent of sand dune rules as promulgated by DEP. The first is Title 38, Article 5-A, section 480-O of the NRPA which allows “rebuilding, replacement or *new* construction of a bulkhead, retaining wall or similar structure” along a segment of the Scarborough River provided that certain conditions are met. Permits for such structures must include a report from a state-certified geologist every two years, which includes recommendations for maintaining the frontal dunes in the permitted areas. This exception for one small segment of the Maine’s coastal dune systems, without consideration of other regional interests, represents a digression from a well-planned, cohesive policy for beach systems throughout the state. Currently under sand dune rule, no other coastal property owners in Maine are allowed to construct new retaining walls or seawalls of any type.

The second instance in which DEP sand dune rules are diminished in effectiveness is section 480-W of the same title and article described above. This section within the NRPA allows state-certified geologists and local code enforcement officers to determine the “integrity of a seawall, bulkhead, retaining wall or similar structure in a coastal sand dune system” that has been “destroyed or threatened.” In doing so, property owners are allowed to use temporary protective materials or strengthen an existing structure without a permit from DEP. Again this section of the NRPA provides coastal property owners with a method of rebuilding seawalls and other similar structures that directly contradict existing sand dune laws developed by DEP.

The third and most recent amendment to section 480 of the NRPA recently passed before the 119th Legislature. The amendment, LD 2063, allows property owners whose property is located in the newly mapped V-zones within the town of Wells to apply for a permit to reconstruct structures destroyed by coastal storm events. Prior to enactment of this legislation, property owners in any V-zone in the state were prohibited from applying for a permit under such circumstances. This legislation prohibits DEP from denying a permit solely because a property lies within a V-zone. This amendment only affects property owners in newly designated V-zone areas in Wells, not areas of Wells that were previously mapped as V-zone areas by FEMA.

If the currently regulatory structure for Saco Bay remains in place it is likely that more exceptions to the sand dune rules will be attempted via amendments to the NRPA. In light of growing national, regional and local economies, coupled with an increasing population in southern Maine, the demand for new, reconstructed and modified residential and commercial structures in sand dune areas is likely to increase in future years. Thus development, both new and rebuilt, should be properly balanced to the liking of all interest groups with a stake in coastal resources management issues. Regional beach management plans will assist with developing policies that provide adequate planning opportunities to municipalities so that they do not have to resort to circumventing DEP policy objectives in order to achieve desired outcomes.

14.19 Federal Regulatory Issues Relating to Dunes and Beaches

The US Army Corps of Engineers is the federal regulatory agency responsible for “construction and other work in navigable waterways” as well as the “discharge of dredged or fill material into the waters of the United States.” (www.nae.usace.army.mil/enviro/m/regualto.htm). Section 10 of the Rivers and Harbors Act of 1899 regulates construction-related work in navigable waters. The discharge of dredged or fill materials into waters is regulated by the Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (Clean Water Act).

In Maine the Corps has implemented a programmatic general permit program. The purpose of this program is to “expedite review of minimal work in coastal and inland waters and wetlands in the United States.” (Amendment to USACOE/State of Maine Programmatic General Permit, Jan. 29 1999.) Under this agreement, activities with minimal impact either are not reported to the Corps, require screening by the Corps and other federal agencies, or require a full Corps application. The categories include Category I (non-reporting), Category II (screening) and Category III (individual permit). Requests for Category I and Category II permits are accepted under existing application requirements of the DEP, with Category II permits undergoing a screening process by the Corps and other federal agencies. These other agencies involved in the review process are the US Environmental Protection Agency, US Fish and Wildlife Service, and the National Marine Fisheries Service. In particular, the Endangered Species Act and the Magnuson-

Stevens Fisheries Conservation and Management Act require impact review as part of the Corps permitting process for dredging and associated beach nourishment projects. The individual permits under Category III require a full application process by the Corps that is independent of the DEP application process.

There are several definitions for each of the three categories mentioned above, depending upon the type of medium (inland or tidal) and the degree of impact from the activity. For the purposes of beach management activities, the dredging subcategory under tidal and navigable waters is most applicable. Category I under the dredging subcategory is applicable to maintenance dredging projects less than 1,000 c.y., using upland disposal. Category II includes maintenance dredging greater than 1,000 c.y. , new dredging up to 10,000 c.y., or projects that do not meet category I. Disposal option for Category II include upland, open water or beach nourishment. Category III (individual permit) covers maintenance and new dredging affecting a unique aquatic site and new dredging greater than 10,000 c.y.

It is important to note that activities in tidal or marine waters permitted by the DEP permit-by-rule application process (section 4.3 of this plan) also require Army Corps approval before activities can begin. In particular, even if the DEP does not respond to the PBR application within 14 days—which implies that the permit has been granted--the Corps is not limited by this deadline.

SAND DUNE REGULATION -- Recommendations

4.20 Recommendations

Policy: Improve the effectiveness of the state's coastal sand dune rules by reviewing sand dune permits at the regional level. The following actions will allow regional oversight of permitting activities with input from the local level when necessary.

Actions:

4.1a) Appoint a permanent regional advisory committee to advise local, state and federal interests about beach regulation and management issues in Saco Bay in accordance with existing state laws and rules. This committee would consist of 4 representatives from each town in the Saco Bay region, including one municipal planner, one elected town/city councilor, one at-large member representing the general public, and a representative from each municipal conservation commission. The advisory committee would consult with applicable state and federal agencies, private nonprofit environmental organizations, and local residents and business owners representing beach interests when considering coastal issues that may have a regional impact. The proposed committee would have no regulatory authority regarding DEP regulated sand dune permits, and the DEP would continue to act as the sole regulator of permits under the current regulatory structure established by the state's sand dune rules. The advisory committee would monitor the progress of the recommendations in this Plan as well as address other issues on an as-needed basis. The town/city councils from each municipality would appoint members of the committee, with assistance from municipal planners.

Implemented by: Saco Bay municipalities

Cost: \$5,000 per year

Possible Funding: Matching grant from SPO; local option sales tax

4.1b) Develop clear state guidelines for routine beach nourishment strategies for Saco Bay beaches, including multi-year permitting for approved sand nourishment areas with adequate monitoring of geological and ecological impacts as determined by DEP and other relevant state agencies. Multi-year beach nourishment permits would require annual review by DEP, IF&W, DMR and MGS, including regular beach profiling and monitoring in order to measure actual or potential impacts to geological processes and wildlife habitat. These policies should incorporate long-term nourishment strategies that include annual sand replenishment in areas identified by this Plan.

Under current sand dune rules, permit applicants may, in effect, apply for multi-year beach nourishment applications. Applicants have two years to initiate activity once the permit is approved and an additional five years to complete the permitted activity. For instance, an applicant may submit an application to the DEP to nourish beaches in Saco Bay according to a pre-approved plan that identifies the areas of sand extraction, the beaches that would be nourished and the amount of sand transported to each area. Nonetheless, this option still restricts the applicant to a five-year period of time to complete permitted activities. It has been suggested by the DEP that a longer time period for permitting beach nourishment may be warranted, possibly 10 years or more (personal communication, DEP).

Implemented by: DEP with assistance from DMR, IF&W, MGS and SPO

Cost: minimal

Possible Funding: Current programs operating budgets

- 4.1c) Recognize different standards and definitions between municipal shoreland zoning ordinances and the sand dune rules. This should include recognition that shoreland zoning ordinances and DEP sand dune rules share overlapping jurisdiction in sand dune areas. In order to improve permitting enforcement at the local level, overlapping jurisdiction in sand dune areas should be clearly defined to permit applicants and local code enforcement officers during the permitting process. The state's current Guidelines for Municipal Shoreland Zoning Ordinances mandate the adoption of stricter standards in cases of overlapping jurisdiction with other ordinances, regulations or statutes.

Implemented by: Saco Bay municipalities, SPO and DEP

Cost: minimal

Possible Funding: Current programs operating budgets

H . ECONOMIC IMPACT OF BEACHES IN SACO BAY

The Saco Bay region has relied on tourism as a major sector of its economy for many years. The region offers miles of sandy beaches that attract tourists from all over the Northeast as well as other parts of the country. Many of these tourists are from major population centers in southern New England (e.g., Boston and Hartford/New Haven areas) as well as the New York region.

While it is evident that the economic impact of tourism to hotels, motels and other lodging, restaurants, and other retail and service related income is substantial, the degree of impact has not been adequately assessed at the regional level for the Saco Bay area. Existing employment and sales tax data, for example, has not been analyzed to determine if economic impact trends may be depicted for each municipality in the Saco Bay region. Also, limited primary data collection (i.e., surveys) has taken place to date in southern Maine's beach areas.

In terms of assessing the impact of tourism as it relates to beach management needs, it is important to measure economic impact to determine the feasibility of beach nourishment projects or other investments in beaches. The economic impact of tourism provides the necessary justification for improving Maine's beaches using local, regional and state resources. The number of jobs and amount of income from the region indicate that Maine's beaches are a vital component of the Maine economy. Without beach resources to attract tourists, regardless of the type of activity undertaken, a significant source of income to the residents of the state may be diminished or lost.

5.1 What remains to be answered?

Ideally, economic data would be collected using primary and secondary collection methods. Secondary data, in this instance, refers to existing data collected on a routine basis to record market-based transactions. In order to collect necessary primary data, a survey of beach-goers would need to be developed and implemented. The inclusion of both primary and secondary data would assist with determining the following questions:

- How many people visit Maine's southern beach areas, and why do they visit Maine over other similar destinations?
- How much money are they spending on lodging, food, and entertainment?
- How much money are visitors willing to spend on conservation and natural resource protection?

- What is the multiplier effect of tourist dollars spent in beach areas? That is, for every dollar spent by tourists how does it benefit the jobs and income of local business owners and residents of the region?

5.2 Long-term Survey Analysis

A rigorously designed economic impact analysis would answer many of the above questions. This type of study, however, would require a fairly sizable data collection effort, including surveying visitors during peak beach season. The questions asked on the survey need to determine why vacationers choose to visit Maine instead of Cape Cod or other beach areas in New England; where the survey respondents' destination originated and terminated; how much money they are spending on accommodations, food and entertainment; the duration of their stay in the region; and the willingness to pay for non-market beach resources.

Primary data collection has distinct advantages over methods that employ strictly secondary data sources. Primary data collection allows the researcher to customize questions to reflect needed information that is specific to the research at hand. Secondary data, on the other hand, is often collected with the intent of using the data for multiple tasks. Therefore, secondary data tends to be broader in scope and may not be detailed enough to identify trends at the municipal or regional level, for instance.

This type of study also should include an economic valuation of non-market goods as well as market goods. For instance, methodologies that measure the economic impact based on specific data sets that reflect market goods such as retail and services income are well understood. However, the non-market value can be measured through contingent value methods. This method directly asks resource users (in this case beach-goers) to attach a monetary value to their experience based upon a choice of activities. For example, if given an option would a person rather visit an unpolluted beach or attend a sporting event in an urban setting. This type of valuation is often measured by a visitor's willingness to pay for the opportunity to use the resource in question, such as a beach. Therefore, in addition to the market values derived from measurable transactions recorded by state agencies and so forth, the contingent valuation method offers an opportunity to measure non-market values. Also, this method allows researchers to determine the actual price a person is willing to pay for any given activity.

5.2.1 Cost and Timeframe

It has been estimated by Dr. Charles Colgan of the Muskie School of Public Service that an undertaking of the magnitude identified under the long-term survey analysis for the entire southern Maine beach region (Scarborough to Kittery) would cost at least \$50,000. A proposal for measuring economic impact was submitted by Dr. Colgan in 1998; however, this proposal was not funded for implementation.

The proposal to measure economic impact of Southern Maine's beaches also is limited regarding the time of year for implementation. Obviously, the survey needs to be

implemented during peak summer months to accurately reflect beach users and subsequent economic impact. At the time of writing, the year 2000 summer season would be the earliest possibility for conducting the impact study.

5.3 Existing Data Analysis

The following economic impact analysis offers a “snap shot” of the number of tourists visiting Maine’s beach region, where they are spending their money and how it impacts the local economy. This alternative proposal offers a more timely and economical methodology for assessing the economic impact of beach tourism than collecting survey data, as it is based entirely on secondary data sources. However, the full economic impact analysis, including the non-market value of beaches as described earlier, should still be considered a priority for long-term planning efforts.

There are two components of economic analysis applicable to the Saco Bay region. First is the impact of tourism on the local and regional economies. This includes the level of economic activity resulting from tourist activities. The impact of tourism is quantified by comparing the off season to the peak season. Thus the seasonal impact of tourism indicates the degree to which Saco Bay communities rely upon income from vacationers. The second measure of economic analysis focuses on the economic value of the land, buildings and public infrastructure within the region.

This economic analysis includes four data sources. These sources include traffic counts of passenger vehicles, restaurant and lodging sales and retail sector sales, restaurant and lodging and retail employment data, and municipal valuation (land and buildings) of the Saco Bay region. This analysis includes data from the municipalities of Saco, Old Orchard Beach and Scarborough.

Traffic count analysis is the first component of the economic impact assessment. Data collected by the Maine Turnpike Authority records traffic flow at each of the exits on the Maine Turnpike on a monthly basis, including the southern Maine beach region. These data viewed over the last ten years not only establish recent data on the number of passenger vehicles, which is roughly 90% of total traffic on the Turnpike (Maine Turnpike Authority, 1990-96), entering Maine and where they went, but it also depicts trends over time. Most important to measuring economic impact in the beach region, is to view the data by month (off season versus peak season) so that seasonal variation in traffic flow is included. This type of trend analysis determines if the total volume of vehicles entering Maine has increased over time, and, if so, provides estimates of the volume of traffic visiting the Saco Bay beach region.

The second component of the analysis is taxable restaurant and lodging sales as compiled by the Maine Revenue Service (formerly the Bureau of Taxation). These data are available at the municipal level and are recorded on a quarterly basis. Again, it is useful to assess such sales over a period of time in order to decipher historical trends. Due to the

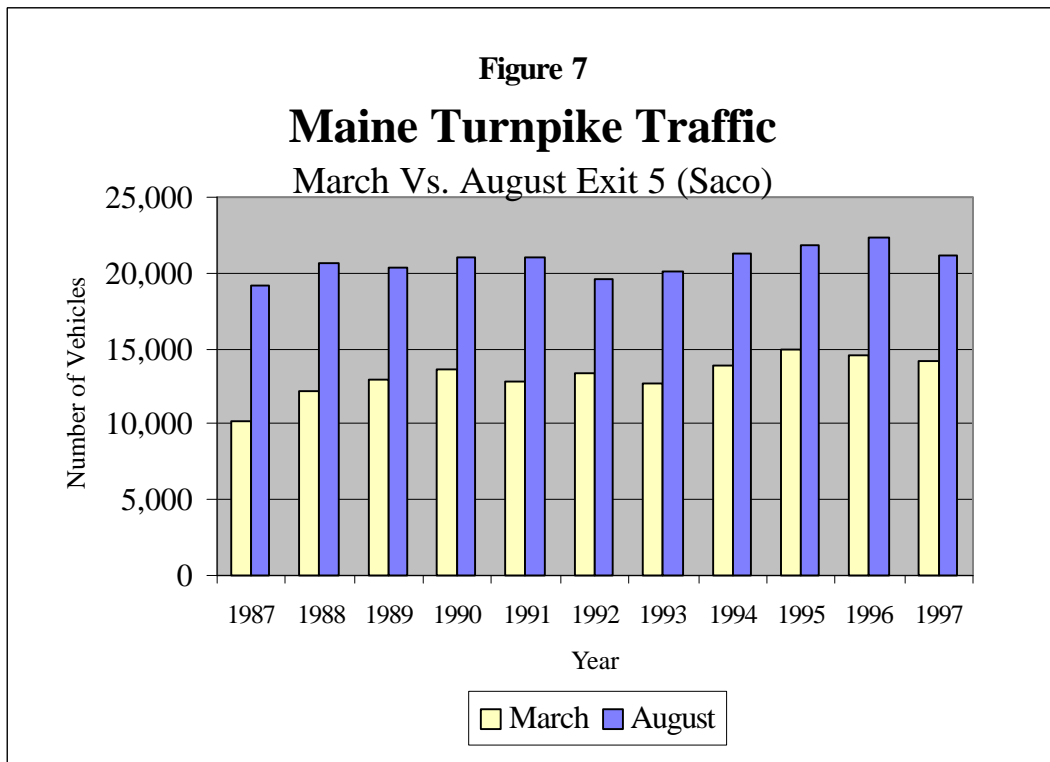
availability of data, the period between 1993 and 1998 was selected for measuring taxable sales in the Saco Bay region.

The third component of the proposal is assessment of employment data by municipality. The Maine Department of Labor records employment data by sector (retail, services, etc.) on a quarterly basis. Therefore, seasonal fluctuations in employment for the Saco Bay region are measured and compared to seasonal tourist activities. The total number of jobs and the sector they represent will assist with understanding the impact of tourism on the local economy.

The fourth and final component of the existing data analysis is the municipal valuation of properties in the Saco Bay region. This section focuses on the relative value of land and buildings in beach-related areas of communities versus the entire number of land parcels in each community.

5.4 Maine Turnpike Traffic Analysis

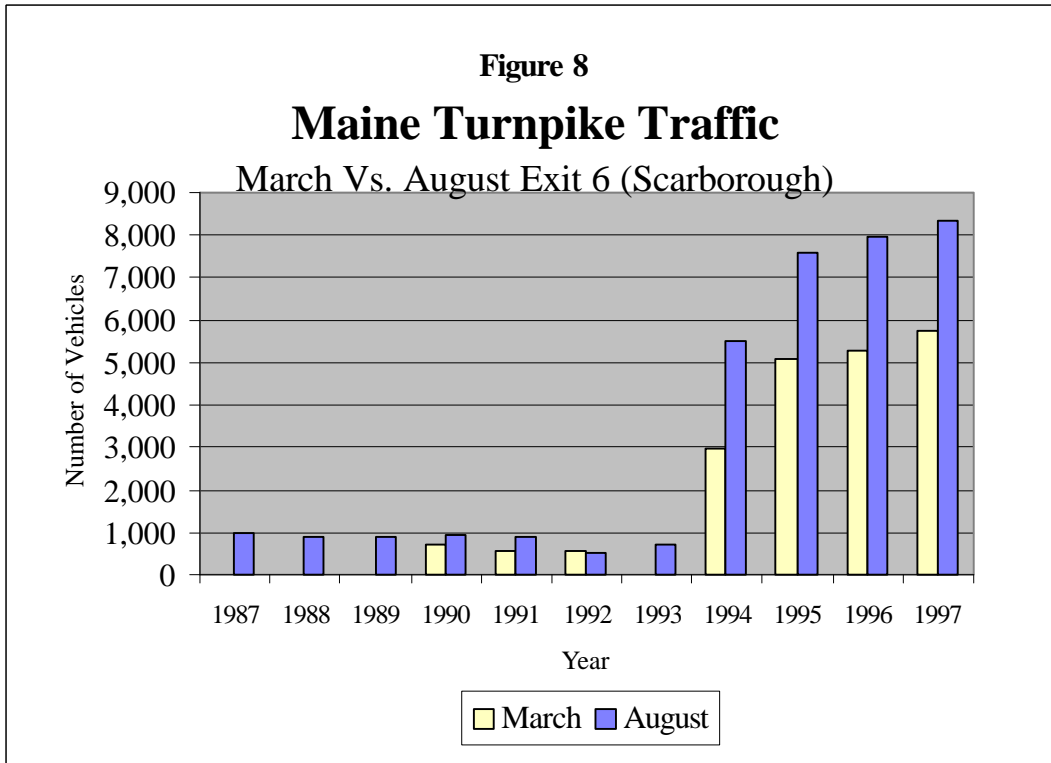
Traffic exiting at Exit 5 of the Maine Turnpike in Saco varies substantially between the months of March (off season) and August (peak season). However, the number of vehicles using exit 5 continues to increase despite the time of year. The number



of vehicles utilizing exit 5 during the month of March increased from 10,121 in 1987 to 14,165 in 1997, an increase of 40%. Likewise, the number of vehicles exiting the Maine

Turnpike at exit 5 during the month of August increased from 19,186 in 1987 to 21,115 vehicles in 1997, representing an increase of roughly 10%.

Most noticeable in the vehicle data from exit 5, however, is the consistent seasonal fluctuation in usage between the months of March and August. As is apparent from figure 7, the average annual variation in the number of vehicles exiting the turnpike at exit 5 between 1987-97 is 57% higher during August when compared to March.



Traffic at exit 6 on the Maine Turnpike shows a similar pattern of increased seasonal variation in the number of vehicles utilizing the exit during March and August. This exit was seasonal use only until 1994 when it was opened to year-round traffic. Therefore, the number of vehicles using exit 6 in 1994 should be compared to the number of vehicles in 1997, rather than comparing skewed data from earlier years.

The number of vehicles utilizing exit 6 during the month of March increased from 2,958 in 1994 to 5,764 in 1997, an increase of 95%. Likewise, the number of vehicles exiting at exit 6 of the turnpike during the month of August increased from 5,530 in 1994 to 8,346 vehicles in 1997, representing an increase of roughly 51%.

Again, the exit 6 data show a consistent seasonal fluctuation in usage between the months of March and August. As is apparent from figure 8, the average annual variation in

the number of vehicles exiting the turnpike at exit 6 between 1987-97 is 54% higher during August when compared to March.

In summary, traffic from the Maine Turnpike utilizing the primary points of entry into the Saco Bay beach region—exits 5 and 6—increased by over 50% during the peak tourist season.

5.5 Total Retail and Services Employment

Table 11
Total Retail and Services Employment
Saco Bay Beach Region, March vs. August

	1993	1994	1995	1996	1997	1998	Total
Retail Mar	5,873	3,715	3,823	3,718	3,706	4,748	25,583
Retail Aug	4,688	5,146	4,957	4,988	5,046	6,433	31,258
% Change	-20%	39%	30%	34%	36%	35%	22%
Services Mar	5,363	3,732	4,549	4,243	4,644	5,164	27,695
Services Aug	5,873	6,433	5,223	5,327	6,833	6,433	36,122
% Change	10%	72%	15%	26%	47%	25%	30%

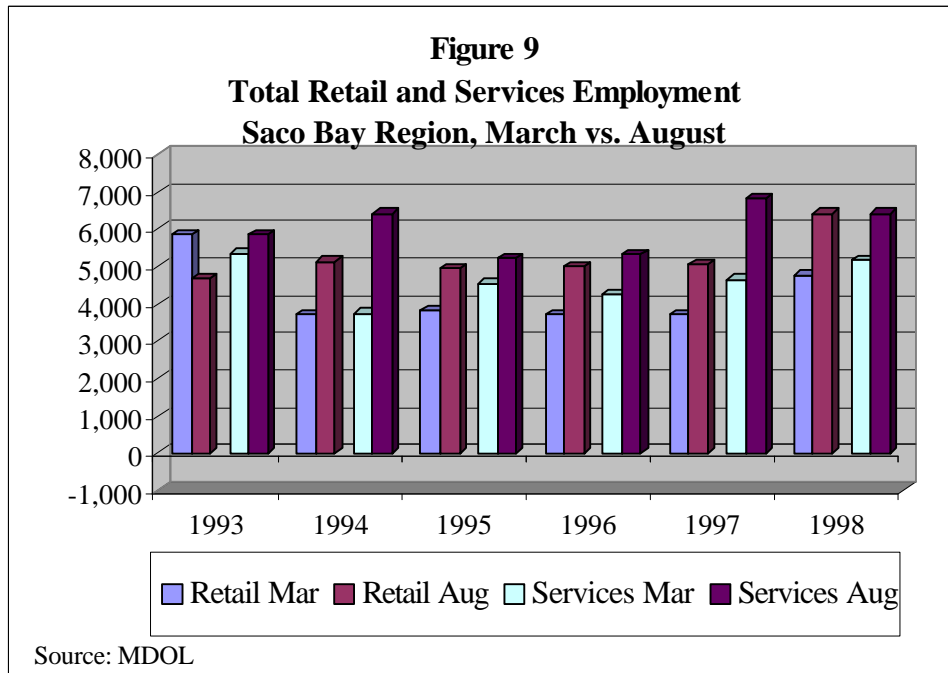
Source: MDOL

This category comprises the total retail and services employment data for the Saco Bay region. It is important to note that this retail and services employment data includes the entire towns of Scarborough, Old Orchard Beach and Saco. Table 11 and Figure 9 illustrate the total number of employees for the retail and services sectors, comparing the month of March to August. March and August were again chosen to illustrate the seasonal variations between off season activity (March) and the peak season (August).

The average increase in retail sector employment in the Saco Bay region between 1993 and 1998 is 22%. Except for 1993, when seasonal variation between March and April decreased by 25%, all other years show a seasonal increase ranging between 30% and 39%. The same period shows an even larger average increase in the services employment sector, with August outpacing March by 30%. The services sector, however, shows much greater employment variability when compared to the retail sector. The annual seasonal changes for the retail sector indicate increases ranging from 10% to 72% between 1993 and 1998.

The total retail and services employment data provided indicate an overall trend of considerably greater retail and services activities in the Saco Bay region during the peak

season of August, versus March with the least seasonal activity. During peak season, the region has contributed over 67,000 jobs to the region between 1993 and 1998.



5.6 Old Orchard Beach Retail and Services Employment

The retail and services sectors for Old Orchard Beach show the greatest seasonal variability of the three municipalities in Saco Bay analyzed for economic impact. Table 12 shows the average seasonal increase in the retail employment sector between 1993 and

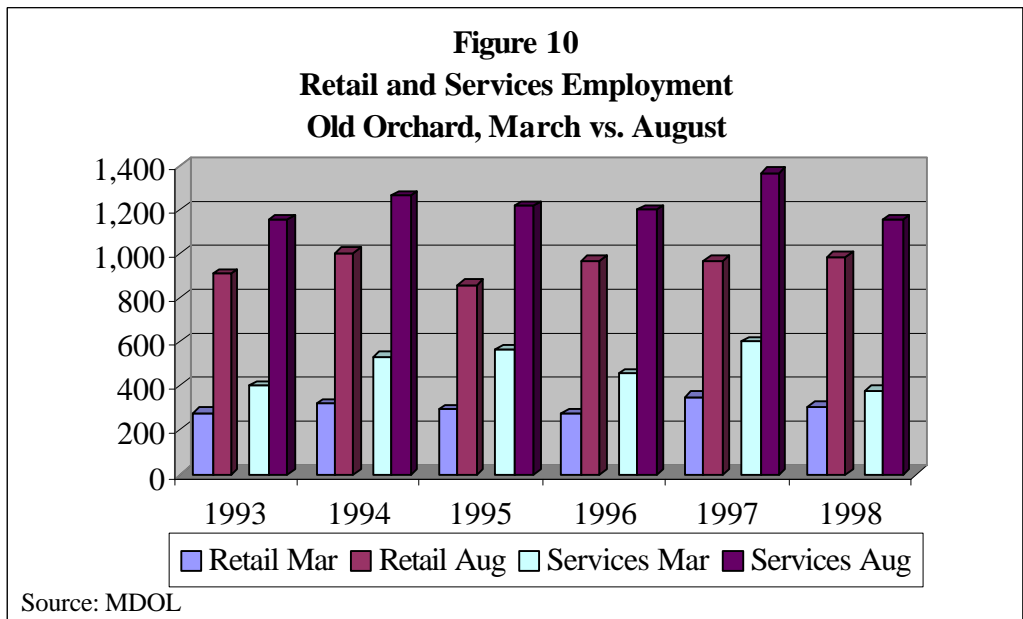
Table 12
Retail and Services Employment
Old Orchard, March vs. August

	1993	1994	1995	1996	1997	1998	Total
Retail Mar	278	319	295	273	354	306	1,825
Retail Aug	910	1,002	860	966	966	986	5,690
% Change	227%	214%	192%	254%	173%	222%	212%
Services Mar	401	534	562	455	601	381	2,934
Services Aug	1,151	1,259	1,216	1,197	1,365	1,151	7,339
% Change	187%	136%	116%	163%	127%	202%	150%

Source: MDOL

1998 at 212%, which is nearly 10 times (190 percentage points) above the average for the entire Saco Bay region. The services employment sector in Old Orchard Beach also represents the greatest seasonal variability in the Saco Bay region, with an average seasonal increase of 150% between 1993 and 1998. See figure 10.

This data captures Old Orchard Beach’s reliance on seasonal tourism for income and employment. Retail and services employment represents a combined total of slightly over 13,000 jobs for the region during peak tourist season.



5.7 Saco Retail and Services Employment

Saco’s retail and services employment is much less affected by seasonal variation when compared to Old Orchard Beach as illustrated by Table 13 and Figure 11. The average seasonal variation in Saco’s retail sector is 22%, ranging from 16% to 26%

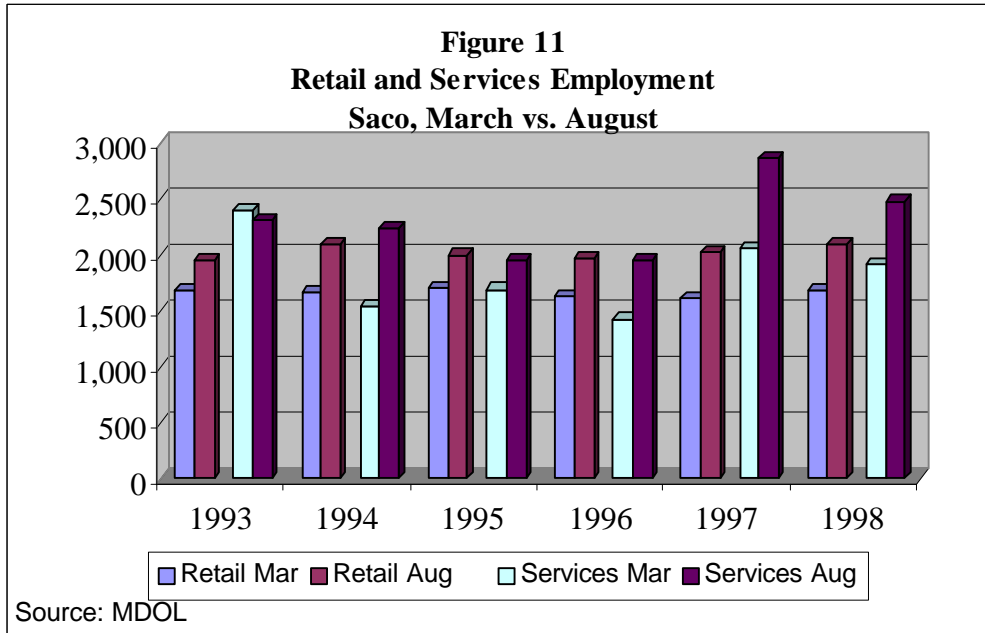
Table 13
Retail and Services Employment
Saco, March vs. August

	1993	1994	1995	1996	1997	1998	Total
Retail Mar	1,686	1,666	1,701	1,629	1,619	1,684	9,985
Retail Aug	1,952	2,102	2,004	1,982	2,023	2,098	12,161
% Change	16%	26%	18%	22%	25%	25%	22%
Services Mar	2,408	1,541	1,698	1,428	2,073	1,926	11,074
Services Aug	2,320	2,239	1,955	1,965	2,875	2,487	13,841
% Change	-4%	45%	15%	38%	39%	29%	25%

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Source: MDOL

between 1993 and 1998. The average seasonal variation in the services sector is slightly higher at 25%, ranging from -4% to 39% between 1993 and 1998.



The data in table 13 highlight the fact that Saco is less reliant on tourism than Old Orchard Beach regarding income and jobs. As illustrated in figure 11, seasonal variation for retail and services employment in Saco is considerably less than Old Orchard Beach. Nonetheless, the number of jobs represented by the retail and services sectors in Saco during peak season is substantially greater than Old Orchard Beach. These two employment sectors represented over 26,000 jobs in the Saco Bay region during peak season between 1993 and 1998.

5.8 Scarborough Retail and Services Employment

Scarborough's retail and services employment is the least seasonal of the three municipalities in the Saco Bay region. In fact, the average seasonal variations for both

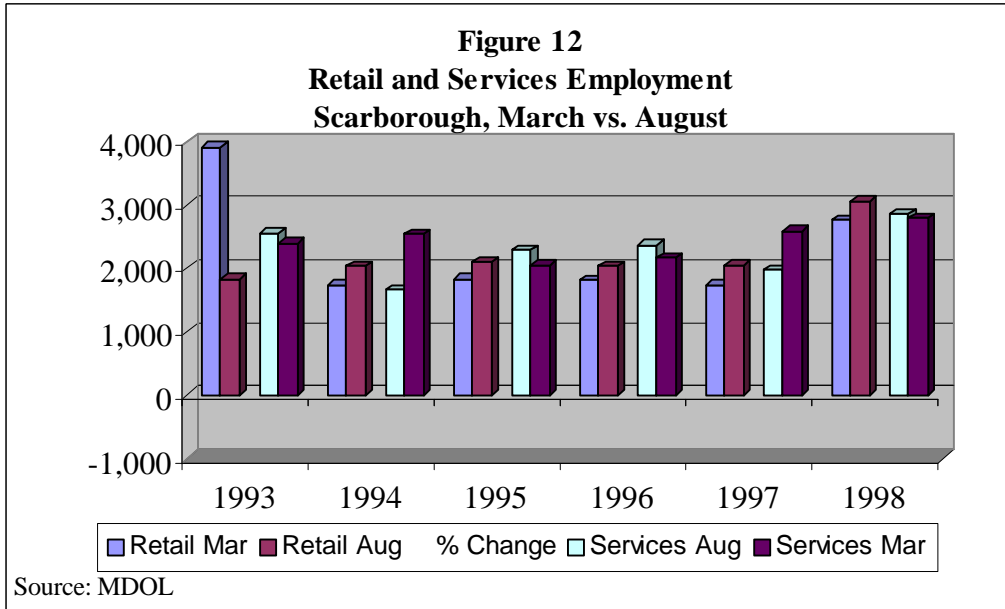
Table 14
Retail and Services Employment
Scarborough, March vs. August

	1993	1994	1995	1996	1997	1998	Total
Retail Mar	3,909	1,730	1,827	1,816	1,733	2,758	13,773
Retail Aug	1,826	2,042	2,093	2,040	2,057	3,064	13,122
% Change	-53%	18%	15%	12%	19%	11%	-5%
Services Mar	2,402	2,538	2,052	2,165	2,593	2,795	14,545
Services Aug	2,554	1,657	2,289	2,360	1,970	2,857	13,687
% Change	6%	-35%	12%	9%	-24%	2%	-6%

Source: MDOL

retail and services are -5% and -6% respectively. However, it is important to note that in the retail sector the average is skewed by a -53% change between March and August during 1993. The average seasonal variation for the retail employment sector in

Scarborough between the remaining years (1994-98) is 15%. The services employment sector is also skewed by sizable negative percentages during 1994 and 1997. Nonetheless, the retail and services sectors in Scarborough are less affected by seasonal variation than either Saco or Old Orchard Beach. See Table 14 and Figure 12.



Scarborough provides the region with nearly the same number of retail and services jobs during peak season as it does during the off season. The peak season represents slightly fewer than 27,000 jobs, with over 28,000 jobs during the off season between 1993 and 1998.

5.9 York County Total Taxable Sales, Other Retail and Restaurant/lodging

Taxable sales are an indicator of seasonal economic activity due to the fluctuations found between the first quarter (January-March) and the third quarter (July-September) of each year. The total taxable sales for York County create a framework for which to measure and compare taxable sales for each of the municipalities in the Saco Bay region. Table 15 shows the average annual taxable sales for York County between 1993 and 1998. The table compares first quarter retail and restaurant/lodging figures to third quarter figures in the same categories. The seasonal variation in the other retail category between 1993 and 1998 shows an increase of 194%. The seasonal variation for restaurant/lodging is considerably higher than other retail, showing a 429% increase over the same period.

Annual taxable sales for restaurant/lodging in York County averaged nearly \$153 million during peak season between 1993 and 1998, with an annual average of \$29 million

Table 15
Taxable Sales for York County
1993-98 in thousands

Year	1st Quarter		3rd Quarter		% change Other retail	% change Restaurant/ Lodging
	Other Retail	Restaurant/ Lodging	Other Retail	Restaurant/ Lodging		
1993	\$11,856	\$24,415	\$33,964	\$137,973	186%	465%
1994	\$11,593	\$26,091	\$33,928	\$136,008	193%	421%
1995	\$12,580	\$27,650	\$36,296	\$151,649	189%	448%
1996	\$13,188	\$30,284	\$46,538	\$154,607	253%	411%
1997	\$17,901	\$31,412	\$49,045	\$163,472	174%	420%
1998	\$19,325	\$34,108	\$51,768	\$172,592	168%	406%
Ave. annual	\$14,407	\$28,993	\$41,923	\$152,717	194%	429%

Source: Maine State Planning Office

during the off season. The other retail category contributed nearly \$42 million during the same time period. Other retail contributed roughly \$14 million during the off season.

5.10 Saco Taxable Sales, Other Retail and Restaurant/lodging

Average annual taxable sales in Saco between 1993 and 1998 are well below the averages for seasonal variation in York County as a whole. The average seasonal variation was 59% greater during the third quarter than during the first quarter for other retail sales. The

Table 16
Taxable Sales for Saco
1993-98 in thousands

Year	1st Quarter		3rd Quarter		% change Other retail	% change Rest/lodging
	Other Retail	Restaurant/ Lodging	Other Retail	Restaurant/ Lodging		
1993	\$1,171	\$2,285	\$2,116	\$7,089	81%	210%
1994	\$1,391	\$2,693	\$2,035	\$6,539	46%	143%
1995	\$1,361	\$2,754	\$2,373	\$7,139	74%	159%
1996	\$1,575	\$3,045	\$2,193	\$7,414	39%	143%
1997	\$1,697	\$3,437	\$2,466	\$8,034	45%	134%
1998	\$1,598	\$3,463	\$2,704	\$8,195	69%	137%
Ave. annual	\$1,466	\$2,946	\$2,315	\$7,402	59%	154%

Source: Maine State Planning Office *Saco Bay Regional Beach Management Plan*

February 2000

maximum seasonal variation was 81% in 1993, while the minimum variation was 39% in 1996. Restaurant/lodging sales increased by 154% on average between the first and third quarters, with a maximum increase of 210% during 1993 and a minimum increase of 134% in 1997. See table 16.

Other retail taxable sales in Saco during the peak tourist season (3rd quarter) averaged \$2.3 million between 1993 and 1998, versus an average of \$1.5 million for the off season. Restaurant/lodging taxable sales in Saco during peak season contributed \$7.4 million to the region in the same 5-year period, as compared to \$2.9 million in the off season.

5.11 Old Orchard Beach Taxable Sales, Other Retail and Restaurant/lodging

Average annual taxable sales in Old Orchard Beach show the greatest seasonal variation of the three municipalities in the Saco Bay region, as illustrated by table 17. The seasonal variation in Old Orchard Beach is considerably higher than the average seasonal variation for York County as a whole. Average increases between the first and third quarters during 1993-98 for other retail and restaurant/lodging are 393% and 1795% respectively. The greatest seasonal variation occurred in other retail occurred in 1995, representing a 527% increase between the first and third quarters. The lowest increase was in 1997 at 232%. The greatest seasonal fluctuation in restaurant/lodging occurred in 1995, with a 2108% increase between quarters. The least amount of change was a 1432% increase in restaurant/lodging sales during 1998.

Other retail taxable sales in Old Orchard Beach for the peak season average \$1.4 million between 1993 and 1998, versus \$288 thousand in the off season. Restaurant/lodging average annual taxable sales in Old Orchard Beach contributed \$18 million to the region during peak season over the 5-year period, as compared to \$980 thousand in the off season.

Table 17
Taxable Sales for Old Orchard
1993-98 in thousands

Year	1st Quarter		3rd Quarter		% change Other retail	% change Rest/lodging
	Other Retail	Restaurant/ Lodging	Other Retail	Restaurant/ Lodging		
1993	\$307	\$930	\$1,564	\$17,104	409%	1739%
1994	\$236	\$825	\$1,229	\$15,631	421%	1795%
1995	\$210	\$806	\$1,317	\$17,796	527%	2108%
1996	\$249	\$887	\$1,031	\$19,076	314%	2051%
1997	\$412	\$1,134	\$1,366	\$19,774	232%	1644%
1998	\$316	\$1,293	\$1,760	\$19,809	457%	1432%
Ave. annual	\$288	\$979	\$1,378	\$18,198	393%	1795%

5.12 Scarborough Taxable Sales, Other Retail and Restaurant/lodging

Scarborough's average annual taxable sales show a relatively small amount of seasonal fluctuation when compared to York County as a whole, with an average increase of 45% between the first and third quarters in the other retail category. The smallest seasonal increase in restaurant/lodging was 17% in 1996, while the greatest increase of 66% occurred in 1995. Restaurant and lodging sales averaged an increase of 332% between the first and third quarter during 1993-98. The maximum increase was 407% during 1993, while the minimum increase was 302% during 1998. See table 18 below.

Table 18
Taxable Sales for Scarborough
1993-98 in thousands

Year	1st Quarter		3rd Quarter		% change Other retail	% change Rest/lodging
	Other Retail	Restaurant/ Lodging	Other Retail	Restaurant/ Lodging		
1993	\$1,127	\$2,181	\$1,688	\$11,062	50%	407%
1994	\$1,660	\$2,600	\$2,266	\$11,101	37%	327%
1995	\$2,133	\$2,758	\$3,534	\$11,677	66%	323%
1996	\$2,037	\$3,070	\$2,390	\$12,566	17%	309%
1997	\$2,012	\$3,034	\$2,759	\$12,800	37%	322%
1998	\$2,289	\$3,478	\$3,778	\$13,996	65%	302%
Ave. annual	\$1,876	\$2,854	\$2,736	\$12,200	45%	332%

Source: Maine State Planning Office

Other retail average annual taxable sales in Scarborough during the peak season averaged \$2.7 million between 1993 and 1998, versus \$1.9 million in the off season. Restaurant/lodging average annual taxable sales in Scarborough contributed \$12 million to the region during the 5-year period, as compared to \$2.6 million in the off season

5.13 Saco Bay Region Taxable Sales, Other Retail and Restaurant/lodging

Table 19 shows the average annual taxable sales seasonal fluctuation for the entire Saco Bay region, with an average increase of 87% between the first and third quarters in the other retail category. The smallest increase was 45% in Scarborough, and the greatest increase was 393% in Old Orchard Beach.

The restaurant/lodging category average annual taxable sales seasonal fluctuation for the entire region is 488% between the first and third quarters. Old Orchard Beach offers the highest seasonal fluctuation in the region's restaurant/lodging category at 1795%, with Saco offering the lowest seasonal fluctuation at 154% between quarters.

Table 19
Taxable Sales for Saco Bay Region
1993-98 in thousands

Year	1st Quarter		3rd Quarter		% change Other retail	% change Restaurant/ Lodging
	Other Retail	Restaurant/ Lodging	Other Retail	Restaurant/ Lodging		
Ave. annual						
Saco	\$1,466	\$2,946	\$2,315	\$7,402	59%	154%
Old Orchard Beach	\$288	\$979	\$1,378	\$18,198	393%	1795%
Scarborough	\$1,876	\$2,854	\$2,736	\$12,200	45%	332%
Average annual						
Saco Bay Region	\$3,630	\$6,779	\$6,429	\$37,800	87%	488%

Source: Maine State Planning Office

5.13.1 Local Option Sales Tax

Taxable sales in the Saco Bay region offer an opportunity to fund regional beach management projects. For instance, Table 18 indicates that combined restaurant and lodging sales accounted for nearly \$45 million over the five-year period between 1993-98. At 1% and 2% of total restaurant and lodging sales, this equates to \$89,000 and \$178,000 per year on average, respectively. However, Title 36, Section 1813 of the Maine Revised Statutes Annotated prohibits retailers in Maine from collecting any sales tax above and beyond that identified by law.

Revenue collected at the local level from a local option sales tax on restaurants and lodging, for example, could provide necessary funding to improve Maine's beaches. This concept can be applied to any sector of the local tax base. As an example, the Town of Hilton Head, South Carolina assesses a 2% beach preservation fee on all short-term rental accommodations. This particular fund generates \$3 million per year that which has been used for beach nourishment projects over the last 10 years (personal communication, Hilton Head town planner).

5.14 Municipal Valuation

The assessed valuation of coastal property in the Saco Bay regional offer a quick glimpse of the value of the land and buildings that border Saco Bay. The table below provides comparisons of assessments for total land area in each municipality in the Saco Bay region as compared to beach-related land areas within each community. The figures given below in table 20 offer the best available data from Saco, Old Orchard Beach, and Scarborough.

For each of the three towns, beach-related property includes several parcels that are not directly on the water but according to municipal assessors are influenced by their close proximity to beaches. The beach-related designation is based upon the historical relationship between market value and assessed of property within designated areas of the three municipalities, thus providing an indicator of relative value based on proximity to beaches.

The total acreage of the towns of Saco, Old Orchard Beach and Scarborough is roughly 64,640 acres or about 101 square miles. The total number of land parcels within the three communities is 19,902, of which 2,989 are considered beach-related. Thus roughly 15% of the land parcels in the Saco Bay region qualify as beach-related properties.

Town	Total	Beach-related	% of Total
Saco	\$778,192,400	\$58,936,600	7.57%
Old Orchard Beach	504,324,350	198,566,400	39.37%
Scarborough	1,138,292,400	245,659,200	21.58%
Total	\$2,420,809,150	\$503,162,200	20.78%

* Does not include Biddeford
Source: Municipal Tax Assessors

ECONOMIC IMPACT -- Recommendations

5.15 Recommendations

Policy: Improve local and state capacity to measure and assess economic impact of beaches and associated tourism. The following actions will assist with measuring economic impact:

Actions:

- 5.1a) Promote a rigorous study of the economic impact of tourism to each of the beaches in Saco Bay, including market and non-market values as identified by surveying beach users during the tourist season.

Implemented by: Muskie School of Public Service or Margaret Chase Smith Center

Cost: \$50,000 (all southern Maine beaches)

Possible Funding: (1) Grant from Maine/New Hampshire Sea Grant; (2) municipal chambers of commerce; (3) local option sales tax

- 5.1b) Develop methods to provide analysis of existing taxable sales and employment data by industry for identified beach areas in Saco Bay, as well as other pertinent economic indicators for measuring the value of beach-related areas in Saco Bay and the economic impact of tourism in the region.

Implemented by: Maine Office of Tourism and Maine Department of Economic and Community Development

Cost: minimal

Possible Funding: Maine Office of Tourism and Maine Department of Economic and Community Development

Appendix G
Inconsistent Standards and Definitions between
Shoreland Zoning and Sand Dune Rules

Standard/Definition	Shoreland Zoning	Sand Dune Rules
lot coverage	<ul style="list-style-type: none"> • 20-70% for buildings, parking, driveways, and other non-vegetated areas • lot area excludes below high tide line and under roads 	<ul style="list-style-type: none"> • 20% for buildings • 40% for decks, lawns and other man-altered areas • single building cap of 2500sq.ft. • lot area excludes v-zone
buildings	<ul style="list-style-type: none"> • included under structure definition 	<ul style="list-style-type: none"> • defined as roofed permanent structures
structures	<ul style="list-style-type: none"> • anything built or constructed, including temporary structures, but not fences 	<ul style="list-style-type: none"> • buildings, pools, fences, but not driveways, parking lots, seawalls, any temporary structure
new structure setback	<ul style="list-style-type: none"> • variable: 0 to 75 ft. from high tide line 	<ul style="list-style-type: none"> • prohibited in frontal dune and v-zone • no closer than adjacent structures
additions	<ul style="list-style-type: none"> • if non-conforming due to setback, limited to 30% and no closer to shoreline (decks included) • if conforming, limited by lot coverage and height 	<ul style="list-style-type: none"> • second story allowed if <35 ft. and <50% of market value • no increase in footprint in frontal dune • back dune must meet lot coverage standard, no increase if above limit
reconstruction/replacement	<ul style="list-style-type: none"> • must relocate to meet setback to greatest extent possible • 30% cap if non-conforming 	<ul style="list-style-type: none"> • no footprint reconstruction allowed within one year in frontal dune
building height	<ul style="list-style-type: none"> • 35 ft. maximum or consistent with existing pattern 	<ul style="list-style-type: none"> • 35 ft. with variance option
driveways and parking lots	<ul style="list-style-type: none"> • variable: 25 to 75 ft. 	<ul style="list-style-type: none"> • not allowed in v-zone
fences	<ul style="list-style-type: none"> • exempt 	<ul style="list-style-type: none"> • fences allowed by permit • closed fences prohibited in a, b, or v-zone but open fences allowed

Source: DEP

Appendix I

REGIONAL BEACH MANAGEMENT PLANNING IN SOUTHERN MAINE

THREE-YEAR PLANNING DOCUMENT FY 1999-2001

Overview

For many years issues surrounding the management and use of beaches in Maine have been contentious as state and local officials attempt to balance the needs of property owners, tourists, wildlife, and flood control. In February, 1997, the State Planning Office and the Department of Environmental Protection established a working group of municipal representatives, property owners, state agency personnel and environmental advocacy groups to discuss coastal issues. The hope of the two departments was that sharing information and perspectives among those with differing views would lead to a common understanding which would result in policy changes at the state, local and federal levels regarding the management of coastal resources.

After many months of information gathering and debate among its members, the Task Force issue its report and recommendations in April, 1998. Among the recommendations in the report are two that address the development of long-term beach management plans. The Stakeholders Group recommended that:

- *Municipalities and state agencies should work with stakeholders, including land owners, environmental groups and business interests, to develop regional beach management plans that establish goals, policies, and recommended regulations that will guide how the beach resource will be managed. The Maine Department of Environmental Protection and the State Planning Office should participate in the development of the beach management plans to ensure that the proposed policies and regulations are consistent with the intent of state law, such as the Natural Resources Protection Act, and to monitor the results of the plans. DEP could, if warranted, change the administrative rules, recommend changes to state law, or delegate some authority to municipal or quasi-municipal authority that has established capacity to administer this law.*
- *The Southern Maine Regional Planning Commission should provide technical and organizational assistance in the development of these regional Beach Management Plans and serve as the liaison with interested State agencies.*

In response to these recommendations, the Maine Coastal Program within the State Planning Office has offered to partially fund a position at the Southern Maine Regional

Planning Commission for the next three fiscal years to implement these recommendations. In order to secure funding from the State Planning Office, the Regional Planning Commission, through the participating municipalities, must provide the remainder of the funds. The State Planning Office has indicated it will provide 50% of the funding. The purpose of this proposal is to provide further guidance to the affected municipalities on the scope of the project, the costs in each municipality for each year, and solicit commitments for participation.

Beach Management Planning

The Stakeholders Group has stressed the need for beach management planning to be done on a beach system basis and, with the input of coastal geologists, have identified eight beach management areas in mid-coast and southern Maine. (map attached) Two of these beach management areas, Reid, Popham and Seawall beaches in Phippsburg and Georgetown, and Crescent Beach in Cape Elizabeth are beyond the scope of this proposal, leaving six management areas to be addressed. Some of these areas are completely within one municipality (such as Goose Rocks Beach); while one involves as many as four municipalities (the Saco Bay system extending from Hills Beach in Biddeford to Western Beach in Scarborough). Economies can be achieved when planning for the isolated beach systems such as Goose Rocks and Horseshoe Cove by grouping beach systems that share issues such as erosion problems with similar existing development densities that could be addressed with similar approaches. In order to be effective, a beach management plan must involve all of the stakeholders with an interest in a particular beach system. These include beach-front property owners, wildlife managers, municipal officials, tourism-oriented businesses, floodplain managers and emergency preparedness personnel, state and federal agencies and others.

Management plans will contain an inventory and analysis of existing resources, uses and geologic process, projections of possible future trends in activity, a discussion of issues and options (including cost projections), recommendations for policies and implementation steps identifying the responsible parties and time frame for action. The plans should address the following issues, as appropriate for each system, and based on the geologic processes and natural, economic, and cultural resource values of each system.

Restoring or maintaining existing beaches. Based on available geological information, set measurable objectives for beach profiles and develop ways to achieve these profiles. This could include a protocol for replenishing beaches and changes to structures that interfere with sand transport. Included should be discussion of the long-term sand needs as well as short-term sand maintenance.

It should be noted that among other recommendations of the Stakeholders Group was that the Maine Geologic Survey should maintain geologic information for each beach system in southern Maine for use in beach management planning. The Survey has indicated a willingness to do so and provide its technical expertise to the planning efforts.

Reducing risks to property. Set measurable objectives for reducing damage to coastal property. Take actions to improve the design and location of existing and

new structures in coastal hazard areas so that they avoid or withstand damage from coastal storms and shoreline erosion. Issues around the maintenance of existing roads, utilities and stormwater outfalls should be addressed.

Protecting wildlife habitat. Set measurable objectives for protecting wildlife populations and habitat. Take actions to further protect State-designated “essential” habitat for endangered species.

Enhancing the economic value of beaches. Set measurable objectives for public access to the beach. Issues around handicapped access, paper streets, and providing services such as bathrooms to beach-goers should be addressed in this section. The plan should also address maintenance or improvement of public access to support tourism-oriented businesses while meeting the needs of beach-front land owners.

Reforming beach regulations. Develop ways to tailor state regulations to better reflect local conditions. Develop ways to improve education and enforcement of these regulations by both municipal and state governments.

Regional coordination. Develop ways to communicate and make decisions about beach management issues among the stakeholders.

The management plans, once endorsed by the municipalities should serve as the blueprint for the overall management of the beach system. These plans will be implemented by municipalities from their day-to-day sand maintenance to their land use regulations to long-term capital planning for harbor improvements. These plans will also be used by state agencies in the amendment or development of policies and regulations for beach maintenance and development on sand dunes.

Other Activities and Assistance

At a meeting in late March municipal officials expressed concern over the benefits they would receive during the years they are not involved in the production of the beach management plan. They were asked to articulate their needs. Most of the attending municipalities responded. Among the activities cited by were:

- assistance on preventing further erosion and establishing a nourishment program
- work with a coastal area committee if it is formed
- assistance to the parks and the public works departments on current management programs
- assistance on municipal permit applications to state and federal agencies
- assistance on funding searches
- liaison and coordination with state and federal agencies on regional coastal issues
- public education on floodplain management; wise coastal management; etc.
- dredging and harbor maintenance
- identification and removal of non-point sources of pollution
- protection of back dune vegetation and natural features of beach

As time allows, the planner will be available to provide these types of services as well as others which are related to beach, harbor and coastal resource management. The steering committee, discussed below, will prioritize these activities and develop an annual work plan which articulates the activities to be accomplished in each year of the project.

Organization and Oversight

During the Summer of 1998, each participating municipality appointed a policy level municipal official to a steering committee to oversee the work of the planner. This committee is in addition to the committees formed to produce each of the regional management plans. The purpose of the steering committee is to provide direction to the activities of the planner and to assure that the needs of the participating municipalities are being addressed through the development of an annual work plan. The Steering committee, comprised of three municipal planners and two elected municipal officials, represents the long-term planning interests in the southern Maine beach region.

Care must be taken to preserve a balance between the time spent on the regional management plan being developed in any given year and attending to the needs of the municipalities not involved in that effort.

The Steering Committee will also be able to establish priorities and directions for activities that are truly regional in scope such as serving as a liaison with state and federal agencies and providing materials or workshops for the public on coastal resource management issues.

Costs

The costs of providing a full time planner at SMRPC is estimated at \$60,000 per year including salary, benefits, and overhead costs. The Maine Coastal Program will be providing \$30,000 of this amount. In addition to providing assistance in the development of regional beach management plans, this individual would also provide information and technical assistance to municipal officials in beach maintenance, land use planning and development review on the beach system. It is envisioned that no more than one regional beach management plan will be undertaken in a year.

The municipalities that are participating in the development of a regional beach management plan should share the proportionate cost of the benefit they will be receiving from the coastal planner. It is proposed that half of the local share be provided from these municipalities with the other half being split among the remainder. For FY 1999, it is recommended that the Saco Bay beach system be chosen for the development of a management plan. This system incorporates Hills Beach and the Saco River inlet and delta to Pine Point and Western Beaches (Beach Management Area #6). The participating municipalities are Saco, Old Orchard Beach and Scarborough. Each of these municipalities has been requested to contribute \$3,750. The remaining three municipalities have been asked to contribute \$3,000 each.

In future years the share of the local contribution will be adjusted to reflect the municipalities participating in the intensive effort of developing management plans. It was recommended that the Wells Bay beach system be chosen for the development of a management plan during FY 2000. The two municipalities involved in this planning effort would each contribute \$6,825. The three remaining municipalities have been asked to contribute \$5,450. In FY 2001, Scarborough and Higgins Beaches will be the subject of the planning effort. Scarborough will be asked to contribute \$6,600, Old Orchard Beach \$5,900 and Saco \$5,900, and Kennebunk and Wells and \$5,700 and \$5,900 respectively in FY 2001.

Schedule of Municipal Contributions

1999 Saco Bay System: Scarborough, OOB, and Saco

2000 Wells Bay System: Kennebunk, Wells, and Ogunquit

2001 Scarborough and Higgins Beaches

	1999	2000	2001	Total
Scarborough	3,750	5,450	6,600	15,800
Old Orchard Beach	3,750	5,450	5,900	15,100
Saco	3,750	5,450	5,900	15,100
Kennebunk	3,000	6,825	5,700	15,525
Wells	3,000	6,825	5,900	15,725
Total	\$17,250	\$30,000	\$30,000	\$77,250

Commitment and Schedule

The Coastal Program of the State Planning Office has indicated its willingness to commit to funding for this project for at least three years. At previous meetings and in correspondence since, municipalities have expressed the need to know that each of the other participating communities will continue to participate throughout the entire process. It has been suggested that a formal memorandum of understanding be drafted between the participating municipalities, SMRPC, SPO and DEP. If enough municipalities feel that such a document is desirable, SMRPC will proceed to draft one. This document would formalize many of the concepts contained in this proposal, indicate the commitment of each municipality to fully fund its share throughout the three year period and set out the roles and expectations for each party.

At the late March meetings, DEP was asked to indicate the extent it would be open to regulatory changes in response to the beach management plans. This commitment could be articulated in the memorandum of understanding.

Municipal officials should contact Jon Kachmar, Coastal Resources Planner, at 324-2952 with responses, questions or comments.

Appendix J

Memorandum of Understanding

Southern Maine Regional Beach Management Planning Project

The following is a memorandum of understanding between municipalities, state agencies and the Southern Maine Regional Planning Commission concerning the Southern Maine Regional Beach Management Planning Project (from hereinafter "Project").

Purpose of the Agreement

The purpose of this understanding is to establish a voluntary agreement (from hereinafter "Agreement") between parties regarding the funding, development and implementation of regional beach management plans for southern Maine's beach systems.

Duration of Agreement

The Agreement shall commence on November 1, 1998, and remain in effect until June 30, 2001. If the regional planning process is extended beyond the termination date, all parties shall be informed of such intentions and requested to extend this Agreement. The Agreement shall remain in force until planning efforts cease or the parties cancel the Agreement in accordance with the terms set forth herein.

Project Description

The beach planning Project is a recommendation of the Southern Maine Beach Stakeholder Group report published jointly in April 1998 by the Maine State Planning Office, the Department of Conservation and the Maine Department of Environmental Protection. The Group's report identifies the following issues: (1) restoring or maintaining existing beaches, (2) reducing risks to property, (3) protecting wildlife habitat, (4) enhancing economic value of beaches, (5) reforming beach regulations, and (6) regional coordination. For a period of three years the Southern Maine Regional Planning Commission will assist municipalities with developing and implementing regional beach management plans that address the identified issues.

The first phase of the Project will develop a plan for Saco Bay in FY 1999. The second phase of the Project will focus on the Wells Bay system during FY 2000. The third and final phase of regional plan development will take place during FY 2001 and focus on the Scarborough Beach and Higgins Beach systems.

General Provisions

Should there come a time when any party is unable to perform its function under this Agreement in a fashion which is consistent with the intent of the Project, the affected party agrees that it will immediately contact the others so that an early resolution can be reached.

Parties to the Agreement

Southern Maine Regional Planning Commission (SMRPC)
Maine State Planning Office (SPO)
Maine Department of Environmental Protection (DEP)
Town of Scarborough
Town of Old Orchard Beach
City of Saco
Town of Kennebunk
Town of Wells

Responsibilities of the Parties Under Agreement

In consideration of the mutual aims and desires of the parties to this Agreement and in recognition of the public benefit to be derived from effective implementation of regional beach management plans, the parties agree that their responsibilities under this Agreement shall be as follows:

Southern Maine Regional Planning Commission:

SMRPC will provide planning and technical assistance to municipalities participating in the Project. In addition to providing assistance during the plan development stages for each regional plan, SMRPC will provide assistance with other coastal zone management issues as identified by each municipality, including but not limited to the following: state and federal permit applications, erosion prevention and sand nourishment, public education, and nonpoint source pollution.

Maine State Planning Office:

Under the terms of the this MOU, the State Planning Office will provide SMRPC with a grant of \$30,000 per year for fiscal years 1999 through 2001, which SMRPC will in turn match with municipal contributions of \$30,000 per year during fiscal years 1999 through 2001(see *Cost of Project* section below). SPO also will provide planning and technical assistance to municipalities through SMRPC staff, acting as liaison between state agencies when necessary.

Maine Department of Environmental Protection:

DEP will provide assistance to SMRPC and the municipalities in their development and implementation of the regional beach management plans and will consider in good faith proposals made through this process for delegation of or changes to applicable regulatory authority.

Municipalities:

After municipalities have had ample opportunity to analyze and discuss beach management plan recommendations as they pertain to their municipalities, they agree to make a good faith effort to implement regional beach management plans, including regulatory modifications if necessary.

Realizing that municipal funding processes may make it difficult to guarantee funding over the course of the three-year Project, municipalities must make every reasonable effort to ensure continued participation and commitment to the Project. Funds from municipal contributions may be earmarked for the entire duration of the Project at any time and will be held in escrow by SMRPC.

Implementation of Regional Beach Management Plans:

Each regional plan developed during the Project will include a deadline for implementation, taking into consideration the possibility of phase-in periods. In the event deadlines are not met, all parties to this Agreement will make a good faith effort to implement plan recommendations within a reasonable period of time following scheduled implementation deadlines provided that all municipalities agree to such recommendations.

Additional Parties to the Agreement

Non-participating municipalities within identified regional beach systems may participate in plan development and implementation provided they designate funding equal to their proportion of benefits derived during the period of non-participation. Non-participating municipalities which choose to participate after the commencement date will provide funding equal to the complexity of beach planning issues within that municipality and the estimated additional time commitment from SMRPC staff. In the event of additional municipal participation, existing participants will receive a reduction or refund proportionally equal to the contribution increase resulting from new municipal contributions.

Cost of Project

The cost of the coastal planner hired to coordinate the development of regional plans is estimated to be \$60,000 per year, including salary, expense reimbursement and overhead. Half of the funding for all three years of the Project is provided through a matching grant from SPO to SMRPC. The Project is dependent upon a match from municipal participants, equaling roughly \$30,000 per year for fiscal years 1999 through 2001. The Schedule of Municipal Contributions is attached as appendix A.

Amendment or Cancellation of Agreement

The Agreement may be amended at any time in writing and by mutual consent of the parties. The Agreement may be canceled by any party upon thirty (30) days written notice except where the cancellation is for cause, i.e. a material and significant breach of any of the provisions of this Agreement, it may be canceled upon delivery of written notice to the other parties.

Date:

Southern Maine Regional Planning
Commission Representative

Date: Maine State Planning Office
Representative

Date: Maine Department of Environmental
Protection Representative

Date: Town of Scarborough
Representative

Date: Town of Old Orchard Beach
Representative

Date: City of Saco
Representative

Date: Town of Kennebunk
Representative

Date: Town of Wells
Representative

Schedule of Municipal Contributions

1999 Saco Bay System: Scarborough, OOB, and Saco

2000 Wells Bay System: Kennebunk, Wells

2001 Scarborough and Higgins Beaches

	1999	2000	2001	Total
Scarborough	3,750	5,450	6,600	15,800
Old Orchard Beach	3,750	5,450	5,900	15,100
Saco	3,750	5,450	5,900	15,100
Kennebunk	3,000	6,825	5,700	15,525
Wells	3,000	6,825	5,900	15,725
Totals	\$17,250	\$30,000	\$30,000	\$77,250

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