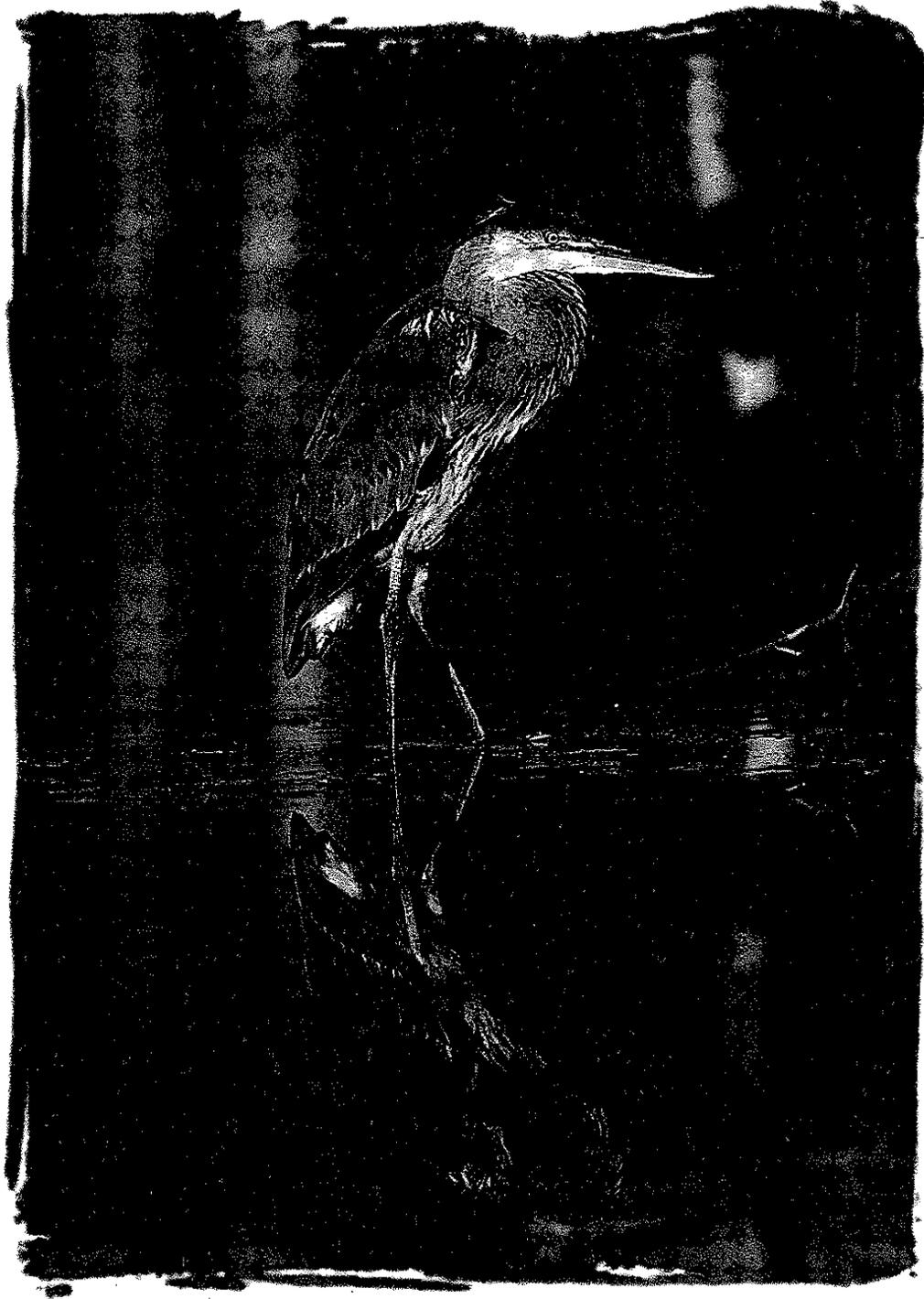


CASCO BAY PLAN

Protect the health and integrity of our bay for the future.



Casco Bay Estuary Project

CASCO BAY PLAN



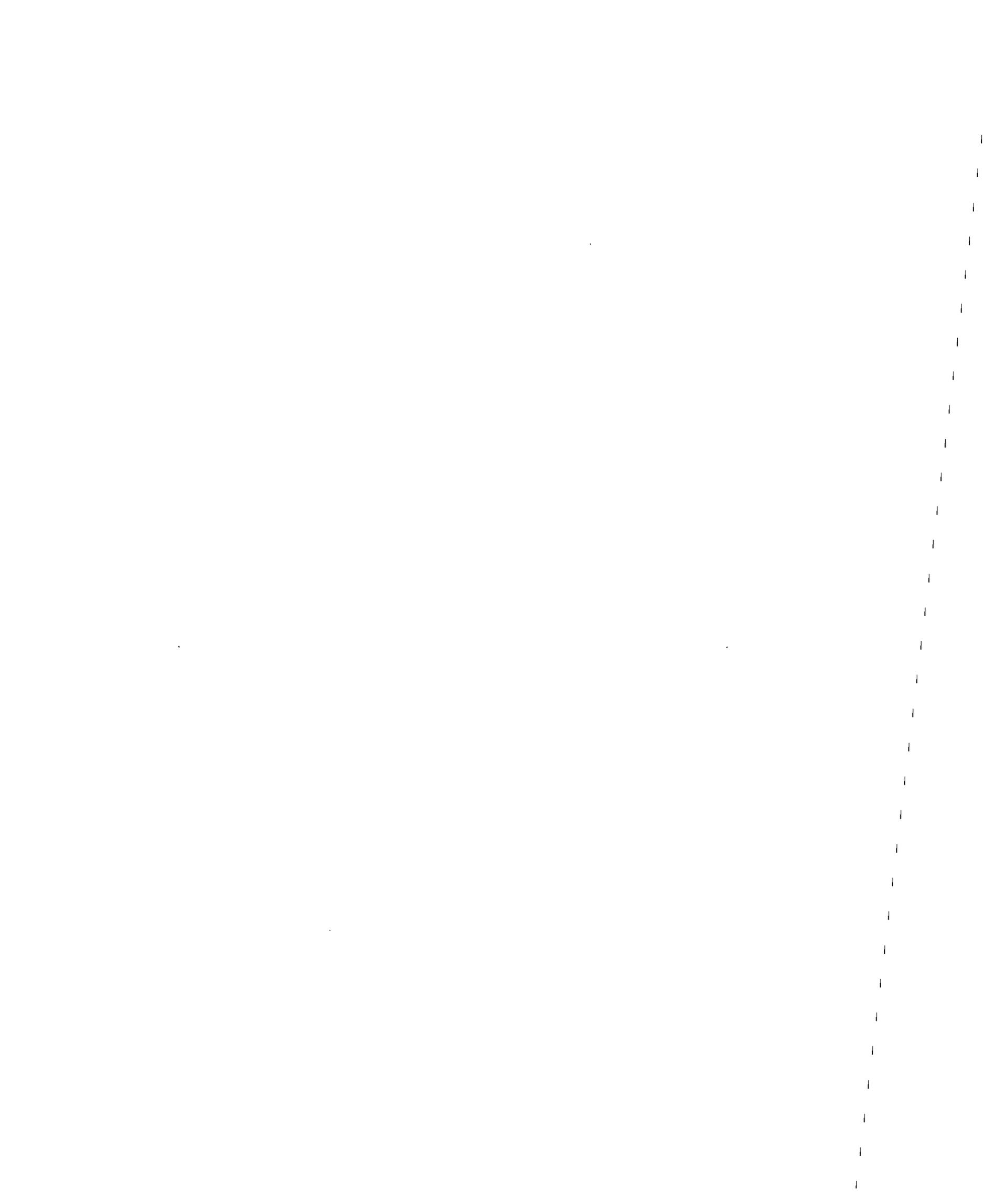
FALL 1996
Casco Bay Estuary Project

CASCO BAY PLAN

TABLE OF CONTENTS

	PAGE NUMBER
INTRODUCTION	1
1. STATE OF THE BAY	5
History of Pollution in Casco Bay	6
Changing Demographics Around Casco Bay	8
Water Quality in Casco Bay	9
The Value of Casco Bay	12
Progress in Understanding Casco Bay	14
Where Are We Going?	17
2. STORMWATER IN CASCO BAY	19
Introduction	20
Water Quality Problems	22
Pollution Sources	24
Economic Impacts	28
Regulatory Measures	29
Recommendations	33
3. CLAM FLATS AND SWIMMING AREAS	35
Introduction	36
Sources of Contamination	37
Economic Effects of Contamination	43
Public Health Effects of Contamination	45
Ecological Effects of Contamination	45
Regulatory Measures	46
Assessment of Regulations	48
Recommendations	49
4. HABITAT PROTECTION	51
Introduction	52
Species Diversity and Density	53
Prime Habitats	54
Habitat Threats	59
Habitat Degradation	61
Ecological Impacts	63
Economic Value of Habitat	65
Regulatory and Other Protective Measures	67
Recommendations	72
5. TOXIC POLLUTION IN CASCO BAY	73
Introduction	74
Types of Toxic Pollution	75
Sources of Toxic Pollution	76
Concentrations of Toxic Pollution	82
Ecological Effects	85
Economic Effects	88
Trends	88
Regulatory Measures	89
Recommendations	90

	PAGE NUMBER
6. STEWARDSHIP	91
Introduction	92
Stewardship Roles	93
Recommendations	102
7. DEVELOPING NEW SOLUTIONS	105
Introduction	106
Public Education Actions	108
Technical Assistance Actions	118
Regulatory/Enforcement Actions	127
Planning and Assessment Actions	134
8. MEASURING PROGRESS: THE CASCO BAY MONITORING PLAN....	145
Introduction	146
Stages of Change	147
Monitoring Plans	148
Summary	151
9. IMPLEMENTING AND FINANCING THE CASCO BAY PLAN.....	153
Introduction	154
Options for Managing Casco Bay	154
Management Structure for <i>Plan</i> Implementation	157
Board Structure	157
Funding the <i>Casco Bay Plan</i>	160
Funding Approach	161
Funding Sources	162
Future Funding Mechanisms	163
10. COORDINATING WITH FEDERAL PROGRAMS	167
Federal Consistency Review	168
The <i>Casco Bay Plan</i> and the Maine Coastal Program	170
Endangered Species Act and National Historic Preservation Act Reviews	171
Endangered Species Act	171
11. DEVELOPING THE CASCO BAY PLAN	179
Introduction	180
Organization	180
The Process	181
Setting Priorities	182
Developing the <i>Casco Bay Plan</i>	183
Local Government Input	185
Lecture Series	185
Long-Term Management	185
Public Outreach Activities	186
Grants	188
GLOSSARY.....	192
BIBLIOGRAPHY	199
APPENDICES	203
Appendix A: Further Reading: Information and Study Reports Funded by the Casco Bay Estuary Project	
Appendix B: State of Maine Water Quality Standards	
Appendix C: About the National Estuary Program	
Appendix D: Summary of Grant Projects Funded by the Casco Bay Estuary Project	
Appendix E: Committee Participation in the Casco Bay Estuary Project	
Appendix F: Summary of Public Comments on the Draft <i>Casco Bay Plan</i>	
Appendix G: Commitment Letters	



INTRODUCTION



CASCO BAY PLAN

The Casco Bay Estuary Project is a cooperative effort to protect and prevent the pollution of Casco Bay by involving concerned citizens and local, state, and federal governments.

Developed through a collaborative process involving hundreds of individuals and dozens of organizations and government agencies, this Plan represents the commitment of citizens, industries, and communities to protect Casco Bay. It marks the culmination of five years' effort involving scientific studies, public feedback, local government input, and countless meetings and discussions.

We invite you to get involved and help us renew Casco Bay.

INTRODUCTION

Casco Bay lies at the heart of Maine's most populated area. The health of its waters, wetlands, and wildlife depend — in large part — on the activities of the quarter-million residents who live in its watershed.

Less than 30 years ago, portions of Casco Bay were off-limits to recreation, fishing, and clamming. The lower Presumpscot River was devoid of fish, and paint peeling off nearby homes was attributed to the strong odor of chemicals emanating from the river. Back Cove and the Fore River were "open sewers" and any human contact was dangerous to one's health.

With the passage of clean water laws and the cooperation of business, industry, and municipalities, the former obvious threats to Casco Bay, such as sewage, industrial waste, and oil, have been greatly reduced. Portland area residents can swim and boat off East End Beach and sailboard in Back Cove. Great blue heron, snowy egrets, and osprey are seen along the Presumpscot River. *The policies and actions of the past 20 years have paid off in tangible ways.*

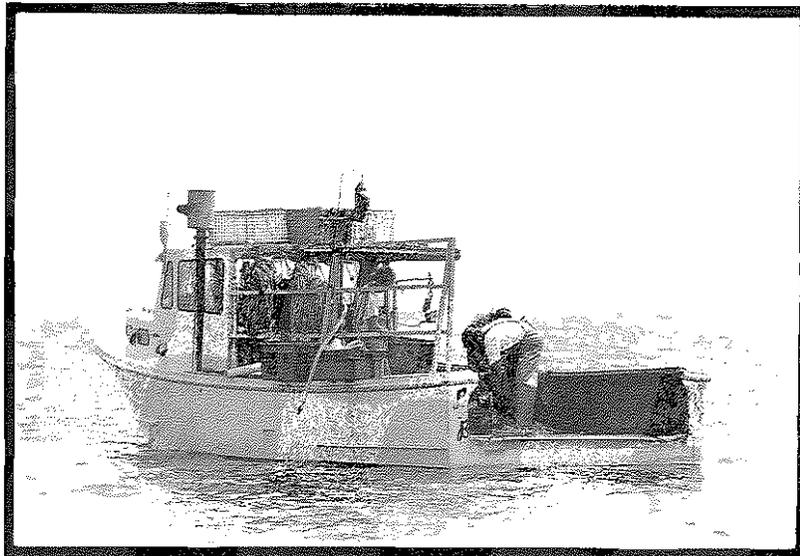


photo by Christopher Ayres

A watershed encompasses the land area that drains into a particular stream, river, or bay. Watersheds can vary in size from a few acres (for a minor stream) to thousands of square miles.

- The watershed of Casco Bay encompasses 985 square miles of land, which includes 41 municipalities. It stretches from the coast at Cape Elizabeth east to Cape Small in Phippsburg, and northwest to Bethel, in the western mountains of Maine.
- The shoreline of Casco Bay covers 578 miles (including 785 islands, islets, and exposed ledges), and the water surface encompasses nearly 200 square miles.
- Twelve significant lake and river systems feed the bay, including Sebago Lake and four major tributaries: the Presumpscot, Royal, Stroudwater, and Fore rivers.
- While the Casco Bay watershed represents only 3 percent of Maine's total land mass, it holds nearly 25 percent of the state's population. Residents depend on the bay and its watershed for multiple (and sometimes conflicting) needs — drinking water, recreation, food, transportation, industry, and waste disposal.

Recognition of the interconnections within each watershed has led to a new approach in environmental management and land use planning. Rather than focusing on local towns or individual species, efforts are now made to sustain the health of the whole ecosystem. **This Plan incorporates a “watershed” view in its recommendations for protecting the Casco Bay estuary.**

While the environmental health of the bay has improved, specific problems relating to conflicting human use, pollution, and habitat loss remain, which prompted public concern about the overall health of the bay in the 1980s. Elevated levels of toxic contaminants have been found in sediments, mussels, and lobster tomalley taken from urban portions of the bay. Through selection of Casco Bay as an estuary of national significance by the U.S. Environmental Protection Agency, Maine received federal support under Section 320 of the Water Quality Act of 1987 to study the state of the bay, assess the impact of human activities, and determine the actions needed to improve its health.

Developed through a collaborative process involving hundreds of individuals and dozens of organizations and government agencies, this *Plan* represents the commitment of citizens, industries, and communities to protect Casco Bay. It marks the culmination of five years' effort involving scientific studies, public feedback, local government input, and countless meetings and discussions. *Through this effort, a view of a generally healthy bay is emerging.*

To understand Casco Bay and prevent further pollution/degradation, this *Plan* focuses on five key issues of importance to the health of the bay. These issues, identified through an inclusive public process, are stormwater management, clam flats and swimming areas, habitat protection, toxic pollution, and stewardship of the bay.

The stress imposed on Casco Bay by our activities is directly attributable to the demands of population growth and suburbanization, which is expected to continue. Roughly 60 percent of the pollution comes from diverse sources, such as oil and chemicals from roadway runoff, pesticides applied by homeowners, and fertilizers from farm fields. These “nonpoint” sources of pollution are difficult

to control and are not easily regulated. Reduction of nonpoint-source pollution is therefore a major focus of this *Plan*.

In the following chapters, each of the five priority issues is described in detail. Although there are many issues important to Casco Bay, these five were selected as the most important issues that were not being addressed comprehensively by others. Chapters 2 through 6 help define the five priority issues and their relationship to the health of Casco Bay.

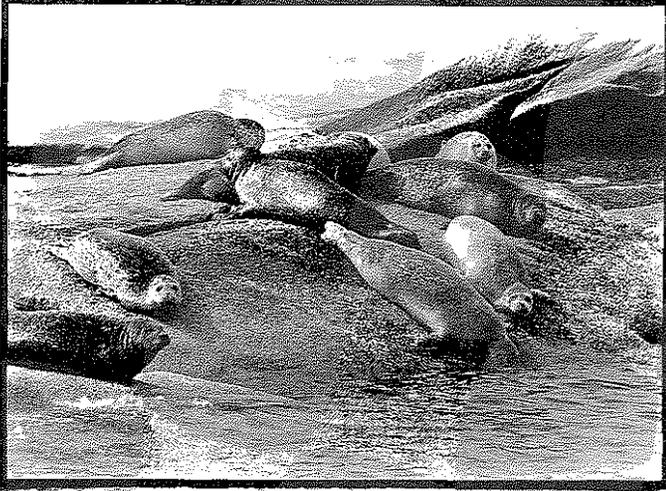


photo by Christopher Ayres

Beyond a review of the problem areas is the need to agree collectively on ways to move forward and responsibly protect the bay into the future. Chapter 7, *Developing New Solutions*, is the heart of this *Plan*. Actions to protect the bay are presented in four areas: public education, technical assistance, regulation and enforcement, and planning and assessment. The monitoring plan (Chapter 8) describes how progress implementing the *Plan* will be measured. Together these two chapters set forth a map to guide protection efforts during the next five years and establish a program for protection into the future.

To understand Casco Bay

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stewardship of the bay.

The structure and leadership needed to realize this vision are described in Chapter 9, which outlines an implementation and finance plan. How to implement the *Plan* has been the subject of numerous discussions and has been probably the most important subject to be resolved in order to ensure that the actions supported by the community are completed.

Chapter 10 defines the process that will be used to ensure that federal programs are coordinated and that federally funded activities that occur in the watershed support our effort.

Finally, Chapter 11 provides an overview of how the *Plan* was developed.

STATE OF THE BAY



CASCO BAY PLAN

STATE OF THE BAY

*Casco Bay
provides a
major link
between open
ocean, fresh water,
and the land.
Past and present
human activities
impact its
health today.*

History of Pollution in Casco Bay

The arrival of European settlers in the late 18th century brought unprecedented changes to the Casco Bay region. Soils from cleared lands resulted in erosion that filled former harbors, such as Mast Landing in Freeport, and dams blocked the passage of fish to spawning areas.

By the middle of the 19th century, Portland had become a major commercial port, with industries (*e.g.*, railroad yards, tanneries, metal foundries, canneries, and paint manufacturers) that emitted airborne pollution and discharged untreated waste, heavy metals, and other pollutants into the bay.

As the population and industrial base around Portland grew, pollution intensified. The early half of this century was marked by growth in manufacturing of glass, paper, textiles, metals, and



photo by Christopher Ayres

shoes, as well as the start of tourism and construction of seasonal shorefront homes. Increased use of automobiles added to marine pollution through airborne emissions, roadway runoff, improper disposal of oil and fluids, and leaking underground fuel storage tanks.

There was little understanding of pollution’s ecological consequences during this era, and hence no regulation. When links were established between disease and water quality, laws were enacted as early as 1903 to protect Sebago Lake, the region’s water supply. To prevent consumption of clams from contaminated areas, the Interstate Shellfish Sanitation Conference adopted the National Shellfish Sanitation Program in 1925. Little action was taken to reduce pollution entering marine or estuarine waters.

By the middle of this century, portions of Casco Bay were an open sewer — toxic to wildlife and humans alike. The Presumpscot River, one of the sub-watersheds that feed Casco Bay, received human waste from 11,000 residents and untreated industrial discharges from textile, pulp, and paper mills. According to reports from Presumpscot River Watch, pollution was so severe that by 1965 there was “no measurable oxygen” in the river, which resembled a “root beer float” with brown bark chips a foot deep, topped by foaming chemicals. A state report that year declared the lower river “dead” and conditions for nearby residents “intolerable.”

While attempts had been made to enact federal and state water quality laws in the late 1940s and 1950s, these initial efforts failed to keep pace with water pollution. Being underfunded and understaffed, state agencies could not adequately regulate the activities of municipalities and industries.

Relief finally came in the early 1970s with passage of the federal Clean Water Act, which mandated sewage treatment and industrial treatment of wastes and provided funds to help municipalities install the necessary equipment. This legislation led to construction of sewage treatment plants in municipalities along Casco Bay.

Reduction of these “point sources” of pollution had a dramatic impact on the bay, permitting the return of many wildlife species, and recreational use of the bay increased. Because the bay no longer looked dirty, most people began to consider it a healthy body of water.

These assumptions were challenged in articles appearing in the *Portland Press Herald* and with the publication in 1988 of a report entitled *Troubled Waters — A Report on the Environmental Health of Casco Bay*. Produced by the Conservation Law Foundation and the Island Institute, this report examined impacts of bacterial contamination and levels and sources of toxic pollution. It was proposed in the report that the bay’s ecosystem was more polluted than had previously been thought, with toxic contamination levels rivaling those of the country’s worst urban harbors. As

Reduction of these “point sources” of pollution had a dramatic impact on the bay, permitting the return of many wildlife species, and recreational use of the bay increased.

media reports spread this information, the public image of a pristine bay was shattered. Residents of the watershed were disturbed by the news and sought prompt governmental action.

The Maine Department of Environmental Protection prepared an Agenda for Action, spelling out measures to clean up the bay, and nominated Casco Bay to a U.S. Environmental Protection Agency program designed to help restore and protect the health of significant estuaries. Admission to the National Estuary Program would provide the federal funds and technical guidance necessary to begin studying the bay, with support administered through a federal/state partnership working at the local level.

In 1990, Casco Bay was selected as an estuary of national significance, and the Casco Bay Estuary Project office was established in Portland to coordinate local efforts. *(For more information on the National Estuary Program, see Appendix A; for more information on the process undertaken in preparing this Plan, see Chapter 11, Developing the Casco Bay Plan.)*

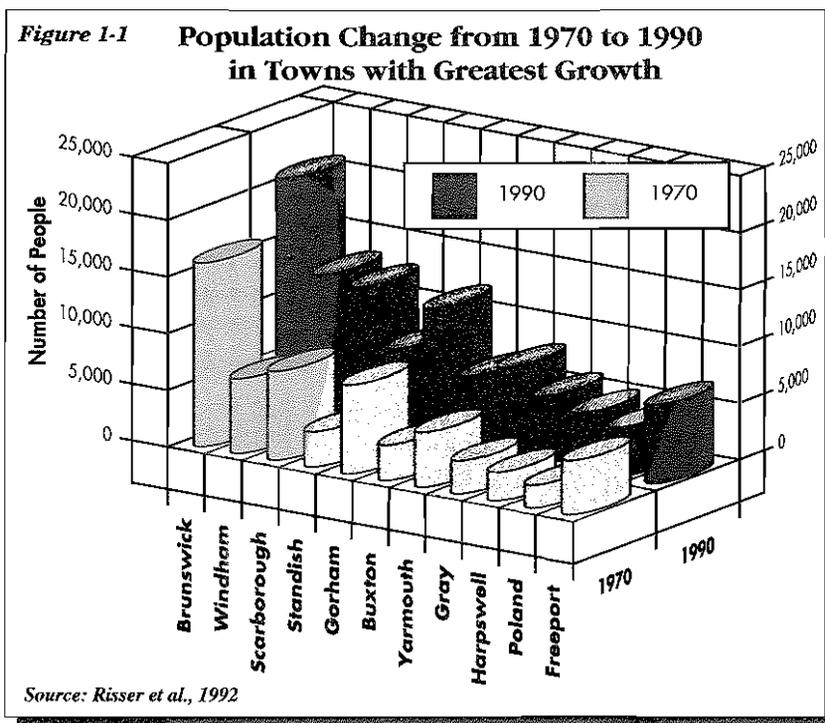
Changing Demographics Around Casco Bay

The concern that surfaced in the late 1980s over the fate of Casco Bay was prompted by demographic factors as well. Growth in population and housing development within the watershed, which had risen steadily for decades, jumped sharply during the “building boom” of the 1980s.

Prior to this period, the region had experienced only modest growth. During the first major influx of European settlers, between the American Revolution and the Civil War, the population of the Casco Bay watershed grew from 30,000 to nearly

80,000, but the growth was evenly distributed. Land grants to veterans helped settle the interior and new industries prompted development in coastal towns.

Growth slowed considerably in the latter half of the 19th century as people migrated out of Maine to find work in other urban areas or to settle in the West. Of the 33 main cities and towns in the Casco Bay watershed, 24 lost popu-



lation between 1850 and 1900, while Portland grew from 20,000 to 50,000, accounting for nearly all the region's net growth.

Population began climbing again early in this century, with a rise in manufacturing around Portland, the growth of tourism, and construction of seasonal homes. Beginning around 1950, improved transportation and the lure of cheaper land and taxes prompted the process of "suburbanization." Widespread construction of single-family homes, on large 2- to 5-acre lots, contributed to rural sprawl and fragmentation of fields and woodlands.

During the period between 1970 and 1990, almost 80 percent of total growth in the lower watershed took place in 11 suburban and rural communities: Brunswick, Windham, Scarborough, Standish, Gorham, Buxton, Yarmouth, Gray, Harpswell, Poland, and Freeport (*see Figure 1-1*). Many of these towns are now bedroom communities, with residents driving to work in larger communities. This lifestyle has led to a proliferation of cars and accompanying environmental problems. While the population of the lower watershed increased by 50,000 people between 1970 and 1990, the number of registered vehicles in Cumberland County during that period increased by roughly 70,000.

Population growth is projected to continue in the lower watershed, with a 9 percent increase over 1990 census figures expected by the year 2000.

Water Quality in Casco Bay

The health of bay waters is determined, in large measure, by levels of dissolved oxygen, nutrients, bacteria, and toxic pollutants, as well as habitat quality and the health of the biological community. Assessments of these parameters help to determine whether waters can support a full and diverse range of marine life and uses.

When dissolved oxygen levels fall below a certain threshold (which varies for each plant and animal species), marine life must move or perish. A number of

Table 1-1

Rivers and Brooks Failing to Meet Water Quality Standards Due to Agricultural Practices

River, Brook	Water Quality Standards (See Appendix B)	Watershed	Town(s)
Chandler River	Class B	Royal River	North Yarmouth, Pownal
Unnamed Brook	Class C	Royal River	North Yarmouth, Yarmouth
Thayer Brook	Class B	Presumpscot, Pleasant	Gray
Otter Brook	Class B	Presumpscot River	Windham
Black Brook	Class B	Presumpscot River	Windham
Colley Wright Brook	Class B	Presumpscot River	Windham
Mosher Brook	Class B	Presumpscot River	Windham
Inkhorn Brook	Class B	Presumpscot River	Windham
Hobbs Brook	Class B	Presumpscot River	Cumberland
E. Branch Piscataqua	Class B	Presumpscot River	Falmouth
Alewife Brook	Class A	Coastal	Cape Elizabeth

Source: Maine Department of Environmental Protection, 1994 Water Quality Assessment

tributaries that feed Casco Bay fail to meet minimum standards for dissolved oxygen, according to an assessment made by the Maine Department of Environmental Protection in 1994 (see Appendix B for information on water quality standards).

The lack of dissolved oxygen in these rivers is attributed to agricultural practices that allow manure and fertilizers to run off into streams. Additional tributaries fail to meet standards for dissolved oxygen due to loadings from urban runoff.

Table 1-2 Rivers, Brooks, and Creeks Failing to Meet Water Quality Standards Due to Urban Runoff

River, Brook	Water Quality Standards (See Appendix B)	Watershed	Town(s)
Frost Gully Brook	Class A	Harraseeket River	Freeport
Capisc Brook	Class C	Fore River	Portland
Clark Brook	Class C	Fore River	Westbrook
Stroudwater River	Class B	Fore River	Gorham
Long Creek	Class C	Fore River	South Portland, Westbrook

Source: Maine Department of Environmental Protection, 1994 Water Quality Assessment

Preliminary results of Friends of Casco Bay volunteer water quality monitoring in Casco Bay itself show that there were seven violations out of 320 samples for dissolved oxygen in SC waters. In SB water, 79 samples out of 1,209 showed dissolved oxygen violations.

Nutrients such as nitrogen can overstimulate the growth of aquatic plants, causing “algal blooms” that then die, depleting oxygen levels and killing off other species. While Casco Bay does not appear to have major nutrient enrichment problems at present, the potential for problems will increase as population and development grows.

Bacteria are a natural component of estuarine and marine food chains, but human sewage can contain pathogenic (i.e., disease-causing) bacteria and viruses that pose a risk to public health from water contact or consumption of shellfish. Fecal coliform, a benign form of bacteria that resides in the intestines of humans and other mammals, is used as an “indicator” species because it may be accompanied by pathogenic bacteria.

Table 1-3 Closed Clam Flats in Casco Bay in 1994

Town	Total Flat Acreage	Closed Acreage	% Closed
Brunswick	1,986	479	24
Cumberland	509	163	32
Falmouth	874	874	100
Freeport	2,089	277	13
Long Island	98	89	91
Phippsburg	222*	36*	16*
Portland	613	613	100
Harpswell	3,464	1,160	33
Yarmouth	1,399	564	40
West Bath	328	268	82

*Includes only that portion of the flats within Casco Bay.

Source: Maine Department of Marine Resources, December 1994

Many areas of the bay currently fail to meet water quality standards for bacteria, and bacteria-laden stormwater has prompted closure of clam flats (*see Chapter 3 for further details*). Bacterial contamination has also caused periodic closure of public swimming areas at East End Beach and Peaks Island (the only two swimming beaches that are routinely monitored).

Streams and rivers that feed Casco Bay carry far more than fresh water; they contain polluted sediments and organic matter that react chemically with salt water and settle to the bottom of the bay. Toxic contamination from “point sources” such as industrial and sewage treatment plant discharges has declined in the past two decades, but Casco Bay continues to receive extensive contamination from “nonpoint” sources such as stormwater runoff (*see Chapter 2*). The National Oceanic and Atmospheric Administration is currently modeling sources of nonpoint pollution entering the Gulf of Maine (including Casco Bay), which will help determine the relative pollutant loads.

A waste load allocation study was conducted on the Presumpscot River by the Maine Department of Environmental Protection with S.D. Warren Company, Portland Water District, the Town of Windham, and Friends of the Presumpscot. The study found that during low-flow conditions, the river does not attain Class B (*see Appendix B*) dissolved oxygen standards for a 2.4-mile segment of the upper Presumpscot in the Windham area. In the lower river, below the point-source discharges in Windham and Westbrook, a 0.3-mile segment above the most seaward dam in the river (Smelt Hill dam) and a 1.5-mile segment in the estuary below the dam do not meet minimum dissolved oxygen standards for Class C or Class SC, respectively (*see Appendix B*). The model also predicted that a 1-mile segment in the lower river (above Smelt Hill dam) would not meet monthly average dissolved oxygen levels (of 6.5 parts per million) needed to sustain cold water fish (*e.g.*, trout). In addition, the study reported that the structure and function of the biologic community (based on bottom-dwelling macroinvertebrates) does not meet Class C standards (*see Appendix B*) downstream of the paper mill outfall in Westbrook.

The study concluded that no additional point-source loading should be allowed and that increasing river flow, in relation to temperature, would be the most effective solution to the dissolved oxygen problems that exist periodically. In extreme drought conditions, which probably occur once every 10 years, there should be increased dissolved oxygen monitoring, adjusted flows, and reduced loading from the paper mill in Westbrook. Also at low-flow conditions in the summer, the heat of the discharge from the paper mill results in an increase in water temperature in



photo by Christopher Ayres

the river that is above the level considered detrimental to the biologic community (based on Maine Department of Environmental Protection rules).

The Value of Casco Bay

The value of Casco Bay is evident to anyone living in its watershed, but hard to capture by any single measure. Economic figures reveal only one dimension of the bay's diverse array of values. While the costs of environmental protection are traditionally seen as detracting from economic gains, it is now clear that Casco Bay will provide economic returns only so long as its ecological health is sustained.

The bay's economic worth is evident in the wealth of industries it supports: from shipping and petroleum transport to commercial fish and shellfish harvesting, tourism, and recreation. The Port of Portland alone provides 3,700 jobs, \$314 million in sales, \$70 million in wages, and \$9 million in taxes per year from these sectors.

As the third largest oil-handling port on the East Coast, Portland ships and stores 80 percent of Maine's petroleum. In 1990, 209 tankers and 260 barges delivered nearly 72 million barrels of oil to the port's nine major oil-transfer facilities. The port also handles other cargo products, including lumber and coal.

Portland is also Maine's largest fishing port, and its fish auction is one of the leading fish-handling facilities in New England (handling more than 30 million pounds of fish in 1994). While most of the fish landed in Portland come from the Gulf of Maine, Casco Bay is thought to be an important nursery for many juvenile finfish.

Casco Bay provides

abundant

recreational

opportunities for

residents and

visitors alike.

Tourism-related

expenditures exceed

\$145 million

per year in Portland

and \$250 million

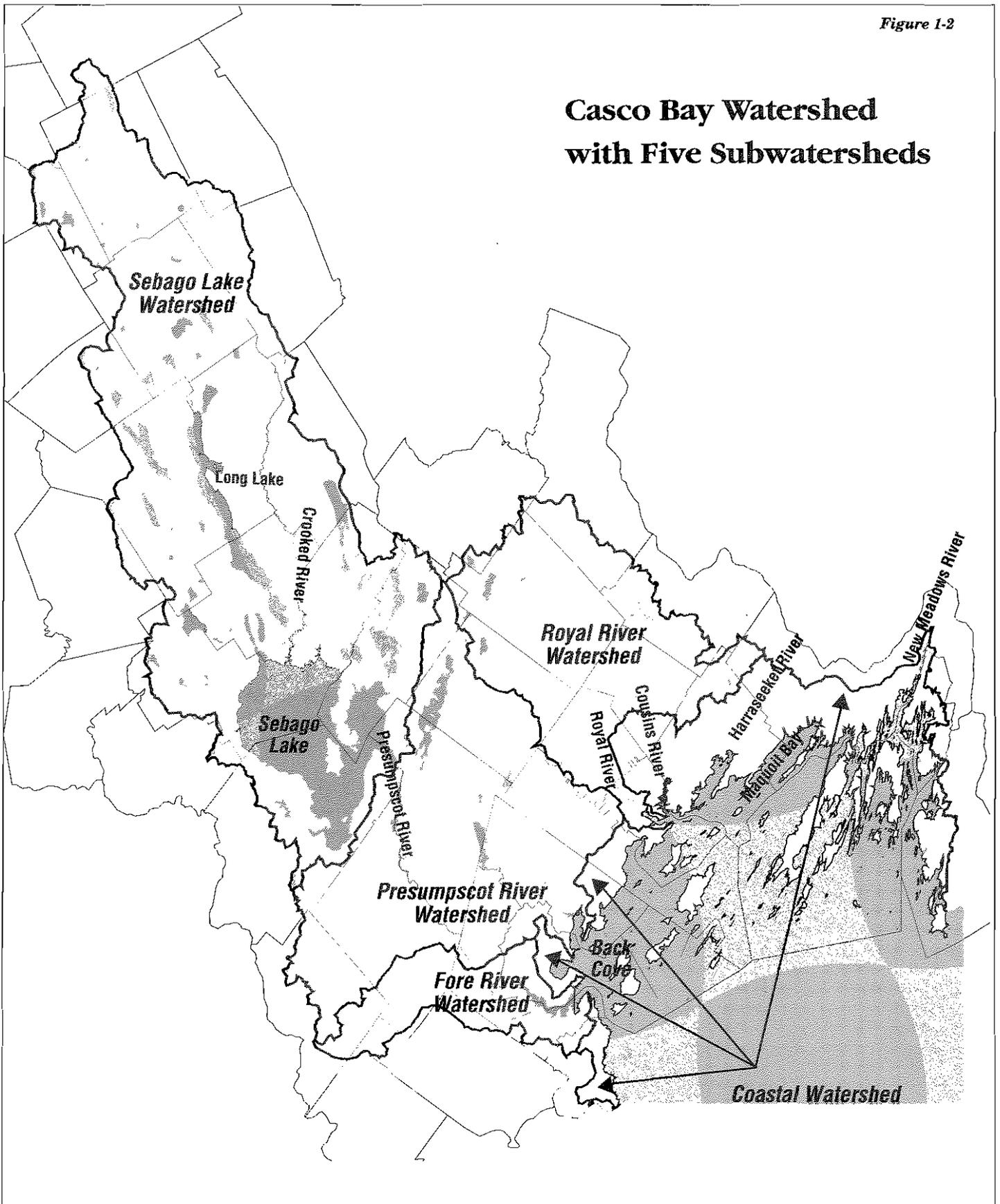
in the region.

Lobster landings in Cumberland County represent approximately 20 percent of Maine's total landings (which in 1994 were 37 million pounds, worth \$100 million). Sea-urchin harvesting has increased dramatically, from next to nothing in 1987 to the No. 2 fishery, after lobsters, today. Soft-shell clams represent a resource for bay residents that has not yet been fully realized. Currently, the industry generates between \$11.6 and \$15.7 million for the local economy, drawn from approximately two-thirds of the bay's clam flats; the remainder are closed due to actual or potential contamination. If water quality in the bay improves, further flats could be reopened and additional jobs generated. Crabs, mussels, scallops, and marine worms are also harvested commercially in Casco Bay.

Casco Bay provides abundant recreational opportunities for residents and visitors alike. Tourism-related expenditures exceed \$145 million per year in Portland and \$250 million in the region. More than 12,000 sailboats and power boats are registered in towns in the watershed (providing \$268,000 in excise taxes, \$90,000 in mooring fees, and more than \$60,000 in registration fees). In addition to recreational boating, residents and

Figure 1-2

Casco Bay Watershed with Five Subwatersheds



tourists use Casco Bay for wildlife viewing, sightseeing, sailboarding, sea kayaking, and recreational fishing and hunting. Cruise ships also contribute to the local economy, with estimated sales from each visit in excess of \$1 million.

Work done for the Casco Bay Estuary Project, over the past five years, has helped demonstrate the economic returns that can be derived from sound environmental protection. A report entitled *The Economic Analysis of the Soft-shell Clam, Mya arenaria, Industry in Casco Bay*, prepared by MER Assessment Corporation, determined that the soft-shell clam industry could provide significantly greater revenues if water quality was high enough to permit harvesting from all the commercially viable clam flats.

A focused study of one “redeemable” clam flat enabled Brunswick to invest \$90,915 (with 90 percent funded by the state) to replace overboard discharge systems and reopen a flat that is expected to yield \$55,000 in the first year of harvesting alone. Over 20 years, the income to clam diggers of that flat could be more than \$1 million.

Progress in Understanding Casco Bay

When the Casco Bay Estuary Project began in 1990, few scientific studies had assessed the human impact on the pollutant levels of Casco Bay. Little was known about the pollutants in the benthic (*i.e.*, bottom) sediments of the bay, its water circulation patterns, or its historic sources of pollution. Several studies had been conducted during the 1980s, but these provided incomplete snapshots of the bay’s health. To gain a better scientific basis for making policy decisions, the Casco Bay Estuary Project commissioned several major studies.

Studies of Sediment Contamination

Research done in the early 1980s had revealed high levels of toxic contamination in sediments taken from certain parts of the bay. The presence of toxic pollution in sediment samples reflects both historic and contemporary sources of pollution — from petroleum products, industrialization, and agricultural practices.



photo by Christopher Ayres

To better document the types and distribution of contaminants, the Casco Bay Estuary Project commissioned two studies, conducted in 1991 and 1994 by Texas A&M University.

Its studies indicated that toxic contaminants including PAHs (polynuclear aromatic hy-

drocarbons), heavy metals, pesticides, PCBs (polychlorinated biphenyls), planar PCBs, butyltins, dioxins, and furans are found throughout the bay. The levels and areas of heavy contamination are not as widespread as initially thought. Five metals (*i.e.*, lead, mercury, cadmium, silver, and zinc) did appear at elevated levels in parts of the bay, but pesticides had very low concentrations. The level of PCBs was high at one location, while PAHs (a by-product of fossil fuel combustion) had the most consistently high levels of toxic pollution. Coming predominantly from urban and industrial activities and automobile exhaust, PAHs enter the bay through stormwater runoff. Dioxins and furans were highest near urban sources in Portland, downstream from a paper mill source, and in the eastern bay where sources could be paper mills on the Androscoggin and Kennebec rivers or combustion sources (both local and distant). Butyltins were highest near potential sources, including marinas and boat anchorages.

These sediment studies form a baseline against which future research can be measured. (*Further information on toxic contamination studies to date is in Chapter 5 of this Plan.*)

Historic Sources of Contamination

The toxic contamination in bay sediments has accumulated over time, some from industrial sources dating back to the mid-1800s. Historic sources of pollution were studied by an environmental historian, through research involving maps, directories, and local history. Highlights are discussed in Chapter 5. The study documented a much more industrialized waterfront than currently exists.

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Land use planning in the Casco Bay watershed has been greatly enhanced by computer technologies that can store, retrieve, integrate, analyze, and display environmental information. The Casco Bay Estuary Project began employing GIS at the outset of its work in order to gather and map information on existing conditions (e.g., soils, topography, wetlands, hydrography, and roads) in the watershed. Later applications have involved build-out analyses, systems for identifying threats to natural resources, and three-dimensional visualizations of development uses. GIS technologies have been shared with local municipalities throughout the watershed to enhance their capacity for informed decision-making.

Water Circulation Modeling

To better understand how water circulation in Casco Bay affects the transport of pollutants, the Casco Bay Estuary Project commissioned a study by researchers from the University of Maine's Department of Civil and Environmental Engineering. Circulation patterns, which are determined primarily by tidal exchange, wind, freshwater flows, and topography, influence both the distribution of flora and fauna, as well as of nutrients and pollution. Knowledge of water circulation can contribute to understanding a range of management issues — from identifying sources of pollution, to predicting where young clams may settle, to what impact an oil spill

might have. The model indicates that water from the Kennebec River may, at times, enter the eastern parts of the bay.

Nitrogen and Bacteria Modeling

Many communities along Casco Bay are struggling to find a balance between human development and water quality. To help them predict how different land uses affect water quality, the Casco Bay Estuary Project commissioned a report from Horsley & Witten, Inc., to develop water quality loading models to predict present and future loadings of nitrogen and bacteria.

Maquoit Bay, which experienced an algal bloom in 1988 that killed off much marine life, afforded a good test case because it is relatively small, shallow, free from point sources of pollution and extensive urban development, and subject to excess concentrations of fecal coliform bacteria (which indicate the presence of disease-causing viruses or bacteria). Marine algal blooms are often triggered by excess nitrogen, so a model was developed to assess Maquoit Bay's potential sources of nitrogen (*i.e.*, agriculture, residential runoff, sewage, and air deposition). The study assumed that septic systems, particularly failing ones, and manure or fertilizer were the largest sources of nitrogen and bacteria entering the bay. This work begins to provide a basis for developing measures to reduce pollutant loading.

Habitat

As Chapter 4 of the *Plan* demonstrates, Casco Bay has a rich diversity of flora and fauna. Like many areas facing rapid growth, however, the watershed could lose important habitats with increased development. Working in cooperation with the Casco Bay Estuary Project, the U.S. Fish and Wildlife Service's Gulf of Maine Project gathered existing data, much of it from the State Department of Inland Fisheries and Wildlife, to determine the location of these important habitats and the potential effect on fish and wildlife habitat if coastal towns in the lower watershed were to develop to the maximum extent permitted by current zoning. This "build-out analysis" provides an innovative way to determine how land uses in the future could affect important habitats.

Where Are We Going?

The health of the bay is dynamic, always in the process of change, and its future is certainly in our hands. Casco Bay has had a varied history from which it has rebounded in part. Much has been accomplished by regulating point sources of pollution. Now the focus is directed at controlling and reducing pollutants that enter Casco Bay through nonpoint sources. As we have come to better understand the complex nature of the ecosystem, it is clear that federal and state regulations and funding have played a vital role in cleaning up Casco Bay. However, the straightforward solutions — building sewage treatment plants and stopping “end-of-the-pipe” discharges — have largely been done. Now a more demanding personal form of change is required.

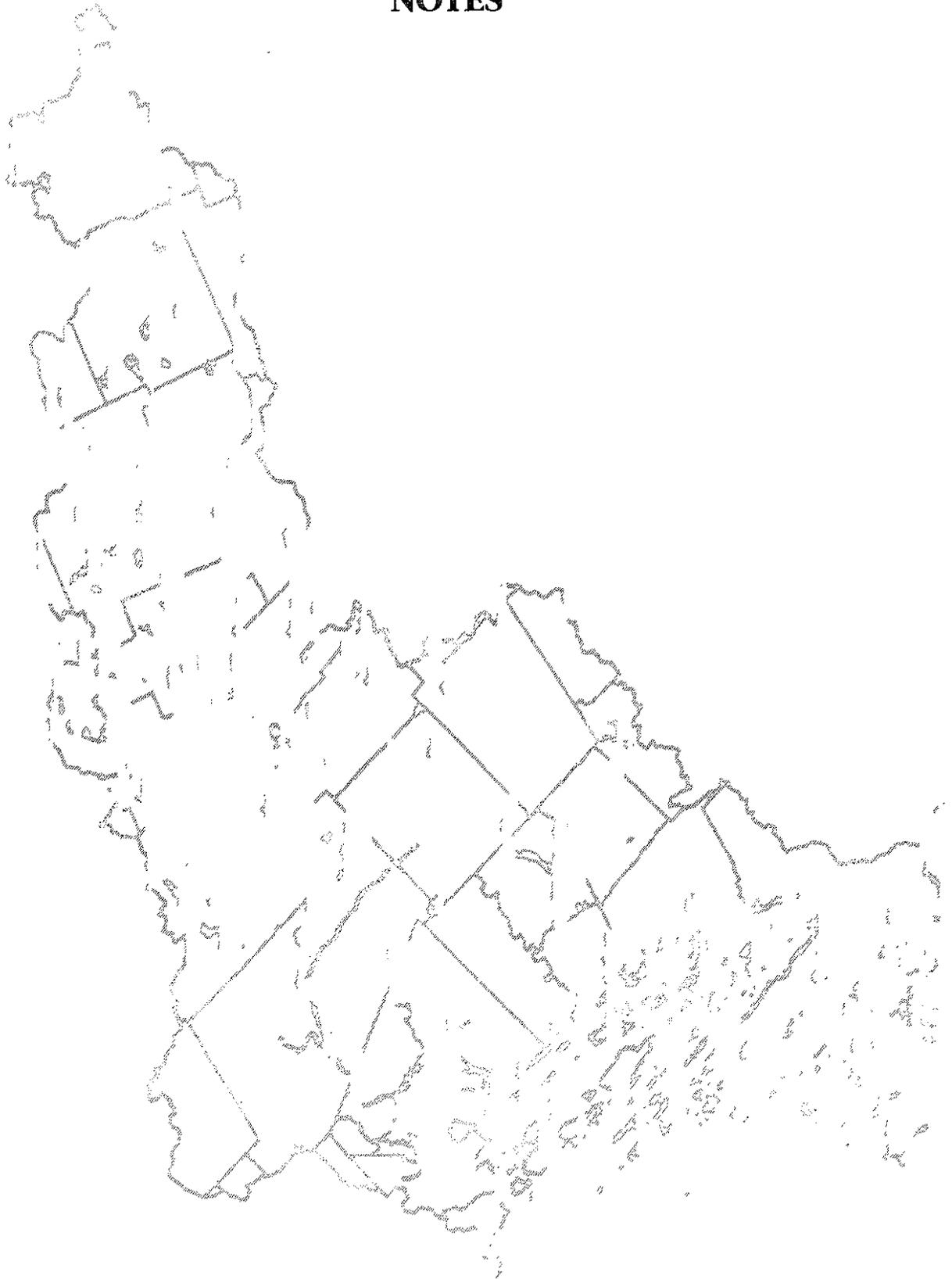
To protect the health of Casco Bay during the next 30 years, we need to rethink many facets of our lives — choices in transportation, development, agricultural practices, home maintenance, consumption, and waste disposal. Roughly 60 percent of pollution comes from diffuse sources — oil and chemicals from roadway runoff, pesticides applied by homeowners, improperly maintained septic systems, and fertilizer from stream-side farm fields. Each of us living in the watershed contributes to this collective pollution and can play a role in reducing it.

This *Casco Bay Plan* represents an important cooperative environmental initiative to focus attention and action on continuing threats from water pollution, habitat loss, and human development. Improvements can be made, but only by working together to achieve a balance between human users and the health of Casco Bay. Where we are going is up to all of us.

Our scientific understanding of the bay is far from adequate. There is a continuing need for marine research focused on the Casco Bay ecosystem and how it functions. Such research represents investments whose returns will provide the basis for more informed management of this precious resource over time.

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Where we are going
is up to all of us.*

NOTES



STORMWATER



CASCO BAY PLAN

To protect and restore Casco Bay from the adverse effects of stormwater, the Management Committee established the following goal and objectives:

GOAL:

Minimize the loading of pathogens, toxics, nutrients, and sediments from stormwater and combined sewer overflows to Casco Bay.

OBJECTIVES:

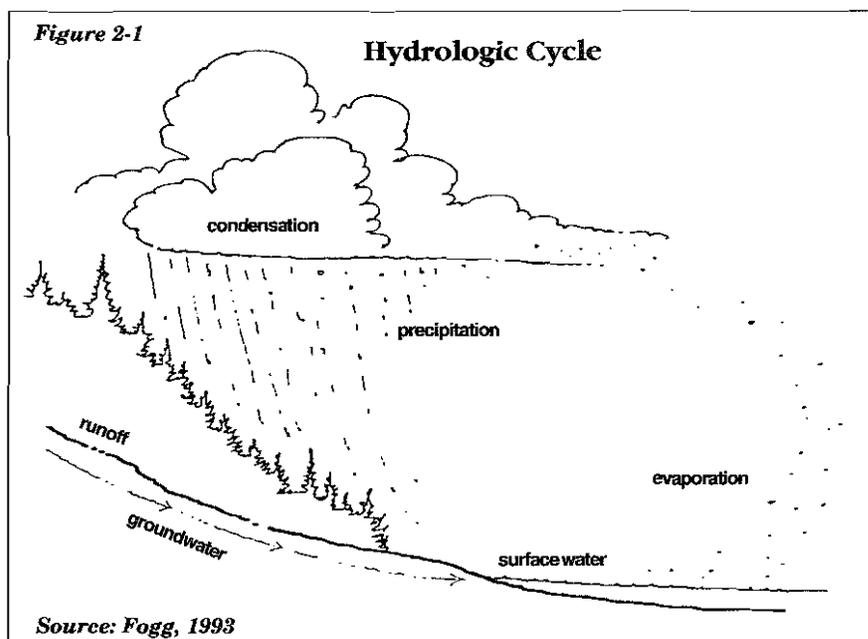
- Reduce loading from combined sewer overflows.
- Reduce loading from nonpoint sources of pollution.

STORMWATER

in Casco Bay

Introduction

Water is constantly cycling through nature — evaporating into clouds, dropping back as precipitation, and moving over and through the ground to streams and, eventually, to the sea.



The water that runs along the ground after a rainfall (or during snowmelt) is known as stormwater. In an undisturbed natural setting, stormwater usually does not pose a problem because plants and soil absorb the water, slowing its flow. Soils usually filter and clean the percolating water before discharging it to streams, rivers, lakes, and the sea.

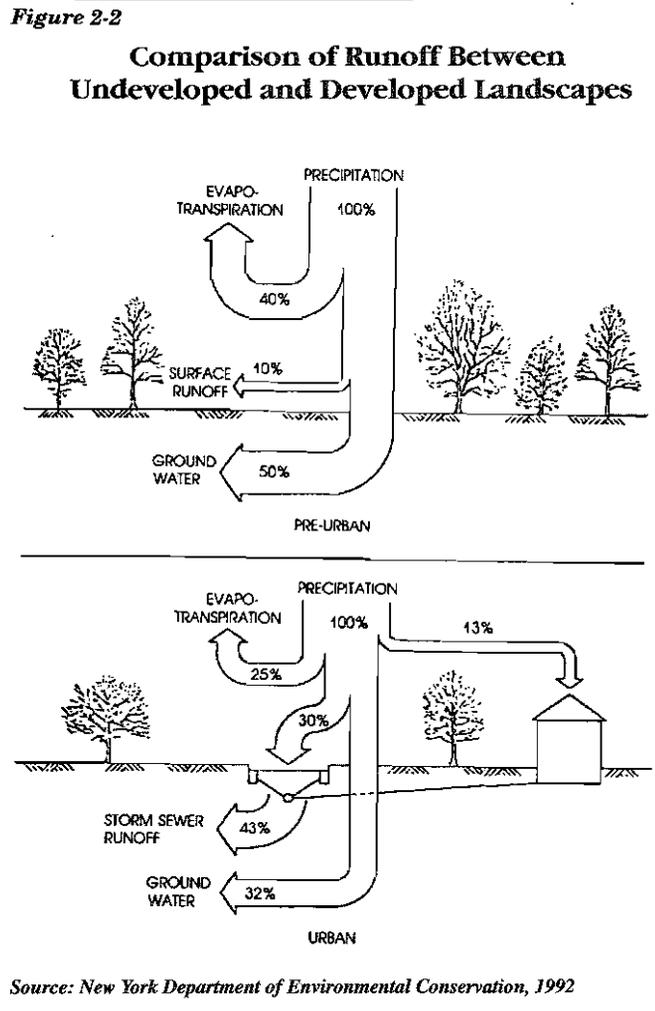
In built-up areas, stormwater causes three problems — erosion, flooding, and water pollution — because pavement, lawns, and hard surfaces slow water absorption into the ground, enabling it to flow rapidly across land surfaces. Stormwater flow may cause

flooding or severe erosion of surface soils, streambanks, and streambeds, particularly in many portions of the Casco Bay watershed where soils are highly erodible even when undisturbed.

Stormwater picks up sediments, bacteria, nutrients, chemicals, and debris as it runs across lawns, roofs, driveways, parking lots, and residential, commercial, and industrial sites. Laden with a variety of pollutants, stormwater then flows into water bodies and storm sewers that drain into Casco Bay. Bacteria and pollutants carried in stormwater have caused periodic closure of productive shellfish flats and swimming beaches in Casco Bay. Stormwater runoff may be the single greatest contributor of contaminants to Casco Bay.

Stormwater can be a veritable witch's brew of bacteria and viruses, nutrients, heavy metals like lead and mercury, PCBs (polychlorinated biphenyls), PAHs (polynuclear aromatic hydrocarbons), oil and grease, and pesticides (U.S. Environmental Protection Agency, 1983). The quantity and type of pollutants distributed by stormwater depend on the nature of the storm and the surfaces over which water flows.

Much has been learned about stormwater in recent years, with new techniques developed for taming its content and flow. Regulatory requirements and governmental programs have offered incentives for states and municipalities to reduce stormwater runoff.

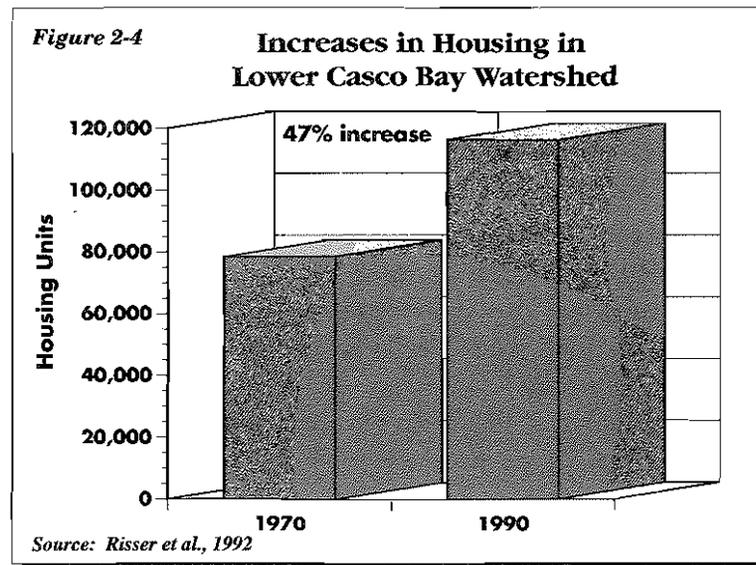
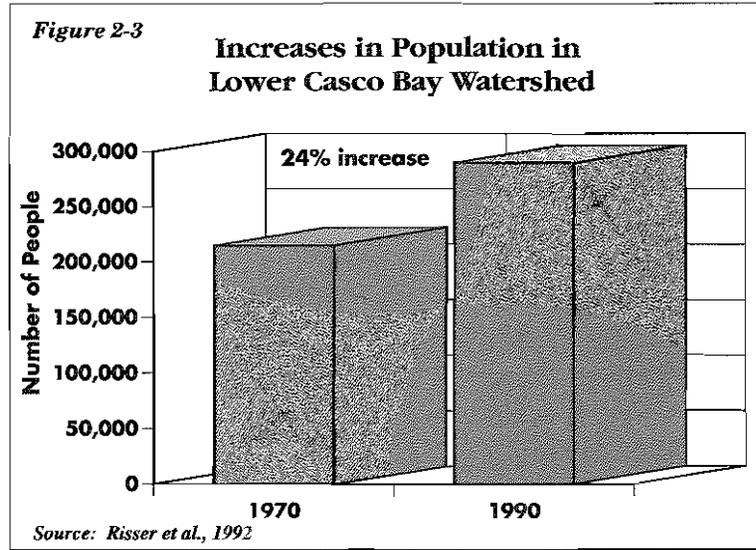


Stormwater runoff may be the single greatest contributor of contaminants to Casco Bay.

Water Quality Problems

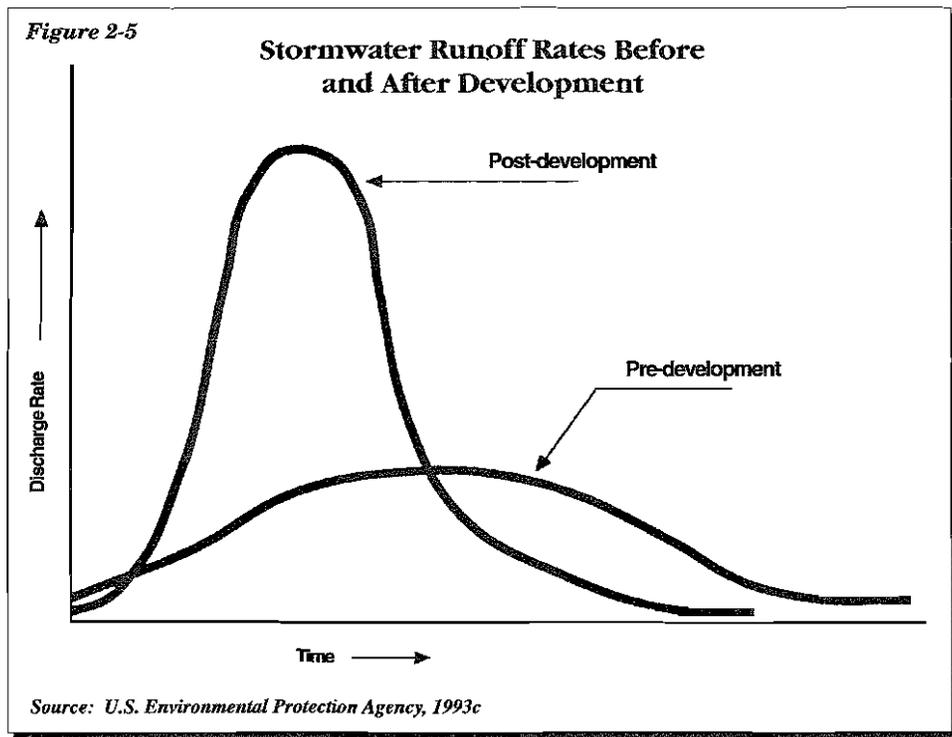
Status and Trends

The water quality of Casco Bay has improved over the last 20 years due to construction of municipal sewage treatment plants, changes in manufacturing processes, and industrial treatment of wastewater prior to discharge. Despite these improvements, there is still a significant pollutant load reaching Casco Bay due to the increased number of vehicles, mileage driven, and development in the area. *During the last two decades, the number of housing units within the lower Casco Bay watershed almost doubled. The 25 municipalities below Sebago Lake, which constitute the lower Casco Bay watershed, grew by 51,000 people (24 percent increase) and 37,000 housing units (47 percent increase) (Risser et al., 1992).*



There is abundant evidence of stormwater pollution throughout the bay watershed.

- Casco Bay waters in the Portland area fail to meet the state's minimum marine water quality standards during rainy weather, while meeting the same standards during dry weather (CH2M Hill and Dufresne-Henry, Inc., 1992).
- *Within the Casco Bay watershed, 56 miles of rivers and tributaries fail to meet water quality standards because of pollution from stormwater runoff due to urban or agricultural uses* (Maine Department of Environmental Protection, 1994). Even rivers that do meet their water quality standards can contribute significant pollution to Casco Bay during storm events because stormwater runoff carries pollutants from land surfaces into rivers, which then drain into Casco Bay. In addition, most water quality sampling is conducted during dry weather conditions (in summer), so pollutants discharged during wet weather go undetected.
- *The 1991 Sediment Contamination Study conducted for the Casco Bay Estuary Project shows high levels of toxics commonly associated with stormwater runoff.* Toxic pollutants such as oil and grease, heavy metals, and hydrocarbons are often attached to the sediment particles washed off by stormwater into streams and rivers. When polluted, sediment-laden fresh water enters marine waters, it reacts chemically with salt water to form larger particles that settle to the bottom, creating a contaminated sediment layer that may be distributed by currents, storms, and tides.
- *Thirty-seven percent of Casco Bay's shellfish flats were closed to harvesting as of May 1995 due to actual or potential contamination, based on analysis by the Casco Bay Estuary Project and Maine Department of Marine Resources.* To protect public health, the federal Food and Drug Administration and the state require that commercial shellfish be harvested only from shellfish flats where positive proof of clean water is available.
- A stormwater sampling study of the Maquoit Bay area (in Brunswick and Freeport) identified the relative contributions of nitrogen and bacteria from different land uses (including residential, agricultural, and forest lands). Assumptions include septic systems and agriculture as the primary contributors of both nitrogen and bacteria.
- Portland's Capisic Brook has experienced increased flooding due to stormwater runoff over the last 30 years as impervious surfaces in the area have replaced absorptive wetlands.
- *The Maine Department of Environmental Protection has found unnaturally high levels of lead and mercury in the tissue of blue mussels taken from inner Casco Bay, near the mouth of the Fore and Presumpscot rivers* (Sowles, 1993). These toxics were transported to the sediments of Casco Bay by stormwater runoff, combined sewer overflows, and other point sources. (A further explanation of combined sewer overflows appears on page 26.)



- *The composition of the benthic animal community in the Fore River has been drastically altered by pollution, including that from combined sewer overflows and stormwater runoff. Most of the expected members of this community, such as mollusks and crustaceans, were absent; the types of worms collected are those commonly found in polluted areas.*
- Where current water quality standards are being met, there are warning signs of potential future problems (Presumpscot River Watch, 1991). Sampling at 20 sites along the Presumpscot River in 1990 found that the water met assigned standards at most locations, except those below the dam in Westbrook, where direct industrial discharges and municipal overflows elevated levels of bacteria (toxics and nitrogen were not measured). However, sampling of tributaries feeding the Presumpscot River showed higher levels of bacteria than water quality standards allow.

This data provides evidence of a growing problem. With continued development around greater Portland, the problem will grow unless appropriate stormwater controls are enacted.

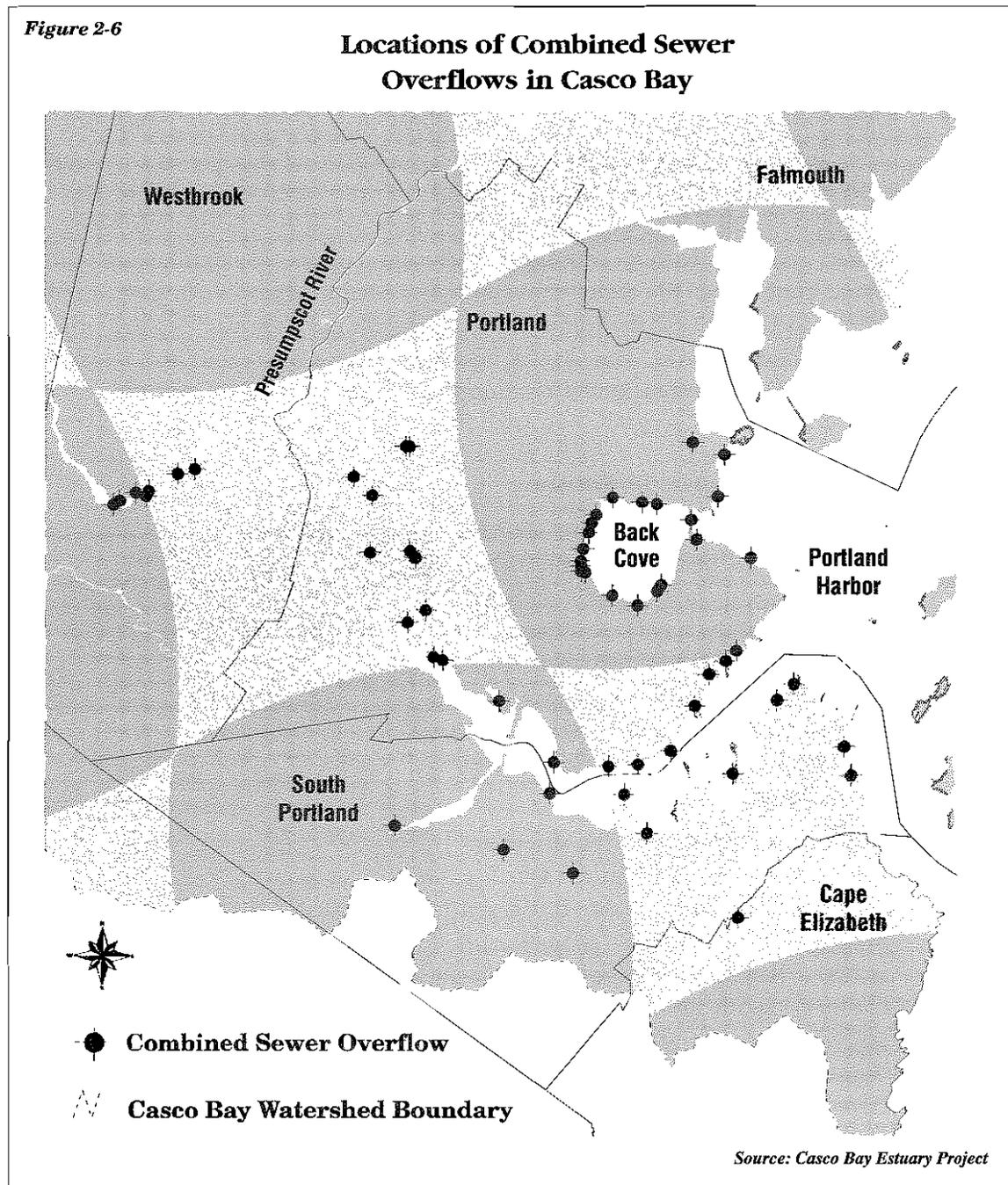
Pollution Sources

There are two primary sources of contaminated stormwater. The first, known as point sources, conveys stormwater runoff into rivers and the bay through direct, identifiable conveyances such as pipes. The second, known as nonpoint sources, includes runoff from land, rain, or snowfall, or groundwater seepage

that enters rivers and the bay from diffuse locations such as malfunctioning septic systems, feed lots, and manure storage areas.

Point-Source Pollution

Point sources of stormwater include storm drains and combined sewer pipes (which collect stormwater from roadways, parking lots, and other built-up areas). Stormwater drainage systems may convey stormwater alone or stormwater mixed with sanitary wastes in combined sewers.



Before sewage treatment plants were constructed, larger municipalities — Portland, South Portland, and Westbrook — collected both domestic and industrial sewage and stormwater in networks of underground pipes, and discharged the combined untreated wastes into area rivers and Casco Bay. When treatment plants were constructed in the 1970s, these sewer pipes were “intercepted” to direct wastes to the plants for treatment before discharge.

Each sewage treatment plant is designed to handle a certain amount of flow. When flow increases dramatically during a storm, it can overload the plant. To avoid damage to the sewage treatment plant during heavy rains, a portion of the combined sewage (sewage and stormwater) that would enter the plant must be diverted without treatment through relief points known as combined sewer overflows.

Combined sewer overflows are a major problem in the Portland area, with 59 points that discharge into Casco Bay or its tributaries during storms. Forty of the combined sewer overflows in the City of Portland contribute an estimated 720 million gallons of sewage and stormwater each year (CH2M Hill and Dufresne-Henry, Inc., 1992). South Portland currently has 10 active combined sewer overflows with an estimated discharge volume of 100 million gallons per year. The State of Maine has two additional combined sewer overflows in South Portland that discharge from the Southern Maine Technical College and the Maine Youth Center. The City of Westbrook has seven combined sewer overflows that discharge into the Presumpscot River.

Nonpoint-Source Pollution

For the past 25 years, point sources have been the primary focus of water quality improvement efforts and dramatic reductions have been effected in sewage and industrial pollution. *However, national studies estimate that nonpoint sources of pollution now contribute up to 60 percent of the remaining pollutant load.*

The Maine Department of Environmental Protection’s *1994 Water Quality Assessment* reports that continued progress toward cleanup of point sources in Maine has been tempered by the discovery of significant nonpoint sources of pollution such as stormwater runoff. Significant portions of Casco Bay are impaired by pollution associated with stormwater runoff from construction

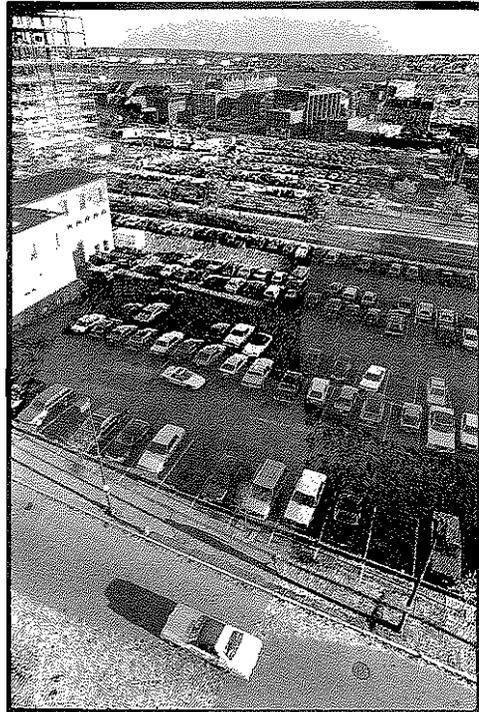


photo by Christopher Ayres

sites, urbanized areas, highways, and agricultural areas. Common sources of stormwater runoff in the Casco Bay watershed include the following:

- **Urban Development.** Stormwater runoff from urban and suburban areas transports toxics, pathogens (bacteria and viruses), and nutrients (nitrogen and phosphorus) to coastal waters. Runoff from roadways, parking lots, and driveways contributes oil and grease and metals such as lead, zinc, copper, cadmium, and chromium (U.S. Environmental Protection Agency, 1983).

Table 2-1 **Summary of Urban Runoff Pollutants**

Category	Parameters	Possible Sources	Effects
Sediments	Total suspended solids Dissolved solids Combined sewer overflows	Construction sites Urban/agricultural runoff Landfills, septic fields	Turbidity Habitat alteration Recreational & aesthetic loss Contaminant transport Navigation/hydrology Bank erosion
Nutrients	Nitrogen Phosphorus	Urban/agricultural runoff Landfills, septic fields Atmospheric deposition Erosion	Surface waters Algal blooms Ammonia toxicity
Pathogens	Bacteria Viruses	Urban/agricultural runoff Septic systems Illicit sanitary connections Combined sewer overflows Boat discharges Domestic/wild animals	Ear/intestinal infections Shellfish bed closure Recreational/aesthetic loss
Toxic Pollutants	Toxic trace metals Toxic organics	Urban/agricultural runoff Pesticides/herbicides Underground storage tanks Hazardous waste sites Landfills Illegal oil disposal Industrial discharges Atmospheric deposition	Bioaccumulation in food-chain organisms and potential toxicity to humans and other organisms

Source: U.S. Environmental Protection Agency, 1993b

- **Residential Development.** Homes and apartments can add to stormwater bacteria and viruses due to failing septic systems; pet wastes; excess nutrients from septic systems, fertilizer, and eroding soil; misuse of toxics such as pesticides, paints, solvents, and household cleaners; and oil, grease, and metals from vehicles and home and garden equipment.
- **Construction Activities.** While construction is underway, water runoff across exposed soils can carry significant loads of sediment, nutrients, and toxic materials from the development site into nearby water bodies. When large areas of a construction site are left unprotected, sedimentation in nearby streams becomes a major problem.

- **Air Deposition.** Local and distant sources of air pollution may result in the deposition of toxic pollutants and nutrients in Casco Bay.
- **Roadways.** Stormwater runoff from roads and parking lots is a source of organic chemicals (e.g., PAHs, oil and grease), sediments, and several toxic metals. Problems created by improper construction and maintenance of roadside ditches at stream crossings were documented in a 1991 survey by the Cumberland County Soil and Water Conservation District. *The survey of roadways in 17 Cumberland County municipalities found significant erosion problems or direct channeling of highway runoff into streams at 266 sites* (Cumberland County Soil and Water Conservation District, 1991).
- **Industrial Sites.** Ongoing industrial activities may result in nonpoint sources of pollution. Traffic-loading areas, leaky storage tanks, improperly disposed chemicals, and uncovered work areas can leach oil and other toxics into surface runoff and groundwater. *A “dirty history” report of the Portland area, conducted for the Casco Bay Estuary Project, identified more than 300 locations where toxic deposits may have been left by industries that occupied those sites 50 to 100 years ago.* Pollution can leach out of these sites through groundwater movement or through construction disturbance.
- **Agriculture.** Soil cultivation practices and application of fertilizers and pesticides can contribute significantly to stormwater runoff. Although the number of commercial farms has declined in Cumberland County over the last 50 years, the number of “hobby farms” has increased and agriculture remains a significant land use in the Casco Bay watershed. Agriculture may contribute nutrients and bacteria to stormwater through the improper land application of fertilizer, animal waste storage, and land-spreading practices. Toxics are generated in the application of pesticides and other chemicals and the use of farm equipment.

In the long
term,
preventing
stormwater
damage and
accompanying
water impacts
is far less
expensive than
mitigation.

Economic Impacts

The economic impacts of stormwater are evident in the costs of repairing damage from erosion and flooding. In 1991, for example, Hurricane Bob created \$2.3 million in damage to public property (including roads and bridges) in Cumberland County (Sidell, 1995). Even small storms can prove expensive for municipalities and private property owners. Inadequately controlled and poorly located stormwater outfalls cause erosion and other damage. For example, improper placement of a culvert under a new private road in Brunswick channeled stormwater to an adjacent home, resulting in \$15,000 of foundation damage (Hanson, 1995).

Using Casco Bay Estuary Project funds, the Town of Falmouth highlighted the experience several residents had with stormwater damage to illustrate the costs of failing to address stormwater runoff in watershed management planning. Impacts included severe road washout, flooded basements, and the pollution of small streams with sediment, oil, and grease (Fogg, 1993).

In the long term, preventing stormwater damage and accompanying water impacts is far less expensive than mitigation. The Town of Poland, for example, was spending \$2,000 annually to repair erosion damage to a section of gravel road on Thompson Lake. Finally, the town rebuilt the problem section for \$20,000 (receiving Maine Department of Environmental Protection funds for 50 percent), using techniques to reduce or eliminate erosion damage in the future. Its annual savings on maintenance will enable it to “pay” for its investment in five years (Benson, 1995).

Cleaning up sources of contaminated stormwater is costly. The cities of Portland, South Portland, and Westbrook expect to spend \$105 million over 15 years to construct facilities that will reduce the volume discharged by combined sewer overflows and provide treatment for stormwater before it enters Casco Bay (CH2M Hill and Dufresne-Henry, Inc., 1992; Portland Water District, 1993; City of South Portland, 1993).

Contaminated sediments from stormwater also increase the cost of dredging. As Maine’s largest port, Portland depends on dredging to keep its facilities accessible. *Disposing of contaminated dredged materials from areas such as inner Portland Harbor can cost at least 10 times as much as disposal of clean materials.* Contaminated materials must be hauled by truck to approved on-land disposal sites rather than barged offshore for ocean dumping.

In 1994, the soft-shell clam resource in the open harvesting areas of Casco Bay provided an estimated income of \$4.66 million to approximately 268 commercial diggers. The total economic activity generated by the soft-shell clam industry that stays within the local economy is estimated at \$11.6 to \$15.7 million for 1994. This represents income from roughly 63 percent of the clam flats in Casco Bay, since the remaining 37 percent (as of May 1995) is closed to harvesting, primarily due to contamination or threats from nonpoint stormwater runoff (Heinig *et al.*, 1995).

Regulatory Measures

Unlike some other states, Maine has no comprehensive stormwater management program (U.S. Environmental Protection Agency, 1993b). Most existing stormwater management requirements focus on flood control rather than water quality impacts, and are typically applied on a case-by-case basis when applicants seek state or local permits. *Except in special cases, there are currently no requirements to address stormwater management through a regional or watershed planning process.*

Stormwater is regulated at the federal, state, and local level under numerous different laws and regulations. While these requirements have led to improved water quality, there are gaps and duplications that allow contaminated stormwater to keep diminishing the quality of water resources.

Laws Governing Point-Source Pollution

Those who discharge wastewater within Maine must be permitted and licensed by both the U.S. Environmental Protection Agency, under the Clean Water Act, and the Maine Department of Environmental Protection, under the Maine Protection and Improvement of Waters Law.

In 1972, the Clean Water Act was enacted to set water quality goals nationwide and to provide mechanisms for reducing surface water pollution. Administered by the U.S. Environmental Protection Agency, the Act established two main goals: (1) fishable and swimmable waters wherever attainable by 1983; and (2) the elimination of pollutant discharges into navigable waters by 1985.

The Act established the National Pollutant Discharge Elimination System, which prohibits discharge of any pollutant from a point source into U.S. waters unless that discharge is authorized by a permit. Efforts to improve water quality under this system focused on municipal sewage treatment plants and industrial process wastewater, but neglected “point-source” discharges of stormwater.

The National Pollutant Discharge Elimination System program establishes discharge limits based on the pollutant control technology available at the time a permit is issued. Each time a permit is renewed, therefore, the discharge must meet stricter standards if improved technology is available. No permit is issued if the discharge could cause or contribute to a violation of water quality standards.

During the past 25 years, the Clean Water Act provided grants to help construct and expand wastewater treatment facilities in Portland, Peaks Island, South Portland, Westbrook, Gorham, Cape Elizabeth, Falmouth, Freeport, Yarmouth, and Brunswick, which have markedly improved water quality in Casco Bay over the past 20 years (Maine Department of Environmental Protection, 1992). It also requires certain types of industrial users of municipal sewage treatment plants to install pre-treatment facilities, which remove pollutants from their waste stream that could interfere with the treatment plant process (Maine Department of Environmental Protection, 1992).

In 1987, Congress amended the Clean Water Act to revise National Pollutant Discharge Elimination System requirements for stormwater discharges and target discharges associated with certain industrial activities and separate municipal storm sewer systems (located in municipalities with a population of 100,000 or more).

Stormwater discharges associated with industry include a wide range of activities such as manufacturing, major construction, landfills, and hazardous waste treatment, storage, or disposal. To minimize pollutant loading to stormwater runoff, the 1992 guidelines require each permittee to develop a detailed

Stormwater Pollution Prevention Plan, implement short-term measures for erosion and sedimentation control, and pursue long-term water quality protection measures such as best management practices (U.S. Environmental Protection Agency, 1992a and 1992b).

In Casco Bay, three municipalities with combined sewer overflow discharges that violate the Clean Water Act and state law have recently taken action to comply with regulatory requirements. As a result of consent decrees with the U.S. Environmental Protection Agency and the Maine Department of Environmental Protection, the cities of Portland, South Portland, and Westbrook have each completed combined sewer overflow abatement plans that outline long-term strategies for reducing their point-source discharges.

The Portland plan recommends \$90 million of improvements to be made over a 15-year period, eliminating 32 of its 40 combined sewer overflow discharges and reducing the volume discharged by 76 percent, from 720 million to 176 million gallons (CH2M Hill and Dufresne-Henry, Inc., 1992). Recognizing that much of the stormwater removed from the combined sewer overflow system will become nonpoint-source stormwater runoff, the plan includes recommendations to control both the quantity and toxicity of the displaced flow.

South Portland has enlarged its sewage treatment plant to provide treatment for a higher volume of stormwater during wet weather. The city's goal is to reduce combined sewer overflow flows by 85 to 90 percent at an estimated cost of almost \$14 million (City of South Portland, 1993). Westbrook's plan, which has not yet been approved by the U.S. Environmental Protection Agency or Maine Department of Environmental Protection, aims to reduce combined sewer overflow flows by replacing the combined sewer system with separate stormwater and sewage lines, at an estimated cost of \$1 million (Portland Water District, 1993).

Laws Governing Nonpoint-Source Pollution

Despite improved water quality from treatment of point discharges, it became clear during the early 1980s that the goal of "no pollutant discharges by 1985" could not be achieved. The cost of eliminating discharges far exceeded the resources available. Studies by the U.S. Environmental Protection Agency also revealed that most of the remaining problem came from nonpoint sources of stormwater, which were not being adequately addressed (U.S. Environmental Protection Agency, 1983).



photo by Christopher Ayres

This recognition led to the formation in 1983 of the Nationwide Urban Runoff Program to study the characteristics and impacts of urban runoff pollution, and to determine the significance of nonpoint-source pollution (U.S. Environmental Protection Agency, 1983). In response to this and other studies, the Clean Water Act was amended in 1987, requiring each state to identify waters threatened by nonpoint sources and develop strategies to reduce those sources (U.S. Environmental Protection Agency, 1993b).

Efforts to reduce nonpoint-source pollution in coastal areas have been supported by funds provided under the federal Coastal Zone Management Act. *In 1990, this Act was amended to require participating states to establish enforceable policies and goals for reducing nonpoint pollution in the coastal area* (U.S. Environmental Protection Agency, 1993a). A draft *Maine Coastal Nonpoint-Source Control Program* was circulated for public comment in June 1995. The plan emphasizes use and evaluation of best management practices and consistent monitoring of ambient coastal water quality.

Currently, nonpoint sources of stormwater pollution are addressed indirectly through state laws that protect natural resources from development and other types of land and resource use. Primary laws include the Site Location of Development Act (38 MRSA, section 481) and the Natural Resources Protection Act (38 MRSA, section 480A), both administered by the Maine Department of Environmental Protection; and the Mandatory Shoreland Zoning Act (38 MRSA, section 435), the Municipal Subdivision Law (30-A MRSA, section 4401), and the Comprehensive Planning and Land Use Regulation Act (30-A MRSA, section 4311), all of which are administered by municipalities.

Each law requires that stormwater impacts be considered; however, none provide specific performance standards for stormwater quality (Maine Department of Environmental Protection and Maine State Planning Office, 1994). Additionally, agency jurisdiction is often limited (*e.g.*, the Site Location of Development Act only pertains to large development projects).

To help address these deficiencies, the U.S. Environmental Protection Agency has provided the Maine Department of Environmental Protection with funding to develop and implement a Nonpoint-Source Pollution Management Plan, and to provide technical assistance and demonstration grants for regional organizations and municipalities to identify and address contaminated stormwater problems. The state has developed manuals on best management practices that outline techniques for reducing nonpoint-source impacts from construction, agriculture, and timber-harvesting activities. Manuals describing best management practices for stormwater and marinas were published by the Maine Department of Environmental Protection in 1995.

In the Casco Bay watershed, stormwater runoff is most frequently addressed by municipalities through local shoreland zoning, subdivision review, site plan review, and/or general zoning ordinances that require erosion control and stormwater management. Some municipalities now require the use of best management practices for new development, although problems with existing

development tend not to be addressed. *Currently, the Town of Brunswick is the only municipality that has enacted any comprehensive regulation of nonpoint sources.* The town's Coastal Protection Zone Ordinance, adopted in 1991, protects marine resources and reduces nutrient-loading into Maquoit and Middle bays (Marine Law Institute, 1992).

Although agricultural activities in Maine are generally not subject to local control, except under the Shoreland Zoning Act, many farmers are voluntarily implementing comprehensive resource management plans with technical assistance from the federal Natural Resources Conservation Service (formerly the Soil Conservation Service).

Regulatory Limits

The overall regulatory picture can be summarized this way:

- Federal government provides laws, permits for point-source discharges, and planning funds. Funding support for needed capital improvements, such as sewage treatment plants, that once offered generous grants has been reduced to smaller loans.
- State government provides technical assistance (*e.g.*, best management practices), permits for point-source discharges, and an array of laws that relate to nonpoint sources of pollution, but not a comprehensive approach to regulate nonpoint sources of pollution.
- Local governments operate and manage sewage systems and treatment plants, and regulate varying aspects of land use — but they may or may not include stormwater runoff considerations.

These factors combine to highlight that:

- A consistent, comprehensive stormwater management system for the communities in the Casco Bay watershed is lacking.
- Grants for further capital improvements to reduce combined sewer overflows and contaminated stormwater discharges are insufficient.

Recommendations

The issue of stormwater pollution poses an unprecedented management challenge for the communities of the Casco Bay watershed. As this chapter illustrates, stormwater is a diffuse and insidious form of pollution that is not easily addressed through traditional regulatory approaches. Developing new methods for stormwater reduction will require innovative and collaborative strategies on the part of businesses, agencies, and individuals.

The following list of actions outlines some measures that will begin to address stormwater impacts on Casco Bay. The title of the action is listed below. Following the title is the action number. The actions are described more fully in Chapter 7. Actions that are designed to directly work to reduce stormwater pollution appear in bold typeface; other actions that support reduction of stormwater pollution appear in regular typeface.

■ **Public Education**

- Fund high school students' research. (#1)
- Focus post-secondary educational programs on Casco Bay. (#2)
- Conduct a comprehensive campaign to promote sound household practices. (#3)
- **Create an educational site demonstrating how vegetation reduces stormwater runoff. (#6)**
- Hold "State of the Bay" conferences. (#7)

■ **Technical Assistance**

- **Provide training in best management practices for contractors, public works crews, road commissioners, and municipal boards and staff. (#4)**
- Establish a reduction and management program for toxic pollutants in Casco Bay communities and small businesses. (#5)
- **Develop and implement action plans for sub-watershed areas. (#6)**
- Conduct pollution prevention audits for businesses/industries that currently affect Casco Bay. (#8)

■ **Regulatory/Enforcement Plan**

- Monitor enforcement of combined sewer overflow reduction plans in Portland, South Portland, and Westbrook. (#2)
- **Adopt minimum standards for stormwater quality in state and municipal regulatory programs. (#3)**

■ **Planning and Assessment**

- Research the contribution of deposition of pollutants from the air. (#10)

CLAM FLATS and SWIMMING AREAS



CASCO BAY PLAN

To protect and restore clam flats and swimming areas in Casco Bay, the Management Committee established the following goal and objectives:

GOAL:

Open and protect shellfish and swimming areas impacted by water quality.

OBJECTIVES:

- Increase open shellfish acreage currently impacted by poor water quality.
- Swimming areas of Casco Bay shall meet bacterial standards.

CLAM FLATS and SWIMMING AREAS

Introduction

For many residents of the Casco Bay region, clamming represents an important tradition, as well as a livelihood. The economic value of this resource has been limited in recent years by the widespread threat of bacterial contamination. Malfunctioning or improperly maintained septic systems, nonpoint-source pollution, overboard discharge systems, and boat discharges and combined sewer overflows have closed many shellfish flats to harvesting. *In May 1995, 37 percent of the clam flats in Casco Bay were closed to shellfish harvesting due to the threat or existence of bacterial pollution.*

Bacterial contamination from sewage also causes closures of swimming areas at Peaks Island and East End Beach in Portland. There is concern that other parts of the bay may also be unsafe; however, there is no water quality testing at other public swimming areas in Casco Bay.

Some progress is being made to address these problems. Straight pipes that discharged raw sewage have largely been removed, and the plumbing code has been revised to regulate design and construction of on-site wastewater disposal systems. Overboard discharge systems that impact clam flats are gradually being



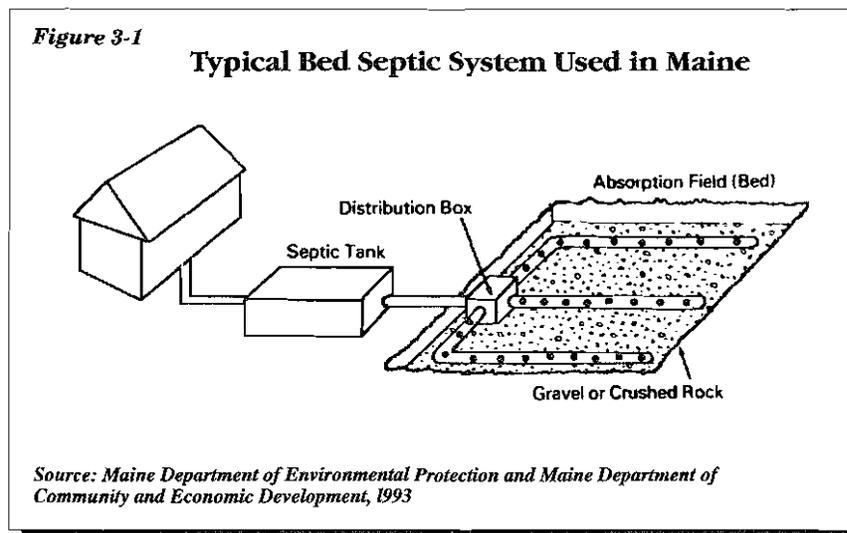
replaced. In 1994, 20 shellfish areas were reopened in Cumberland, Yarmouth, Freeport, Harpswell, and Brunswick (Livingston, 1995).

Sources of Contamination

Shellfish flats and swimming areas are closed when elevated bacteria levels indicate the presence of human or animal waste, since exposure to contaminated water and shellfish can cause illness. Too many nutrients, especially nitrogen, can pose additional problems for shellfish harvesting and the bay (see page 45). Sources of bacteria and nitrogen include septic systems, overboard discharge systems, municipal and industrial discharges of wastewater, illegal sewage discharge from boats, and polluted stormwater runoff.

Septic Systems

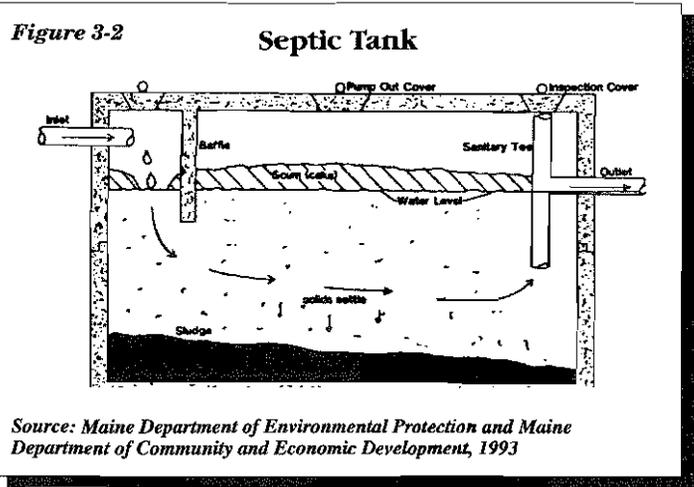
Septic systems constitute the principal form of residential wastewater treatment in areas near clam flats in Yarmouth, Freeport, Brunswick, Harpswell, West Bath, Phippsburg, and the Casco Bay islands. Many systems were installed before the plumbing code was updated in 1974, and may provide little or no treatment. Failure in systems may cause sewage to back up into the house, break out at the surface, run off in surface water, or seep undetected into groundwater or cracks in the bedrock.



A septic system acts as an individual sewage treatment and disposal system buried in the ground. Figure 3-1 shows a typical bed septic system used in Maine. Other types of leach fields (*i.e.*, absorption fields) are installed on sites that have soil or slope limitations.

Household effluent (*i.e.*, wastewater from sinks, toilets, showers, washing machines, and dishwashers) flows into the tank. There the heavier particles settle to the bottom and become sludge. A scum layer of fats, greases, and other lightweight materials rises to the top. Between the sludge and

the scum, the remaining liquid (called effluent) — which is high in nitrogen and bacteria — flows to the leach field where it is dispersed into the soil. There the nitrates are somewhat diluted by groundwater, and the bacteria and viruses are filtered and die off. *Even in fully functioning systems, it is estimated that only half the nitrogen dissipates during treatment* (Horsley & Witten, Inc., 1995).



When a septic system fails, untreated nitrogen and bacteria may flow directly into groundwater, streams, or coastal waters. The number of malfunctioning septic systems in the Casco Bay area is not known. Septic systems fail due to inadequate maintenance, overloading, or poor design and construction (*e.g.*, septic systems installed before the plumbing code revisions may not work properly because they were often sited in areas with poor soil conditions and shallow depth to bedrock, and were not designed to meet current public health standards).

On one portion of Peaks Island, the Portland Water District found that more than 80 percent of the 275 houses surveyed used cesspools (which have not been permitted since the plumbing code was updated in 1974 because they provide ineffective treatment of sewage). Cesspools and other substandard systems on Peaks Island and elsewhere that were constructed prior to 1974, however, are usually “grandfathered” if they appear to be working. Except when seasonal camps are converted to year-round residences, there is no requirement to upgrade outdated septic systems. Swimming areas on Peaks Island are closed because of inadequate septic systems and direct discharges (which are currently being connected to a sewage treatment plant).

Inadequate septic system maintenance results, in most cases, from failure to pump out the sludge at the bottom of septic tanks once every two to five years.

A study conducted along Flying Point and Mere Point necks in Freeport and Brunswick found high bacterial counts — attributed to septic systems — in water seeping into Maquoit Bay through cracks in the bedrock (Horsley & Witten, Inc., 1995). *Among potential sources of bacterial and nitrogen runoff assessed in a watershed study of Maquoit Bay, septic systems caused the highest bacterial and nitrogen loading, followed by agriculture.*

Inadequate septic system maintenance results, in most cases, from failure to pump out the sludge at the bottom of septic tanks once every two to five years. Septic systems require routine inspections to make sure they are operating properly. Other maintenance needs include

making sure garbage disposal waste solids do not clog the leach field and avoiding septic system cleaning additives that may disrupt the system and result in discharge of contaminants.

Overloading of septic systems occurs when water use exceeds design specifications. The leach field size and tank capacity are designed to effectively treat a defined flow of water. If water use exceeds that capacity, the system may become overloaded and fail. Newer systems can also fail if they are not sized properly or if the leach field is improperly constructed.

Overboard Discharge Systems

Prior to 1974, businesses and residences could legally discharge untreated wastewater directly into the bay when they could show that subsurface disposal was infeasible. Since 1974, such “straight pipe” discharges have been prohibited.

Between 1974 and 1987, Maine Department of Environmental Protection regulations allowed treated, chlorinated overboard discharge systems to be built as a replacement for straight pipes or as an alternative to conventional in-ground septic systems where soils were inadequate to serve as a leach field. As house construction burgeoned in the mid-1980s, overboard discharge systems were placed on previously undeveloped lots. *By 1987, nearly 400 overboard discharge units had been installed in the towns surrounding Casco Bay.*

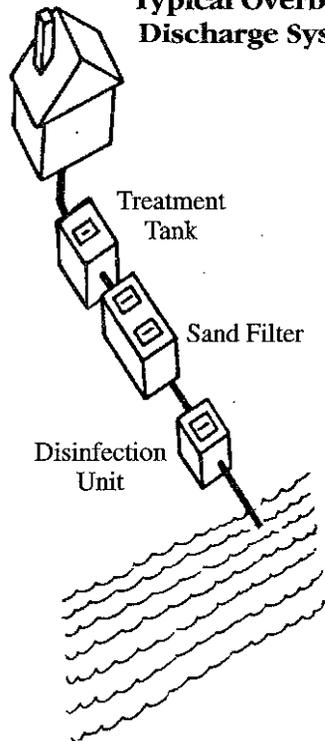
An overboard discharge system is similar to a septic system except that the leach field is replaced by a combination of a sand filter or mechanical aerobic tank and a chlorination unit to disinfect the effluent before it is discharged into a water body.

Overboard discharges require more maintenance than conventional septic systems. Homeowners must ensure that the sand filter or mechanical aerator is working properly, and that chlorine tablets are in place in the disinfection unit.

Because the required maintenance cannot be ensured, the Maine Department of Marine Resources must consider each discharge a potential source of bacterial contamination; therefore, their presence necessitates closure of nearby shellfish flats.

Figure 3-3

Typical Overboard Discharge System



Source: Maine Department of Environmental Protection and Maine Department of Community and Economic Development, 1993

The impact of the chlorine used to disinfect overboard discharges is also an environmental concern. While the amount of chlorine discharged from any single system is very small, this toxic chemical can harm nearby plants and animals. Swimmers in the vicinity of overboard discharge units may also be exposed to bacteria or chlorine, although there is no state or municipal regulation or policy that requires water quality testing.

Environmental concerns about clam-harvesting prompted enactment of the Overboard Discharge Law in 1987, which prohibits all new, non-municipal overboard discharges and establishes a procedure for replacing existing overboard discharge units with alternative treatment methods. Only those persons with an unexpired permit from the Maine Department of Environmental Protection may continue to operate or install an overboard discharge system. On undeveloped lots the permittee must install the unit by January 1998 or the license will expire.

Since the new law took effect, approximately 100 overboard discharge systems have been removed from municipalities surrounding Casco Bay, allowing some shellfish flats to be reopened. Money has been obligated for overboard discharge system removal (i.e., through state bond issues that generated \$3.5 million to provide partial grants to homeowners to remove old overboard discharge systems, all but \$800,000 of which has been obligated). The Maine Department of Marine Resources works with towns and the Maine Department of Environmental Protection to identify closed shellfish flats that are priority areas for using the overboard discharge grants.

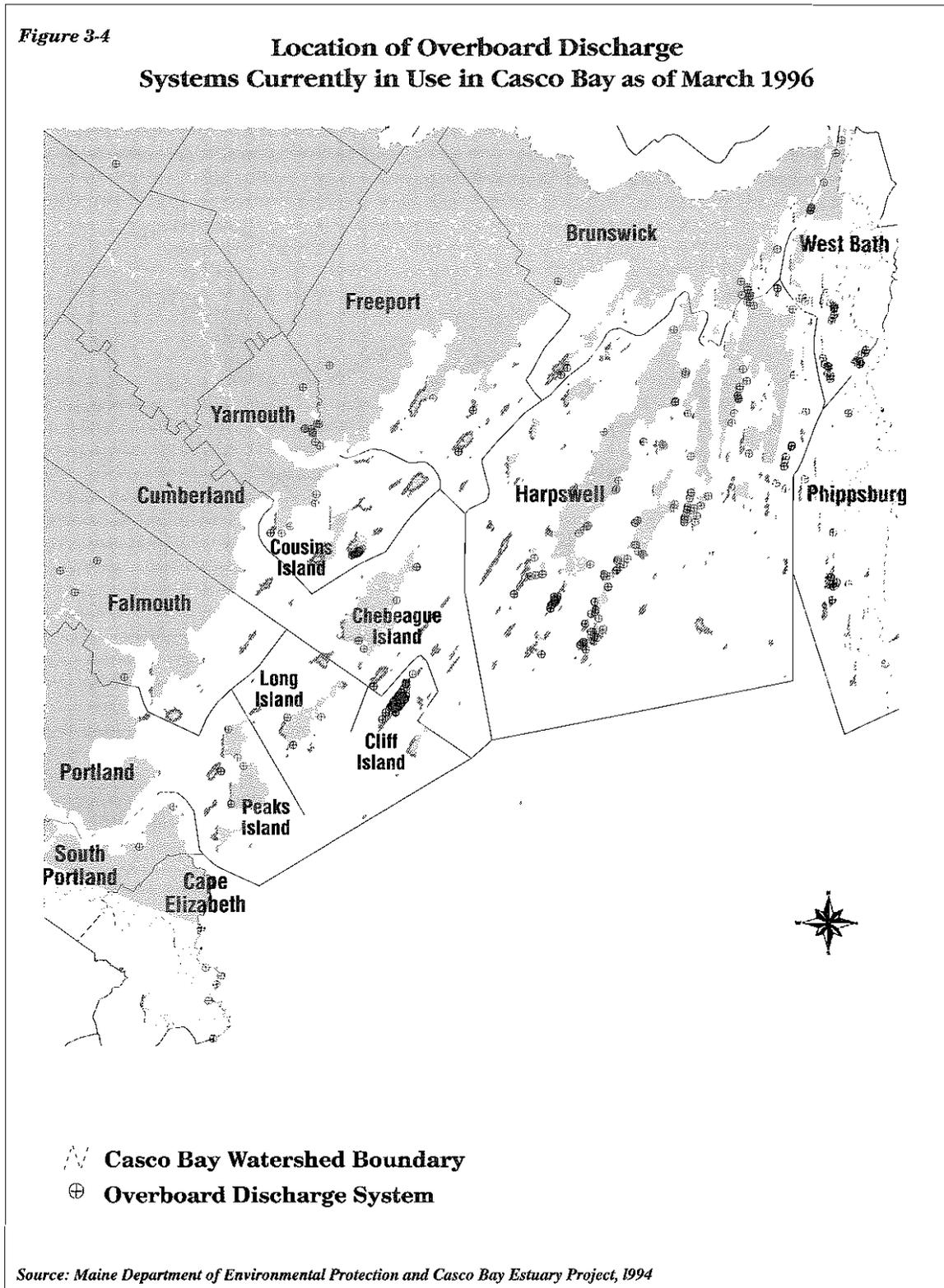
Harpwell has the largest number of overboard discharge systems, followed by the Portland islands and West Bath (see Table 3-1).

Table 3-1 Overboard Discharge Permit Status
in Casco Bay Watershed

MUNICIPALITY	TOTAL UNITS AS OF 3/22/96	UNITS REMOVED TO DATE	UNITS INACTIVE	PERMITTED UNITS NOT YET INSTALLED/USED
Cape Elizabeth	5	2	1	1 permitted not installed
South Portland	1	1		
Portland	53	2		
Falmouth	2	2		
Cumberland	3	3		
Yarmouth	15	13		1 permitted not installed
Freeport	11	0		
Brunswick	13	3		
Harpwell	119	9	1	6 permitted not installed
West Bath	40	4	1	
Phippsburg	12	8		1 permitted not installed
Long Island	2			
TOTAL	276	47	3	9

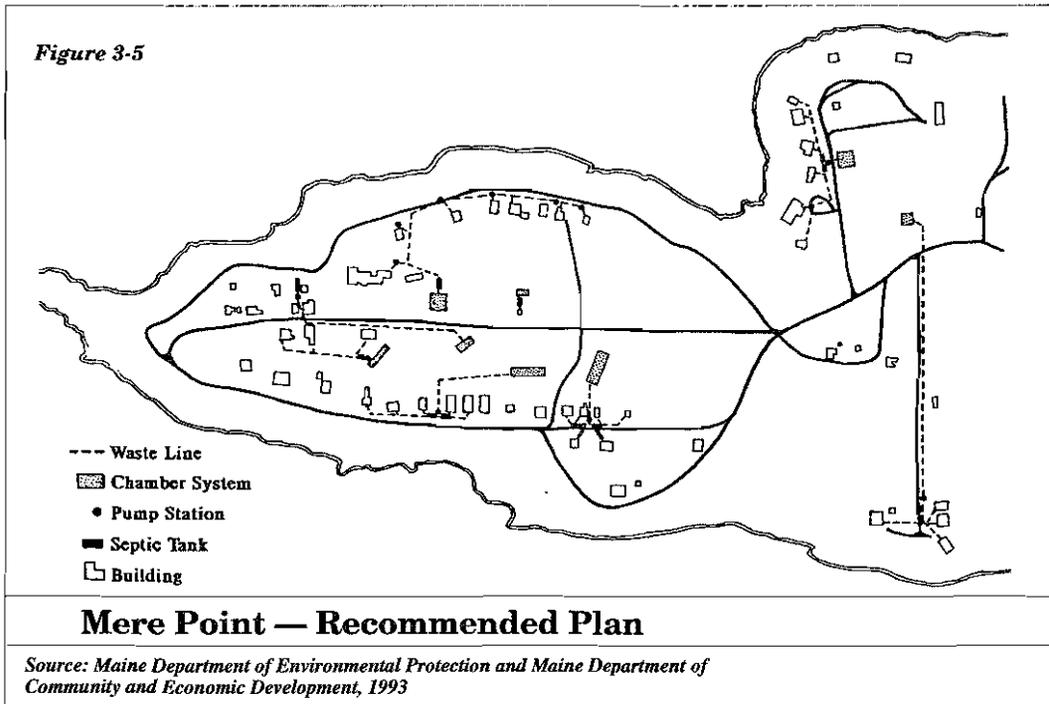
Source: Maine Department of Environmental Protection, 1996

Figure 3-4 shows the locations of overboard discharges (as of March 1996), based on information supplied by the Maine Department of Environmental Protection.



A Creative Alternative for Wastewater Disposal

Removal of overboard discharge systems becomes more complicated on waterfront lots where soil is inadequate or where lots are too small for an in-ground septic system. The Town of Brunswick devised a creative solution for 53 homes and cottages on Mere Point that had overboard discharge or substandard systems. With help from the U.S. Environmental Protection Agency, the Maine Department of Environmental Protection, the Maine Department of Economic and Community Development, and a local engineering firm, the town replaced the existing systems with subsurface "cluster" wastewater disposal systems and individual septic systems. The project demonstrates one feasible waste disposal solution for areas with limited soil capacity and small lots.



Licensed Wastewater Discharges

Among the potential sources of nutrients, municipal wastewater discharges contribute the most nitrogen to Casco Bay's ecosystem. However, the impact of this nitrogen input depends on the receiving water's flushing ability. The more flushing by tides or currents, the less damaging the impact. *Flats near combined sewer overflows, municipal sewage treatment plants, and other licensed discharges are permanently closed to shellfish harvesting.* Many of these discharge sites in Casco Bay are in the Fore River, Back Cove, and Presumpscot River, where other contributing factors (e.g., bacteria-laden stormwater runoff from a densely populated area) could precipitate closure. Permanent closures are also in place around municipal sewage treatment plant discharges in Freeport and Yarmouth.

Illegal Boat Sewage Discharges

Casco Bay has approximately 1,900 boat slips at 19 privately owned marinas and 3,400 moorings controlled by towns. Illegal discharge of sewage from boats presents a public health problem for both swimmers and shellfish consumers. Although sewage discharge is only permitted in waters 3 miles out from the coastline (*i.e.*, outside the bay), it is suspected that many boats discharge into bay waters. *Currently, seven marinas in Casco Bay have boat pumpout facilities, although the state's pumpout law requires all marinas with 18 or more berths (serving boats more than 24 feet in length) to have such facilities.*

The U.S. Fish and Wildlife Service provided grant money for a pilot program in Casco Bay to provide on-the-water pumpout services with a mobile pumpout boat operated by the regional nonprofit group, Friends of Casco Bay. The summer of 1995 was the first boating season for this innovative pilot program.

Polluted Stormwater Runoff

Agricultural practices and livestock also contribute to the bacterial and nutrient runoff that can close clam flats. Many farmers work with the federal Natural Resources Conservation Service (formerly the Soil Conservation Service) to reduce contaminated runoff and apply conservation practices through the implementation of site-specific conservation plans. However, bacteria and nutrients from some farm operations, domestic pets, golf courses, gardens, lawn maintenance practices, and wildlife can cause excess input of nitrogen or bacteria.

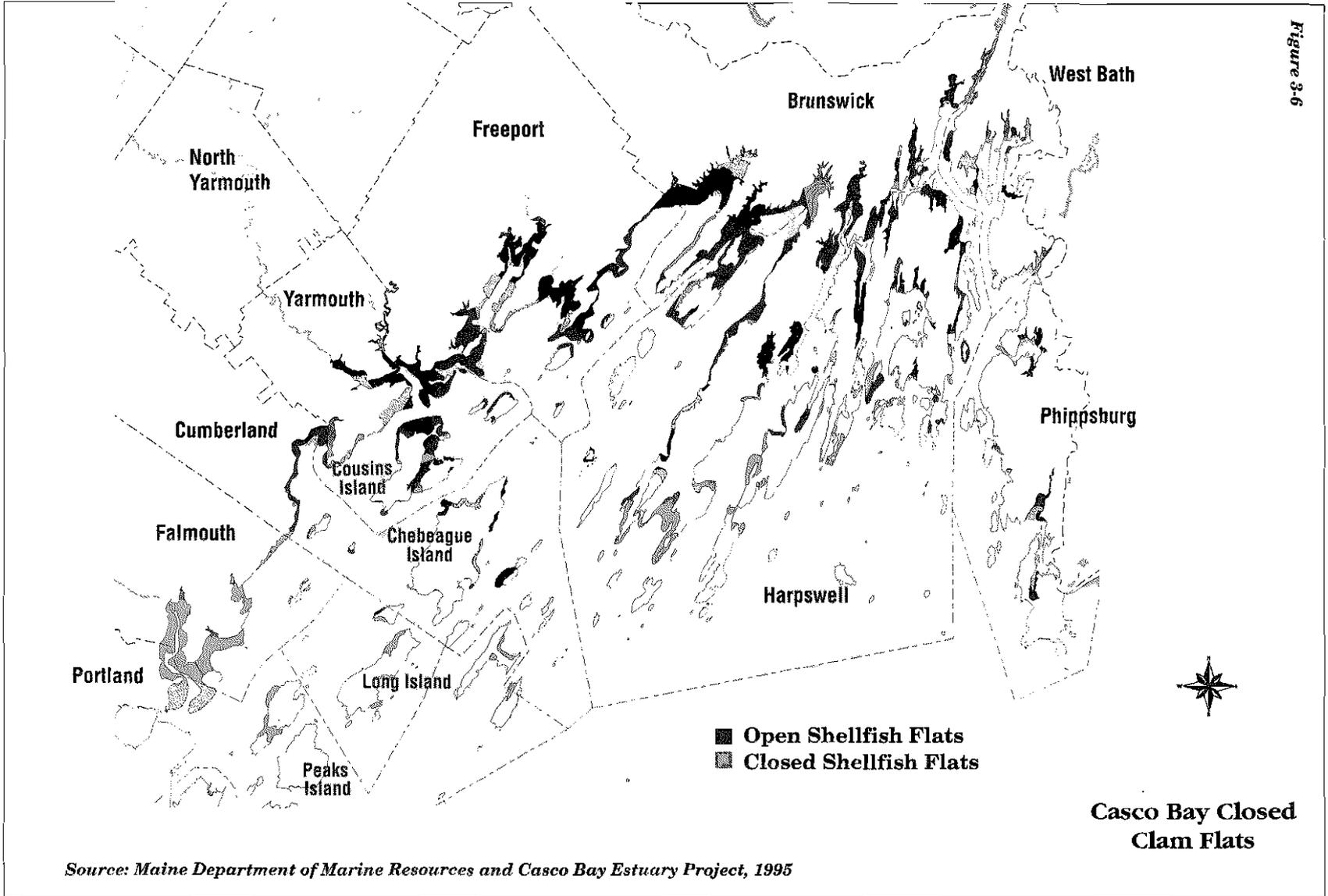
Economic Effects of Contamination

In 1995, the Casco Bay Estuary Project funded an economic study of the soft-shell clam industry in Casco Bay, which found that harvesters landed an estimated 63,805 bushels of clams in 1994 worth an average price of \$72.95 per bushel, for a total value of about \$4.66 million.

The total economic activity generated by the Casco Bay soft-shell clam industry in 1994 (i.e., money that stays within the local economy and adds to the income of area residents) is estimated at \$11.6 to \$15.7 million. It is important to note that this represents production from only about 63 percent of Casco Bay's clam flats; the remaining 37 percent were closed (May 1995) because of potential or actual pollution (see Figure 3-6).

The study also found that in 1994, the soft-shell clam industry directly supported almost 300 jobs: 268 commercial diggers and 13 shellfish dealers who sell Casco Bay clams to restaurants and other retail outlets. In addition, 1,252 recreational licenses were granted by the Casco Bay towns of Yarmouth, Cumberland, Freeport, Brunswick, Harpswell, Phippsburg, and West Bath. Shellfish harvesters and consumers have the greatest stake in ensuring that on-site disposal systems around Casco Bay function properly. *When flats are*

Figure 3-6



closed, high quality seafood is lost; harvesters, dealers, and shuckers lose work; restaurateurs pay higher prices; and more stress is put on the remaining open flats.

Economic benefits of proper sewage disposal extend to homeowners themselves, since proper management and maintenance prolongs the life of the septic system beyond the 20-year average. *A periodic inspection and pumpout costs about \$100; the replacement of a system costs between \$2,500 and \$15,000.* Maintenance of septic systems can improve neighborly relations and reduce the legal liability caused by a system's failure, and a functioning septic system is important to ensure sale of a house. If the system does not meet required standards, the buyer or lending institution can require that it be upgraded prior to sale. A record of proper septic system maintenance helps homeowners at the time of sale. Likewise, replacement of an overboard discharge unit with a conventional septic system increases the value of a shorefront property.

Public Health Effects of Contamination

Consumption of shellfish from a contaminated flat can cause intestinal illness and spread viral diseases. While commercial harvesting of shellfish is carefully regulated, uninformed recreational diggers and consumers are at risk of infection, and poaching in closed areas endangers potential consumers.

Water quality at public swimming areas around Casco Bay is not monitored except at East End Beach and Peaks Island in Portland. Contact with contaminated water through swimming or water sports can result in infected cuts and scrapes and accidental ingestion of bacteria and viruses. Because no consistent water quality monitoring is conducted at Casco Bay beaches, the health risks for swimmers are currently unknown.

Ecological Effects of Contamination

"Eutrophication" is a natural process. Human-induced pollution can accelerate the rate of eutrophication and result in the uncontrolled growth of nuisance algae (e.g., single-celled plants or seaweed), which can indirectly deplete oxygen, suffocating shellfish and other marine life. The phenomenon is caused by excessive inputs of nutrients such as nitrogen into a water body. Numerous bays and estuaries around the country have been seriously harmed by eutrophication.

An algal bloom in 1988 that killed shellfish in Maquoit Bay in Brunswick caused speculation that parts of Casco Bay may have excessive nitrogen-loading and prompted creation of a program to monitor oxygen levels in coastal Maine waters. The Maine Department of Environmental Protection, Friends of Casco Bay, and the Wells National Estuarine Research Reserve are monitoring bays that could have reduced oxygen levels. If oxygen depletion is found, the area will be examined for natural causes and for sources of excess nitrogen-loading.

Shoreland Zoning

Shoreland zoning applies to all land within 250 feet of the shore of a lake, river, wetland, or ocean, and within 75 feet of major streams. Municipal shoreland zoning ordinances must meet minimum state standards. Shoreland zoning rules related to wastewater disposal systems include requirements to upgrade existing systems when replacement occurs or when a dwelling is converted from seasonal to year-round use.

Shellfish Ordinances

Many towns have shellfish ordinances that give them the right, by following Maine Department of Marine Resources guidelines and obtaining approval, to manage shellfish resources within their town. Active management programs currently operate in Brunswick, Freeport, Harpswell, West Bath, and Phippsburg, where towns budget thousands of dollars for shellfish management and pollution control. *Due to sound management, which can include limiting licenses, seeding clam flats, and rotating open and closed flats, and to the natural settlement of young clams, these municipal flats have a much higher shellfish productivity than unmanaged flats elsewhere in Maine.*

Land Use Controls

Shellfish flats are vulnerable to pollution from stormwater runoff, control of which depends on local zoning, subdivision, and site-review ordinances. The Town of Brunswick recently enacted a strict zoning provision to protect shellfish areas from runoff.

Assessment of Regulations

- (1) Programs governing management of wastewater and clam-harvesting are fragmented and confusing to municipalities, partially because responsibility for these issues is divided among three state agencies: the Maine Department of Marine Resources, the Maine Department of Environmental Protection, and the Maine Department of Human Services.
- (2) Confusion exists among Casco Bay area harvesters and the public about the interpretation of National Shellfish Sanitation Program requirements.
- (3) *There is strong public interest in opening clam flats and swimming areas, but no regional strategy at present.*
- (4) *Many people (e.g., homeowners, municipal officials, septic system installers, farmers, and boatowners) are not aware of their potential impact on swimming areas and clam resources.*
- (5) An appropriate indicator of human-derived bacteria and viruses needs to be developed for both clam flats and swimming areas (one that does not reflect wastes from wildlife). The *National Indicator Study*, a cooperative

effort of the National Oceanic and Atmospheric Administration and university, industry, and shellfish regulatory members throughout the country, has been underway to try and determine a more appropriate indicator organism. The study needs to be revitalized.

- (6) Regular inspection and maintenance of septic systems does not occur and there is limited enforcement to correct malfunctioning systems. *Municipalities need to pursue enforcement of existing rules and regulations.*
- (7) Towns have to be well-organized to take full advantage of the overboard discharge removal funds. Brunswick, Harpswell, Freeport, and Phippsburg have actively pursued funds for overboard discharge removal, while other towns appear to need more assistance to prioritize clam-flat resources and develop creative design options.
- (8) Monitoring is needed to determine if excess loading of nutrients is occurring.

Recommendations

There are strong economic, ecological, and health incentives to reduce the levels of bacteria and nutrients entering Casco Bay. While state and municipal actions have begun to address the sources of contamination, further efforts are needed. The following list of actions outlines some measures that would help reopen the clam flats and protect swimming areas of Casco Bay. The title of each action is listed below. Following the title is the action number. The actions are described more fully in Chapter 7. Actions that directly relate to this chapter appear in bold typeface; other actions that support this chapter appear in regular typeface.

■ Public Education

- Fund high school students' research. (#1)
- Focus post-secondary educational programs on Casco Bay. (#2)
- Conduct a comprehensive campaign to promote sound household practices. (#3)
- Educate boaters about low-impact practices, non-toxic boat products, and the need to protect sensitive habitats. (#4)
- Hold "State of the Bay" conferences. (#7)

■ Technical Assistance

- **Provide technical assistance to help reopen and manage clam flats.** (#1)
- Provide technical assistance to monitor and open public swimming areas. (#2)
- Train installers and pumpers of septic systems. (#3)

- Provide training in best management practices for contractors, public works crews, road commissioners, and municipal boards and staff. (#4)
- Develop and implement action plans for sub-watershed areas. (#6)

■ **Regulatory/Enforcement Plan**

- Adopt minimum standards for stormwater quality in state and municipal regulatory programs. (#3)
- **Comply with the pumpout law. (#4)**
- Improve local enforcement of the plumbing code. (#5)
- Require proof of legal waste disposal upon transfer of property. (#6)

■ **Planning and Assessment**

- **Develop municipal programs to protect water resources and clam flats from septic system discharges. (#1)**
- **Review implementation of the National Shellfish Sanitation Program. (#3)**
- **Research whether the State Plumbing Code adequately prevents coastal pollution. (#9)**

HABITAT PROTECTION



CASCO BAY PLAN

To protect and restore habitat in Casco Bay, the Management Committee established the following goal and objectives:

GOAL:

Minimize adverse environmental impacts to ecological communities from the use and development of land and marine resources.

OBJECTIVES:

- No net loss of aquatic and island habitats.
- Habitats in Casco Bay should be of a quality that does not have an adverse effect on the structure and function of the biological community.
- The miles of rivers, streams, and coastal waters meeting water quality standards shall increase annually.
- The acreage of protected, regionally significant coastal habitat shall increase annually.

HABITAT PROTECTION

Introduction

To protect the wealth of species that live in Casco Bay, it is necessary to conserve the natural environment that provides their food, cover, travel corridors, and breeding and nursery areas. The habitats that support the bay's abundant plant and animal life range from forested wetlands and streams to eelgrass beds and muddy sea bottom.

Habitats are places where plants and animals live, feed, find shelter, and reproduce. The productivity of a habitat depends on how well the physical (e.g., temperature, salinity, and substrate) and biological (e.g., vegetative cover and food) requirements meet the needs of the species of plant or animal. For human members sharing natural habitats, the knowledge of interdependence carries with it a responsibility. To sustain the health of Casco Bay, we must pursue actions that benefit not only our own species, but also all the "neighboring" plants and animals that share the watershed's ecological community.

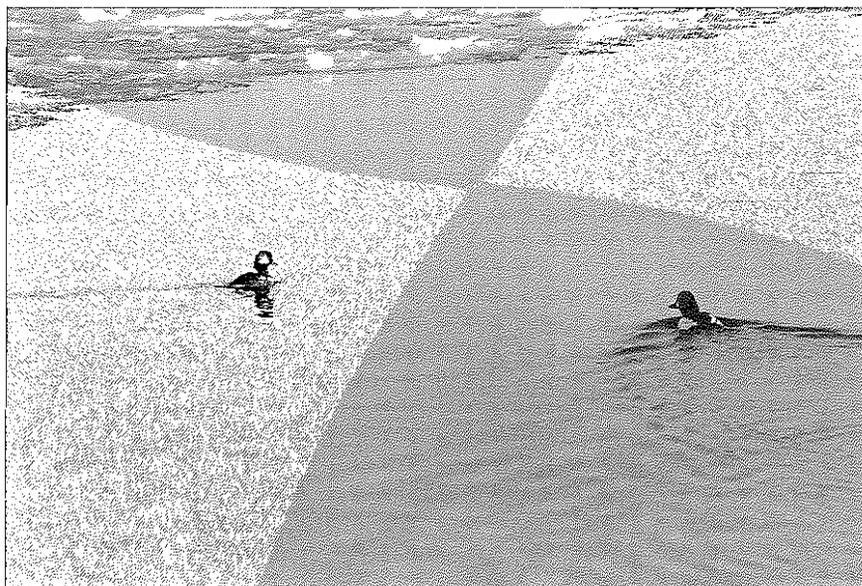


photo by Christopher Ayres

Species Diversity and Density

Casco Bay has long been recognized for its richness and diversity of wildlife. Collecting over 500 species from Casco Bay in 1874, the famous marine biologist A. E. Verrill noted the “great diversity in the character of the [bay’s] bottom and in the character of the fauna.” Much of that ecological diversity still exists today. *To date, at least 850 species have been identified in the waters of Casco Bay* (U.S. Fish and Wildlife Service, 1980). In 1980, a sample of just 1 square foot of Casco Bay mud yielded 86 different animal species (Larsen *et al.*, 1983).

The marine life in Casco Bay is rich in numbers as well as diversity. In the early 1900s, Dr. Kingsley, who located a biological laboratory in South Harpswell, wrote that “Casco Bay is nearly as rich in species as the southern coast [*i.e.*, Vineyard Sound, Massachusetts], while in individuals it is vastly richer, as has been noticed by everyone who has collected in the two regions.” *When compared to four similar water bodies around the world, Casco Bay illustrates its richness in numbers of living organisms* (Larsen *et al.*, 1983).

Mean Density of Organisms/Square Meter	
Casco Bay	8,743
Gullmars Fjord, Sweden	4,198
Mystic River, Massachusetts	3,000
Lambert Bay, South Africa	1,153
Delaware Bay, Pennsylvania	722

The marine and coastal organisms found in Casco Bay include the following (Hutchinson and Ferrero, 1981; U.S. Fish and Wildlife Service, 1980; and Gilbert, 1995):

- 150 species of waterbirds, whose population reaches about 32,000 at peak times of the year
- 15,000 pairs of seabirds, including eiders, herring gulls, great black-backed gulls, double-crested cormorants, common terns, and black guillemots, which nest on approximately 50 islands in Casco Bay
- nesting sites of the endangered roseate tern
- hundreds of wintering loons and grebes
- 33 species of shorebirds, including thousands of migrating sandpipers, plovers, and related species
- six heron rookeries, including great blue herons, snowy egrets, glossy ibises, and black-crowned night herons
- one of the most important winter waterfowl populations along the Maine coast, including eiders, black ducks, and other waterfowl

- more than 50 pairs of nesting osprey, one pair of nesting bald eagles, and use by occasional peregrine falcons
- more than 2,000 harbor seals using approximately 40 ledges
- migrating whales, porpoises, and dolphins
- a wide variety of fish: flounder, skate, mackerel, haddock, cod, bluefish, striped bass, bluefin tuna, pollock, and others
- important commercial shellfish species, including lobster, clams, and scallops
- extensive and dense eelgrass beds

Prime Habitats

While Casco Bay provides habitat for all these species, each type of plant and animal tends to concentrate in particular sections of the bay and its watershed. Some ecological features — such as islands, tidal flats, and salt marshes — are especially important sources of food and shelter for numerous wildlife species.

The needs of plants and animals (their “habitat requirements”) may vary over their life span. For example, juvenile fish often inhabit the protected and rich waters of the bay’s estuaries, moving to deeper waters when they mature. Juveniles who, as a rule, usually are the most sensitive to habitat degradation have the most stringent habitat requirements.

The habitat requirements for adults remain relatively constant over time. For example, herons need tall shrubs or trees in which to nest and eelgrass beds require shallow clear water. The way a species uses a given set of resources, however, may change over time. Which rookeries herons use, or which mudflats they feed on, can vary depending on the availability of food, the existence of cover to lend protection from predators, and the population level of competitors.

This variability makes it difficult to define exactly which locations are most important and how much of these habitats must be protected. What is appropriate one year may be inadequate the next. *Environmental planning for habitat protection must therefore include a “margin of safety” to account for possible future needs.*

Priority habitats identified by the Casco Bay Estuary Project include the waters and islands of Casco Bay, and the rivers, streams, and freshwater wetlands of the watershed. While lakes, ponds, and certain terrestrial features provide important habitats, these are less directly linked to Casco Bay and therefore are not discussed in the *Plan*.

Marine and Estuarine Waters

The marine habitats of Casco Bay, which cover 229 square miles, can be separated into subtidal areas (those always under water) and intertidal areas (those between extreme high and low tides that are periodically exposed to air).

Subtidal Areas. The composition of the sea bottom (*i.e.*, fine mud, sand, gravel, cobble, boulders, and rock) determines which plants and animals live in particular subtidal habitats. For example, lobsters, crabs, and sea urchins generally live on hard bottom, whereas scallops and worms dwell in soft-bottom areas.

Fish. Above the sea bottom, fish are an important user of the water of Casco Bay. *Thirty-six species of finfish reside in Casco Bay, with winter flounder being the most common species found year-round.* The most abundant year-round fish in the bay are bottom feeders such as pollock, sculpin, and skate. These fish feed on the diverse and plentiful supply of marine invertebrates, including small bottom-dwelling mollusks, marine worms, and shrimp-like animals. The shallow protected coves in Casco Bay provide perfect spawning habitat for fish that deposit eggs on the bottom (*e.g.*, sculpin, winter flounder, rock gunnel, tomcod, and skate) (U.S. Fish and Wildlife Service, 1980).

The Atlantic herring, alewife, Atlantic menhaden (pogy), American sand lance, and Atlantic shad live in the water column and feed on microscopic plants and animals. Bluefin tuna, the hakes, spiny dogfish, bluefish, Atlantic mackerel, and striped bass enter the bay in summer; alewife, rainbow smelt, shad, and occasional salmon pass through Casco Bay on their way to spawn in rivers. Eels live in the rivers of the watershed and travel through Casco Bay to spawn in the Sargasso Sea.

Waterbirds. Waterbirds also use the open waters of Casco Bay. Cape Elizabeth in Casco Bay is the boundary for two zoogeographic regions — the boreal and northern temperate zones — for waterbirds (*i.e.*, seabirds, shorebirds, wading birds, and waterfowl). Consequently, a wide variety and unusual aggregation of marine birds occur in Casco Bay. *Approximately 150 species of waterbirds inhabit Casco Bay, 100 of which occur regularly.* The number of waterbirds in Casco Bay varies seasonally from approximately 4,600 to about 32,000. There are three peaks: in October during fall migration, during January when the majority of birds (primarily waterfowl) are wintering in Casco Bay, and in February and March during spring migration. These birds use the bay's open waters for feeding, molting, migrating, and wintering. The endangered least tern and piping plover nest on beaches north and south of Casco Bay and use the bay for feeding (Hutchinson and Ferraro, 1981; and U.S. Fish and Wildlife Service, 1980).

Casco Bay supports important winter waterfowl populations. Eiders, black ducks, mallards, goldeneyes, buffleheads, scaups, scoters, old squaws, megansers, brant, green-winged teal, and Canada geese are common in the bay. Loons and grebes also winter in Casco Bay, with the horned grebe and common loon being the most common species. Large numbers of eiders, scoters, goldeneyes, black ducks, and buffleheads winter in Casco Bay. For example, Back Cove in Portland is an important winter feeding area for black ducks and mallards. Several raptors, including osprey and the endangered bald eagle, use open water areas for feeding.

Marine Mammals. The harbor seal is the most common species found in the waters of Casco Bay, with occasional sightings of gray seals as well. Whales migrate through the waters off Casco Bay. Sightings in the Casco Bay area include the endangered humpback whale, the killer whale, the beluga, and the sperm whale. Harbor porpoises can be seen during the summer, and the common dolphin and striped dolphin occasionally enter Casco Bay. Seals and whales use the subtidal waters for feeding.

Plants. Plants, which support the food chain, are an important part of subtidal habitats. One particularly sensitive plant, eelgrass, is considered an indicator of ecosystem health. Growing in shallow, clear water with silty sand bottoms (and on some flats), it is used by flounder, cod, striped bass, scallops, crabs, lobsters, and waterfowl as a nursery area, feeding ground, or refuge from predators. Casco Bay has the largest and most dense concentrations of eelgrass mapped along the coast of Maine, with over 7,000 acres of beds.

Intertidal Areas. The intertidal zone of marine estuarine waters includes a diverse array of habitats from rocky shore to salt marshes and flats. Due to topography and wide tidal variations characteristic of the Gulf of Maine, intertidal areas in Maine are the most extensive along the Atlantic Coast of the United States.

Salt marshes are highly productive ecosystems that contain cordgrass, salt hay, and spikegrass. Salt marshes provide essential habitat to mussels and other mollusks, herons, mallards, black ducks, muskrat and other fur-bearing mammals, silversides, sticklebacks, mummichogs, and worms.

Salt Marshes. Casco Bay, unlike areas south along the Atlantic Coast, does not have numerous expansive salt marshes. However, significant areas of salt marsh exist around sheltered flats, and these marshes are extremely productive areas.

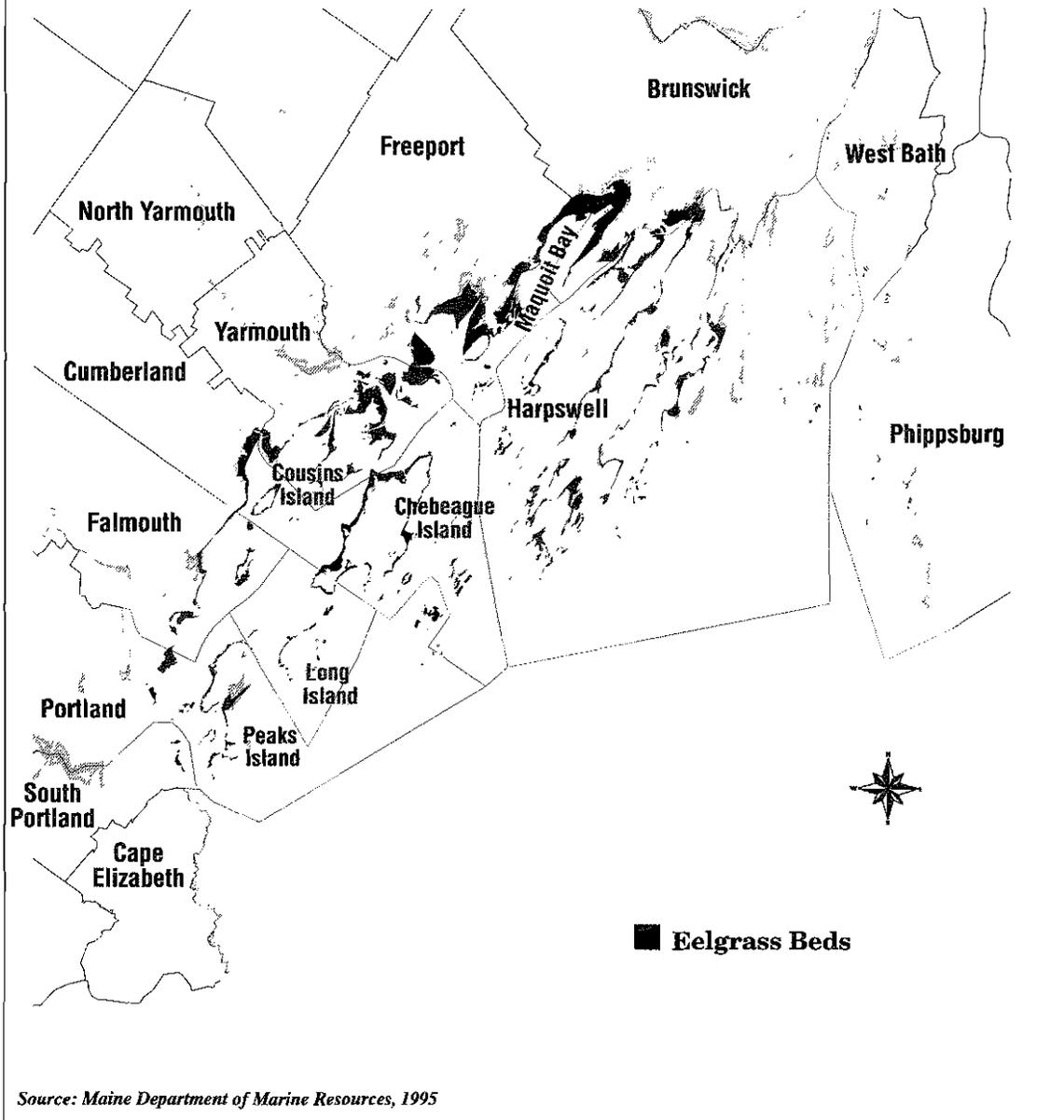
Salt marshes filter stormwater from upland developments and help moderate nutrient flow to adjoining waters. Marshes also act as giant sponges during storms and therefore reduce damage from flooding.

Flats. Flats are the most characteristic intertidal habitat in Casco Bay, with 11,582 acres of tidal flats. Flats form in relatively sheltered bays and are principally mud or sand. Flats are especially important environments because they support a rich and abundant animal community, including commercially harvested clams, sandworms, and bloodworms. Flats are also home for the Baltic clam, green crabs, numerous tiny worms, and shrimp-like animals (amphipods). The flats in the Brunswick and Harpswell area also have southern species, such as quahogs, that are completely isolated from their counterparts in southern New England.

Shorebirds, waterfowl, and wading birds feed on flats and in the creeks and shallow subtidal areas near flats. Thirty-three species of shorebirds are common along the Maine coast. As many as 300,000 semipalmated sandpipers, which is approximately 10 percent of their total population, migrate along

Figure 4-1

Eelgrass Beds in Casco Bay



Source: Maine Department of Marine Resources, 1995

the coast of Maine in spring and early fall. Tens of thousands of migrating semipalmated plovers, short-billed dowitchers, black-bellied plovers, and ruddy turnstones also use the Maine coast.

There are numerous areas in Casco Bay used by hundreds of shorebirds and several locations where relatively large numbers of migrating shorebirds congregate to feed seasonally, such as the Fore River Estuary, Back Cove, and Maquoit and Middle bays in Brunswick. A popular feeding area is Back Cove, where up to 5,000 shorebirds, including semipalmated plovers, black-bellied plovers, ruddy turnstones, yellowlegs, least sandpipers, dunlins, short-billed dowitchers, and semipalmated sandpipers, congregate to feed.

Rocky Shore. The 500 acres of rocky shore in Casco Bay provide habitat for a wide range of species, from seaweeds, periwinkles, mussels, barnacles, and crabs to starfish and seals. Some areas are exposed to the force of wind and waves, which impacts the species that can be supported. In and around tide pool areas are lumpfish, sticklebacks, sea snails, winter flounder, and pollock, as well as sandpipers, ruddy turnstones, and sanderlings. Waterfowl such as eider ducks use rocky shore habitat for feeding.

Islands. Casco Bay contains 758 islands, islets, and exposed ledges at mean high tide, a few of which are important habitat for colonial nesting seabirds (e.g., the common eider, double-crested cormorant, herring gull, great black-backed gulls, and common and roseate terns). Uninhabited outer islands often provide prime nesting sites for seabirds, being inaccessible to predators such as fox, mink, and raccoons.

The bay has 50 seabird nesting islands, of which 17 support nationally significant populations of nesting birds (defined by U.S. Fish and Wildlife biologists as greater than 1 percent of a species population in Maine). The 17 major nesting colonies are inhabited by approximately 15,000 nesting pairs of eiders, herring gulls, great black-backed gulls, and black guillemots, which collectively represent more than 15 percent of the state's nesting seabird population.

The numbers of common terns are reduced today in Casco Bay because they are out-competed for food and nesting space and preyed upon by great black-backed and herring gulls. A recently enacted tern restoration program devised by the National Audubon Society and Maine Audubon Society at Jenny Island in Casco Bay helped revitalize that colony of common terns from 59 pair in 1991 to 500 pair in 1995.

Large numbers of great blue herons and lesser numbers of black-crowned night herons, glossy ibises, and snowy egrets nest on several islands in Casco Bay.

Ledges and bars associated with the outer islands provide important ice-free wintering areas for black ducks, eiders, scoters, and old squaws. Migratory brant use these areas in the spring. Landbirds, shorebirds, and geese also use islands during migration.



photo by Christopher Ayres

Until the 1960s, the endangered bald eagle nested in Casco Bay. Absent for years, two nesting pairs recently returned to Casco Bay. *More than 50 pairs of osprey nest in Casco Bay, principally in the eastern part of the bay.* The endangered peregrine falcon occasionally uses Casco Bay during migration.

There are 41 documented seal haulouts in Casco Bay, on either small islands with no terrestrial vegetation or half-tide ledges that are under water at high tide (Gilbert, 1995).

Rivers, Streams, and Freshwater Wetlands. Casco Bay is fed by four rivers (the Presumpscot, Royal, Stroudwater, and Fore) and a vast network of streams that flows into these rivers or directly into Casco Bay. *Throughout the Casco Bay watershed, there are more than 1,356 miles of rivers and streams that offer habitat to muskrat, beaver, river otter, belted kingfisher, black duck, spotted sandpiper, shad, trout, bass, perch, pickerel, and salmon.* Streams provide important habitats for juvenile fish and for anadromous fish like alewife and smelt, which use them for spawning. The landlocked salmon, a prized recreational fish, lives in Sebago Lake and spawns in the upper Casco Bay watershed.

The riparian (i.e., streambank) zone and the 578 miles of edge habitat next to the shoreline of Casco Bay are important links between the terrestrial (land) ecosystem and the wetlands or water. Many species of birds and mammals use these areas for shelter, feeding, and nesting or raising young. This riparian or edge habitat protects the abundant and diverse species that use the adjacent open water. These habitats also act as filters for stormwater and groundwater flow from upland development.

Freshwater wetlands (*i.e.*, vegetated wetlands that often fringe open water but also can be isolated from surface water bodies) range from marshes and wooded swamps to vernal pools (*i.e.*, wetlands that hold standing water for several months in spring and early summer and provide important breeding sites for amphibians). Like coastal salt marshes, freshwater wetlands afford critical habitat, particularly for deer, beavers, muskrats, raccoons, wood ducks, American bitterns, great blue herons, green herons, leopard frogs, painted turtles, and four-toed salamanders. Freshwater wetlands also play an important role in purifying polluted water and reducing flood damage.

Habitat Threats

Human activity can threaten habitat in numerous ways, through direct loss, fragmentation, encroachment, disturbance, diminished water quality, altered drainage patterns, and barriers.

Who Needs Large Habitat Areas?

Large habitat areas are needed by certain species, such as red-shouldered hawk, which require up to 620 acres of upland and wetland forest for breeding, and the American bittern, which requires a minimum of 6 to 12 acres of shallow freshwater wetlands where abundant vegetation is interspersed with patches of open water (Eaton *et al.*, 1914; Gibbs *et al.*, in press).

Direct Loss

Construction of buildings or parking lots causes fragmentation and loss of natural habitats. Although building projects may appear small and losses minimal, their cumulative effect can be significant. In marine environments, subtidal dredging of navigation channels, piers, and marinas can diminish or destroy habitat.

Fragmentation

Many animals and plants require large tracts of habitat to meet their own needs or to serve as a buffer from human activities. Development can fragment natural areas, disrupting important travel corridors and increasing mortality rates by making it easier for predators to reach species that inhabit the interior of undisturbed areas.

Encroachment

Activities adjacent to a habitat may make it unusable. All habitats need buffers (the size and type of buffer depends on the species); impacts like water quality changes, human disturbance, and increased predator activities can reduce or eliminate a habitat for some species.

Disturbance

Some wildlife cannot tolerate any human disturbance and will, for this reason, abandon otherwise suitable habitat. Even minimal recreational activity, such as walking on islands during nesting season or noise from boats, can affect some species.

Metal drags used to harvest groundfish, mussels, sea urchins, and scallops turn over the surface layer of sediments, disrupting the community of plants and animals that lives there. Other organisms that share the soft-bottomed habitat, such as eelgrass and large burrowing worms, can be completely removed.

Diminished Water Quality

Direct or nonpoint discharges of pollution can increase water temperatures, degrade water quality, create turbid conditions, change currents, or alter salinity — any of which can make the area unsuitable for native species.

Altered Drainage Patterns

Buildings and pavement prevent water from seeping into the ground; storm drains channel water from a wide area to one location; and pipes and culverts can move water from one sub-watershed to another. Such changes can cause flooding, reduce groundwater discharge, change stream flows, increase water temperatures, alter salinity, and increase erosion — all of which degrade habitats.

Barriers

Human-made structures such as roads, driveways, and bridges often create barriers for plants and animals. Culverts can obstruct the passage of fish and restrict the flow of salt water to upstream marshes. Dams prevent fish from migrating upstream, reduce downstream flows, raise water temperatures, reduce dissolved oxygen levels, and accumulate toxic sediments, making the river unsuitable for some species.

Seawalls built to prevent erosion represent another type of barrier. Due to subsidence of the earth's crust, the sea level in Casco Bay has risen almost a foot this century and continues to rise. When property owners construct seawalls to hold back the water, they sacrifice intertidal lands, which get squeezed out between the sea and a stone or riprap wall.

Birds That Need Privacy

In Casco Bay, the bird species most susceptible to human disturbance during critical seasons are bald eagles, great blue herons, common eiders, common least, roseate terns, and piping plovers. Migratory shorebirds and other wading birds are also easily disturbed from their layover/feeding sites. Disturbances reduce feeding times that are already limited by tides, which can cause birds to abandon a preferred site for a less advantageous one.

Habitat Degradation

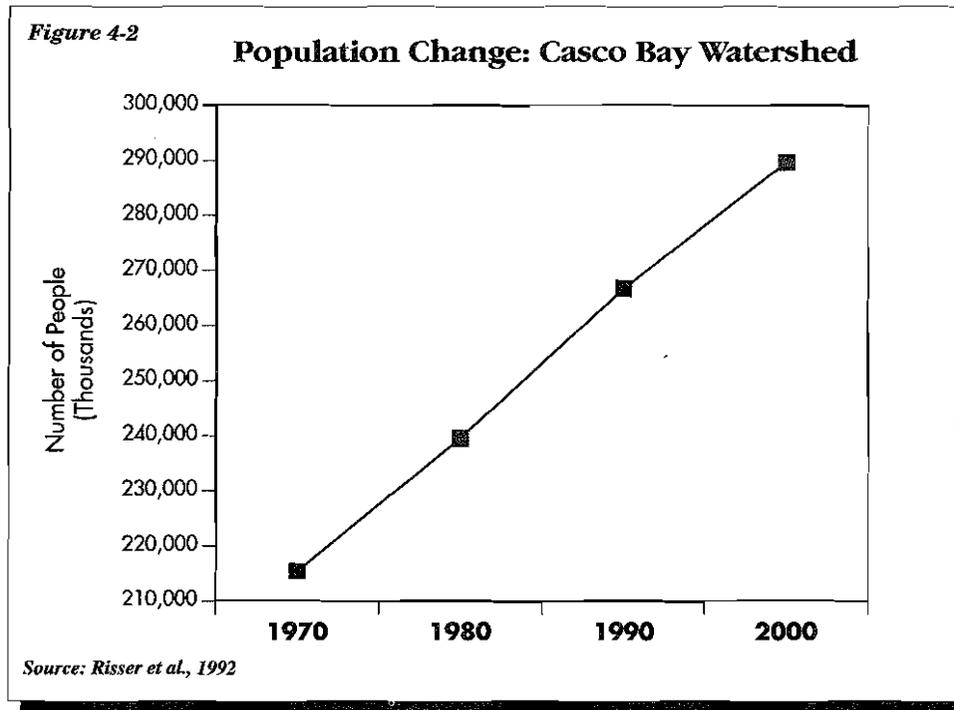
Evidence of damaged habitats can be found throughout Casco Bay and its watershed:

- The New Meadows “Lake” north of Route 1, once a tidal estuary, now suffers from algal blooms due to limited tidal flushing caused by the restrictive spillway.
- Long Creek, near the Jetport in Portland, has degraded wetland areas resulting from the construction of Interstate 295.
- Interstate 295 crossing over the Presumpscot River has impaired the natural tidal flushing and allowed the buildup of sawdust and paper mill waste.
- Four dams on the main stem of the Royal River present barriers to fish, as none have fish ladders.
- Capisic Brook in Portland used to be an American eel run but is now impassable due to a dam and reduced water flows caused by sewerage in the area, which redirected some water flows to sewers.

Populations and Housing Trends

Damage to natural habitat has accelerated due to an increase in human population and housing development. *Population in the lower Casco Bay watershed increased by 51,000 people (almost 24 percent) between 1970 and 1990, bringing*

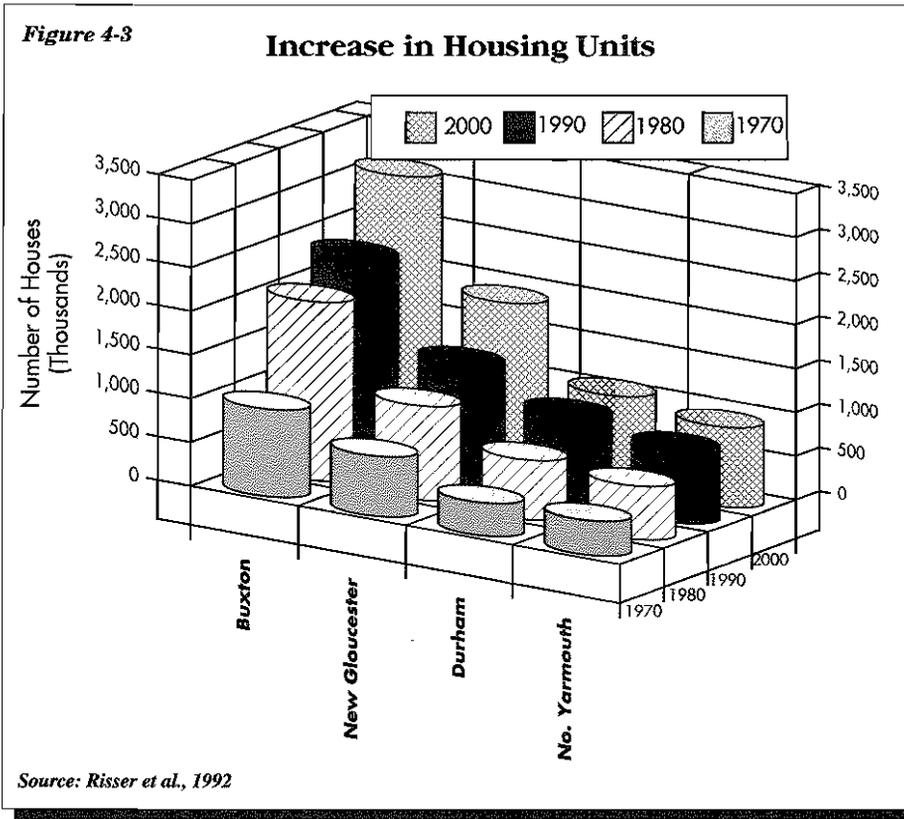
the total to almost 270,000. Although growth has slowed in recent years, the area is projected to have 290,000 people by the year 2000 (Risser *et al.*, 1992) (see Figure 4-2).



The impact of population growth is accentuated by the geographic dispersal of people in the watershed. *The more dispersed housing is, the greater the fragmentation of habitat and loss of critical species.* From 1970 to 1990, the number of housing units in the Casco Bay watershed increased by almost half — twice the rate of population, with most of the growth suburban and rural. Small towns in the lower watershed grew the most between 1970 and 1990. Durham more than doubled its housing units, growing 164 percent; Buxton grew 136 percent, North Yarmouth 111 percent, and New Gloucester 99 percent (see Figure 4-3).

As the number of people living in each household declines, more houses are required to shelter the population. And as people move out from urban to rural areas, new growth disturbs more plant and animal communities. A review of comprehensive plans completed by Casco Bay communities indicates a widespread concern over this dispersal of housing. Increased population pressures are also evident on the islands of Casco Bay. *Annual ridership on the Casco Bay Ferry Lines rose from approximately 360,000 people in 1972 to more than 760,000 in 1994* (Christian, 1995).

The population of Portland and South Portland dropped from 88,383 in 1970 to 84,284 in 1980. During the same decade, the watershed population increased by over 24,000 people. These figures reflect the “suburbanization” of the Portland area.



Ecological Impacts

The combined effect of development and pollution has caused damage to Casco Bay habitats. In 1994, for example, the U.S. Fish and Wildlife Service documented that 228 acres of vegetated wetlands were lost between the mid-1970s and mid-1980s in coastal areas from Prouts Neck to Merrymeeting Bay (Foulis and Tiner, 1994). Some of these areas are outside Casco Bay.

While this figure represents a small percentage of the watershed's total wetlands, the loss did not include further losses during rapid growth of the late 1980s, or losses of "linear fringe wetlands" that surround narrow streams. Documented causes of the loss are cited as follows:

CAUSE OF WETLAND LOSS	ACRES LOST
Commercial development	95.12
Housing	43.53
Sand and gravel pits	10.78
Road construction	10.49
Agriculture	8.35
Timber harvest	7.80
Unknown	5.55
Public facilities (federal land)	4.43
Trailer parks	2.91
Construction of pond dams	2.48
Industrial development	0.81
Channelization	0.63

Beyond the direct loss of habitats, there is the more widespread threat of habitat encroachment that was clearly documented in a 1987 study of cumulative impacts from development in Scarborough and four other coastal Maine towns. This study found that while direct wetland loss was minimal, there were high rates of loss in areas surrounding wetlands (Arbuckle and Lee, 1987). *Human encroachment in nearby uplands can diminish wetland quality through agricultural runoff, stormwater runoff, groundwater withdrawals, and increased water pollution.*

Wetlands are the only habitat type that have been carefully studied for changes over time. However, the cumulative degradation of wetlands is occurring in all the priority habitats: islands, rivers and streams, and marine waters.

Loss of habitat leads to declines in species populations, a trend evident around Casco Bay (Doggett, 1995; Libby and Banner, 1995; Larsen *et al.*, 1983; and U.S. Fish and Wildlife Service, 1980):

- Terns, which have historically nested on several islands in Casco Bay, now nest only on Jenny Island. While the island supports a productive population, the colony is vulnerable because all nests are concentrated in one location.
- *A sediment sample in the Fore River found only two animals per square foot, compared to an average of 874 animals per square foot in other parts of the bay.*
- Rainbow smelt used to spawn in the Presumpscot River, but dams now block their use of the river.
- Alewives, anadromous fish that spawn in freshwater rivers and streams and provide an important food source for other species, have declined drastically.
- Quahogs and American oysters, found in Back Cove and the Fore River by A. E. Verrill in 1874, are gone due in part to high levels of contamination.
- Black ducks wintering in Casco Bay have shown an overall decline.
- Atlantic salmon have declined due to over-fishing and habitat destruction.

Casco Bay's Endangered and Threatened Species

Currently, 22 animal species are listed as endangered or threatened under Maine's endangered species law. Of these, the bald eagle and roseate tern nest in Casco Bay, and peregrine falcons use the area during migration. The watershed of Casco Bay is in the habitat range for the endangered sedge wren and black racer (snake) and the threatened Blanding's turtle. The threatened spotted turtle has been found in the watershed (Hunter *et al.*, 1992). An expanded list of endangered and threatened species is being considered for protection by the State of Maine.

Identification of Important and Potentially Threatened Habitats

A comprehensive study identifying important fish and wildlife habitat in Casco Bay and 15 adjoining towns was completed for the Casco Bay Estuary Project in 1996. Using data from Maine Department of Inland Fisheries and Wildlife, Maine Department of Marine Resources, Maine Office of Geographic Information Systems, Maine Audubon Society, National Wetland Inventory, and LANDSAT satellite imagery, biologists from the U.S. Fish and Wildlife Service's Gulf of Maine Project mapped the distribution of habitats for waterbirds, seabirds, wading birds, fish, eelgrass, cordgrass, marine worms, shellfish, and endangered threatened species.

Additionally, U.S. Fish and Wildlife Service biologists and the Casco Bay Estuary Project examined a related but more specific question: "What would happen to existing habitats if the towns surrounding Casco Bay developed to the extent currently permitted?" By relating potential land use with the existing habitat, U.S. Fish and Wildlife Service biologists identified key fish and wildlife habitats that may be threatened. This information will help individuals and organizations focus voluntary, locally initiated protection efforts toward those areas most likely to be impacted by development.

Economic Value of Habitat

Although their full worth cannot be quantified, the species and ecosystems of Casco Bay provide a valuable economic resource for the region. The dollar value assessed in transactions when habitats are bought and sold as real estate does not include the broader ecological values of habitat (*e.g.*, supporting wildlife, filtering surface and groundwater, and providing open space and flood control).

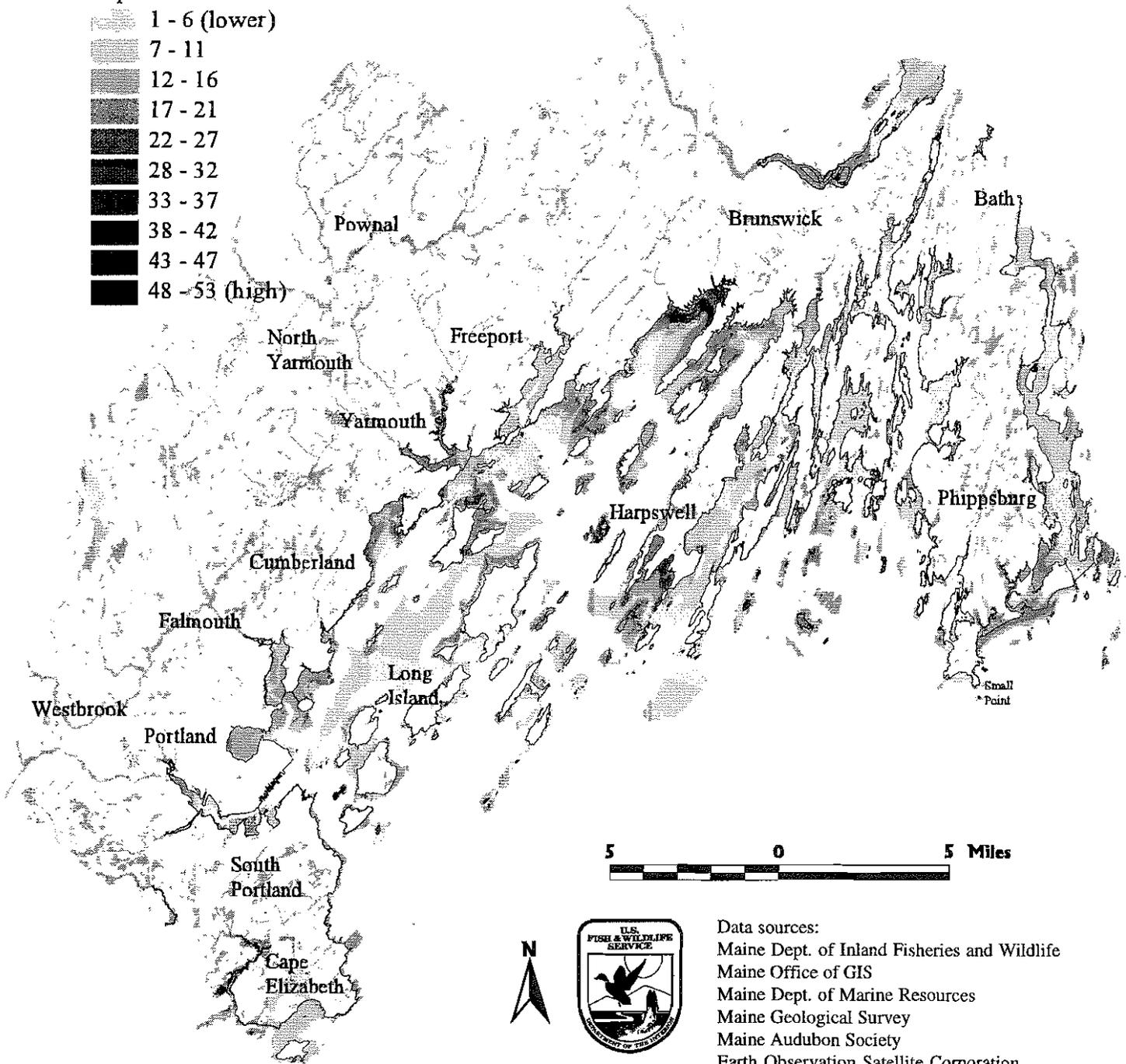
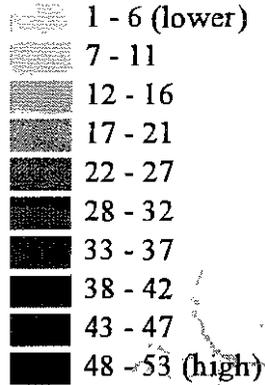
Some economic indicators, such as the fisheries industry, do reflect the health of the ecosystem. Research done by the University of Southern Maine estimated the value of the fisheries industry to Casco Bay at \$120 million (Colgan and Lake, 1988). A study done for the Casco Bay Estuary Project estimated that *the direct "in-flat" value of the soft-shell clam industry in 1994 was \$4.66 million, with an overall impact between \$11.6 and \$15.7 million — providing full or partial employment for almost 300 people, including commercial license holders and shellfish dealer employees (while an additional 1,252 people held recreational shellfish licenses) (Heinig et al., 1995).*

A second direct measure of economic value can be found in tourism and recreation. The 1988 University of Southern Maine study estimated that tourism and recreation in Casco Bay generated \$250 million a year. While the success of these industries cannot be directly attributed to the living resources of the bay, the region's natural assets are clearly an integral part of what makes it a popular destination.

Figure 4-4

Important Habitats for all Evaluation Species (Lower 15 Towns in Casco Bay Watershed)

Important habitat scores



Data sources:
 Maine Dept. of Inland Fisheries and Wildlife
 Maine Office of GIS
 Maine Dept. of Marine Resources
 Maine Geological Survey
 Maine Audubon Society
 Earth Observation Satellite Corporation
 U.S. Geological Survey
 U.S. Fish and Wildlife Service
 National Wetland Inventory
 Prepared by:
 U.S. Fish and Wildlife Service
 Gulf of Maine Project

A statewide study done in 1990 on the impact of game and nongame species also documented the value of wildlife. It was estimated that \$121 million to \$260 million was spent by residents and non-residents to fish recreationally in Maine's marine waters. The report estimated that an additional \$158 million to \$351 million was spent on freshwater recreational fishing in 1988. Although these numbers are not confined to the Casco Bay region, they do reflect the economic importance of wildlife to Maine.

The value of living resources is also evident in the higher value placed on waterfront property. The University of Southern Maine study (1988) found that waterfront property was worth 100 to 400 percent more than similar property not located on the water.

Other studies show that the cost of habitat protection is far less than restoration of damaged habitats. Based on preliminary analysis of several recent projects, the Maine Department of Transportation found the cost range for creation of new wetlands from \$54,766 to \$504,736 per acre of impact, with an average of \$214,000 per acre. The cost for preservation is \$30,538 to \$1,055,112 per acre of impact, with an average of \$151,000.

While these economic indicators give some measure of the value of habitat, they cannot capture many of the intrinsic values of the ecosystem or the non-monetary benefits it provides to residents of the watershed in terms of aesthetic appreciation, sense of place, and leaving a legacy for future generations.

Regulatory and Other Protective Measures

Wetlands Regulation

Casco Bay and the rivers, streams, and freshwater wetlands of the watershed are treated as waters under both federal and state law. At the federal level, the U.S. Army Corps of Engineers issues permits under Section 404 of the Clean Water Act for discharges of dredged and fill material into wetlands and other waters, and under the Rivers and Harbors Act for dredging activities and the placement of structures in traditionally navigable waters of the United States. Most activities are covered by a State Program General Permit (SPGP) issued by the Army Corps of Engineers on October 1, 1995. The nationwide permits that were in effect in Maine are now replaced by the SPGP, with the intended result of streamlining the permitting process while increasing environmental protection. The SPGP sets thresholds for projects, specifies the type of review they must receive (based on the size of the impact), and requires certain standards to be followed. For projects requiring an individual Section 404 permit by the Army Corps, Maine has the authority, under Section 401 of the Clean Water Act, to deny, grant, or condition certification of the Section 404 permit, to ensure that the permit satisfies the water quality requirements of state law.

As of September 29, 1995, Maine's Natural Resource Protection Act (38 MSRA 480-W) was amended to make it more consistent with the federal wetlands regulatory program (described previously). Major points of the new law include:

- A requirement for permits for any activity that affects floodplain wetlands, coastal wetlands, and freshwater wetlands regardless of size. There is no longer a 10-acre-size threshold for freshwater wetlands. The level of review required is now based on the size of the alteration in the wetland rather than the size of the wetland.
- A tiered review process. The review time is dependent on the size of the wetland impact and the level of alteration of significant wetland functions.
- A definition of projects that might affect significant wetland functions.
- Exemptions for *some* minor projects, activities adjacent to freshwater wetlands, forest management, and agricultural activities.
- Significant vernal pools are now included as significant wildlife habitat.

As a result of these revisions, "one-stop permitting" is now in place for most wetland alteration projects. A joint application form is filed by applicants. The Maine Department of Environmental Protection coordinates with federal agencies on screening and reviewing applications.

A State Wetland Conservation Plan is being prepared by the Maine State Planning Office through funding provided by the U.S. Environmental Protection Agency. The goals of the plan are to:

- improve the effectiveness and efficiency of governmental wetlands regulation programs
- protect, restore, and create wetlands
- provide an opportunity for the participants to speak with one voice on critical policy issues

Through the Conservation Plan Task Force and five technical work groups, consistent policies and priorities for wetland management will be developed with recommendations for implementation. When the plan is implemented, Maine will inventory and protect its most valuable wetlands, while creating a streamlined, predictable process to permit impacts on wetlands with lower value.

Maine's Mandatory Shoreland Zoning Act protects areas adjacent to some wetlands and streams by requiring that towns establish resource protection districts for certain sensitive areas, including wetlands rated by the Maine Department of Inland Fisheries and Wildlife as having moderate or high value for waterfowl, and land areas along rivers subject to severe bank erosion. The law also requires protection districts to be established around certain streams, and encourages protection districts around other important wildlife areas in municipalities.

Habitat Regulation

The Natural Resource Protection Act also protects “significant wildlife habitats.” Defined by the species that use them, these areas include habitats of threatened or endangered species; high and moderate value deer-wintering areas and travel corridors; high and moderate value waterfowl and wading bird habitats; critical spawning and nursery areas for Atlantic sea-run salmon; shorebird nesting, feeding, and staging areas; and seabird nesting islands.

Under the law, these areas must be mapped by the Maine Department of Inland Fisheries and Wildlife and the maps taken through rule-making by the Maine Department of Environmental Protection before the protection of the law applies. Subsequent activities occurring in, on, or over these areas must receive a permit from the Maine Department of Environmental Protection. Since the law was passed in 1988, the Maine Department of Inland Fisheries and Wildlife has produced maps for seabird nesting islands (of which 59 are in Casco Bay), and the Maine Department of Environmental Protection has begun the formal rule-making process. The Maine Department of Inland Fisheries and Wildlife is completing additional maps for deer-wintering areas and habitat for inland waterfowl and wading birds.

The Maine Endangered Species Act also provides for habitat protection, allowing the Maine Department of Inland Fisheries and Wildlife to designate “essential habitats” for threatened and endangered species if habitat is a limiting factor restricting their population growth. Activities occurring within these areas are then reviewed by the Maine Department of Inland Fisheries and Wildlife. The Department has mapped essential habitats for bald eagles, roseate and least terns, and piping plovers. Essential habitat for bald eagles and roseate terns occurs in Casco Bay.

Species Regulation

Threatened and endangered species are protected under the Maine Endangered Species Act and the Federal Endangered Species Act. The federal law protects listed species from activities such as takings, harassment, harming, capturing, and collection, while the state law prohibits the export, hunting, trapping, possessing, or selling of threatened or endangered species.

The federal Marine Mammal Protection Act imposes a moratorium on the taking and importation of all marine mammals and marine mammal products, and regulates incidental taking of mammals during commercial fishing activities.

The Commissioner of the Maine Department of Marine Resources also has the authority to close certain portions of in-state waters to fishing activities for conservation and propagation purposes. Statewide, conservation areas are currently in effect for clams, quahogs, mussels, oysters, marine worms, and lobsters; however, none of these occur in Casco Bay.

Regulatory Limits

While providing important protection for many Casco Bay habitats, the existing laws have several notable gaps and weaknesses:

- *They fail to address activities adjacent to designated habitats that diminish habitat value.* Shoreland zoning only applies to specified areas (e.g., streams below the first branch shown on U.S. Geological Survey topographic maps), leaving many streams unprotected. In the Royal River watershed, for example, only 46 percent of the waterways are protected under the Shoreland Zoning Act (Sowles, 1991).
- *Only a few of the “significant wildlife habitats” specified in the Natural Resources Protection Act are being formally regulated to date.* The process of gathering reliable habitat data, developing criteria for determining “significant” habitats, and developing land use standards is time-consuming. Limited resources at the Maine Department of Inland Fisheries and Wildlife may prevent additional areas from receiving protection in the near future.
- Because the Natural Resources Protection Act focuses on habitats of statewide significance, certain local habitats that are an important town resource may not be mapped by the Maine Department of Inland Fisheries and Wildlife.
- *The Natural Resources Protection Act does not effectively address cumulative impacts (and there are few known examples of laws that do adequately address this concern).* Many minor influences that seem innocuous when viewed in isolation can have major impacts when taken as a whole.
- Municipal officials routinely make decisions that affect habitat when administering their shoreland zoning ordinance or deciding to grant variances, yet those involved often lack the information and expertise needed to identify and protect important habitat areas. While the Maine Department of Inland Fisheries and Wildlife provides habitat maps, and both the Maine Department of Inland Fisheries and Wildlife and the Maine Department of Marine Resources staff respond to inquiries from towns, this information is often solicited in reaction to a specific project, rather than in a proactive manner.
- The Maine Endangered Species Act neglects coverage of rare and endangered plant species. The Maine Natural Areas Program tracks data on rare plants (and other significant natural features) but has no regulatory authority.
- Property tax rates can strongly influence decisions made by property owners concerning the future of undeveloped lands. *Under the current tax structure, some landowners cannot afford to keep land undeveloped and preserve its maximum habitat value.*

Voluntary Conservation

An important complement to regulations are voluntary partnership activities designed to protect habitat. Private organizations, working with federal and state agencies, pool their collective capabilities in biological expertise, funding, and local knowledge to protect habitat.

Voluntary habitat protection involves the collaborative efforts of willing landowners, private citizens, local land trusts, Maine Coast Heritage Trust, The Nature Conservancy, Maine Department of Inland Fisheries and Wildlife, U.S. Fish and Wildlife Service's Gulf of Maine Project, and other local, state, and national groups that protect habitat through the donation or purchase of land and conservation easements. Local, state, and federal governments also pursue proactive conservation through the purchase and maintenance of open space, parks, wildlife refuges, and wildlife management areas and by providing biological expertise and funding to other organizations with similar objectives.

Land Trusts — A Complement to Regulations

Twenty nonprofit conservation land trusts now operate in the Casco Bay watershed. Their efforts are supplemented by statewide groups such as The Nature Conservancy, Maine Audubon Society, Maine Coast Heritage Trust, Small Woodland Owner's Association, Maine Department of Inland Fisheries and Wildlife, and federal agencies such as U.S. Fish and Wildlife Service's Gulf of Maine Project. They all pursue voluntary conservation, working with private landowners, municipalities, and each other to permanently protect and manage land for the public benefit.

The Casco Bay region has some outstanding examples of voluntary land conservation:

- Portland Trails led a successful campaign to establish the Eastern Promenade Shoreway Trail, a critical segment of its proposed 30-mile trail network in and around Portland.
- Brunswick/Topsham Land Trust recently completed public trails for hiking and skiing on a private waterfront farm in Topsham, where a conservation easement fosters traditional public uses.
- Phippsburg Land Trust recently raised \$200,000 to buy Center Pond, a local landmark, and the surrounding 250 acres.

Tax Code

The state tax code can affect the ability of private landowners to protect habitat. If the tax burden on undeveloped habitat areas is too high, landowners may be forced to subdivide or sell their land. To alleviate this pressure, Maine has instituted two tax-relief measures: the tree growth and open space tax laws. While not designed specifically for habitat protection, these measures often protect areas that include valuable habitat.

Recommendations

Protecting habitat for the wealth of species that live in Casco Bay is a critical concern as land development continues throughout the watershed.

The following list of actions outlines some measures that will begin to address habitat protection and restoration. The title of each action is listed below. Following the title is the action number. The actions are described more fully in Chapter 7. Actions that directly relate to this chapter appear in bold typeface; other actions that support this chapter appear in regular typeface.

■ Public Education

- Fund high school students' research. (#1)
- Focus post-secondary educational programs on Casco Bay. (#2)
- Conduct a comprehensive campaign to promote sound household practices. (#3)
- **Educate boaters about low-impact practices, non-toxic boat products, and the need to protect sensitive habitats. (#4)**
- Develop an environmental habitat kit and guide maps to Casco Bay for the general public. (#5)
- Hold "State of the Bay" conferences. (#7)

■ Technical Assistance

- **Provide technical assistance necessary for habitat protection. (#7)**

■ Regulatory/Enforcement Plan

- **Clarify use of the Natural Resource Protection Act for habitat protection. (#1)**
- Adopt minimum standards for stormwater quality in state and municipal regulatory programs. (#3)

■ Planning and Assessment

- Develop a comprehensive management strategy for dredged material. (#2)
- Research the impact of tax codes on habitat conservation. (#4)
- **Develop a plan to restore degraded habitats in Casco Bay. (#5)**
- **Develop a grant program to support local habitat protection activities. (#8)**

TOXIC POLLUTION



CASCO BAY PLAN

To reduce toxic pollution in Casco Bay, the Management Committee established the following goal and objectives:

GOAL:

Reduce toxic pollution in Casco Bay.

OBJECTIVES:

- The accumulation of toxics in the sediment and biota shall be reduced.
- Seafood harvested from Casco Bay shall be acceptable for consumption.
- Contamination in Casco Bay shall not have an adverse effect on the biological community.

TOXIC POLLUTION

in Casco Bay

Introduction

Sediments can act as an indicator of overall environmental contamination in marine ecosystems because many toxic contaminants, which do not dissolve readily in water, become attached to sediments and organic material and settle to the bottom.

When scientists first took a careful look at the bottom sediments of Casco Bay in 1980, their findings occasioned some concern. What had been considered a relatively uncontaminated environment actually contained a broad array of toxic contaminants: polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), lead, cadmium, copper, nickel, chromium, and zinc.

Further studies of the Casco Bay floor were conducted in 1989, 1991, and 1994, providing more data on the types, potential sources, and location of toxic pollutants. This chapter outlines the extent of the toxic pollution problem and preliminary

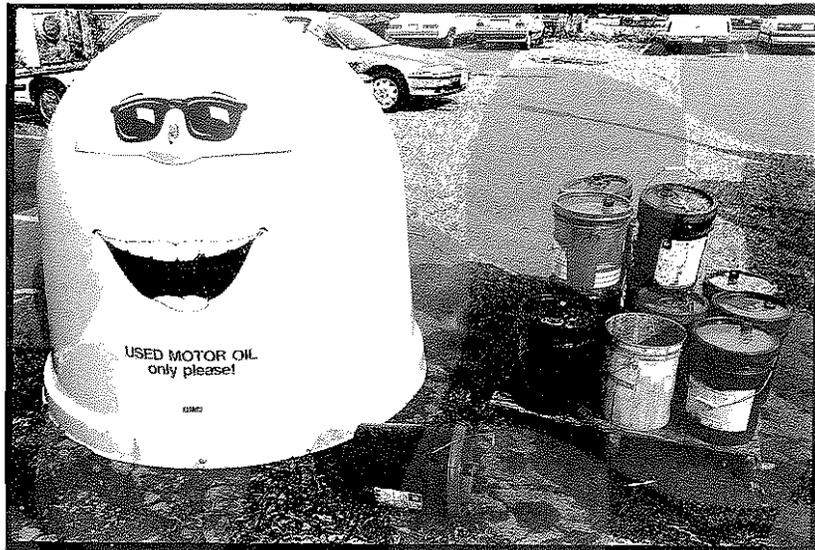


photo by Christopher Ayres

measures taken to address it, as well as recommendations for additional action. Toxic contaminants may become concentrated in plants and animals, a process known as bioaccumulation.

Types of Toxic Pollution

The toxicity of a substance depends on how it is structured, how much is present, and how readily it can be absorbed by living organisms. Mercury, for example, is relatively nontoxic in its elemental form, but highly toxic in other chemical forms. While essential for a healthy diet in low concentrations, metals such as copper, nickel, and zinc can be lethal in high doses. Some species absorb toxic chemicals more readily than others. Toxics can also combine to produce a “cocktail effect” that is more harmful than exposure to single substances. The presence of toxics in animal tissues is not necessarily hazardous to the animal.

There are two primary types of toxic pollutants: organic chemicals and heavy metals. The former are bonded forms of carbon, hydrogen, and other atoms. Many occur naturally and several hundred thousand have been developed by chemists for use in oils, paints, pesticides, cleaners, solvents, insulation, fire retardants, and other products. Organic compounds found in the sediments of Casco Bay include PCBs, PAHs, pesticides, butyltins (organometallic compounds), dioxins (organochlorines), and furans. Organic chemicals eventually break down into hydrogen and oxygen, but this breakdown is slow; during the interim, they can remain toxic.

Heavy metals are metallic elements that in pure form are literally heavy (dense), such as lead, mercury, arsenic, cadmium, silver, nickel, selenium, chromium, zinc, and copper. Many heavy metals found in Casco Bay result from contemporary or historical discharges from vehicles and industry. Others naturally occur in rocks and minerals and leach into the environment over time. Because metals are elements and generally do not break down further into less harmful chemicals, they can accumulate where they are released, provided they are not disturbed and moved elsewhere.

In 1991, the Casco Bay Estuary Project commissioned a baseline study to provide a “snapshot” of sediment contamination levels in Casco Bay, using state-of-the-art analytical methods (Kennicutt *et al.*, 1992).

As Table 5-1 indicates, the bay registered potentially toxic levels of PCBs and PAHs and high levels of four heavy metals compared to other estuaries nationally.

Two classes of organic chemicals — PCBs and PAHs — are present at potentially toxic levels to bottom-dwelling animals (benthos) in the inner Fore River of Casco Bay (Long and Morgan, 1990; and Kennicutt *et al.*, 1992). PAH levels are considered high in several locations when compared to other bays around the country (O’Connor, 1990).

Table 5-1 Toxic Chemicals in Casco Bay

TOXICITY	CHEMICAL	LOCATIONS
POTENTIALLY TOXIC LEVELS	PCBs	Fore River (Inner)
	Hydrocarbons (PAHs)	Fore River (Outer)
HIGH COMPARED TO OTHER BAYS NATIONALLY	Hydrocarbons (PAHs)	Fore River Back Cove Inner Bay East Bay Cape Small Outer Bay
	Lead	Fore River Back Cove
	Cadmium	Back Cove East Bay
	Mercury	Inner Fore River Back Cove
	Silver	Back Cove

Sources: Kennicutt et al., 1992; O'Connor, 1990; Long and Morgan, 1990

Four heavy metals — lead, cadmium, mercury, and silver — are considered “high” in some locations in Casco Bay when compared to bays nationwide (O'Connor, 1990). However, these metals are not present at a level that would be considered toxic to benthos in the bay (Kennicutt *et al.*, 1992). Six — arsenic (As), chromium (Cr), copper (Cu), nickel (Ni), selenium (Se), and zinc (Zn) — are not considered “high” on a national scale (O'Connor, 1990).

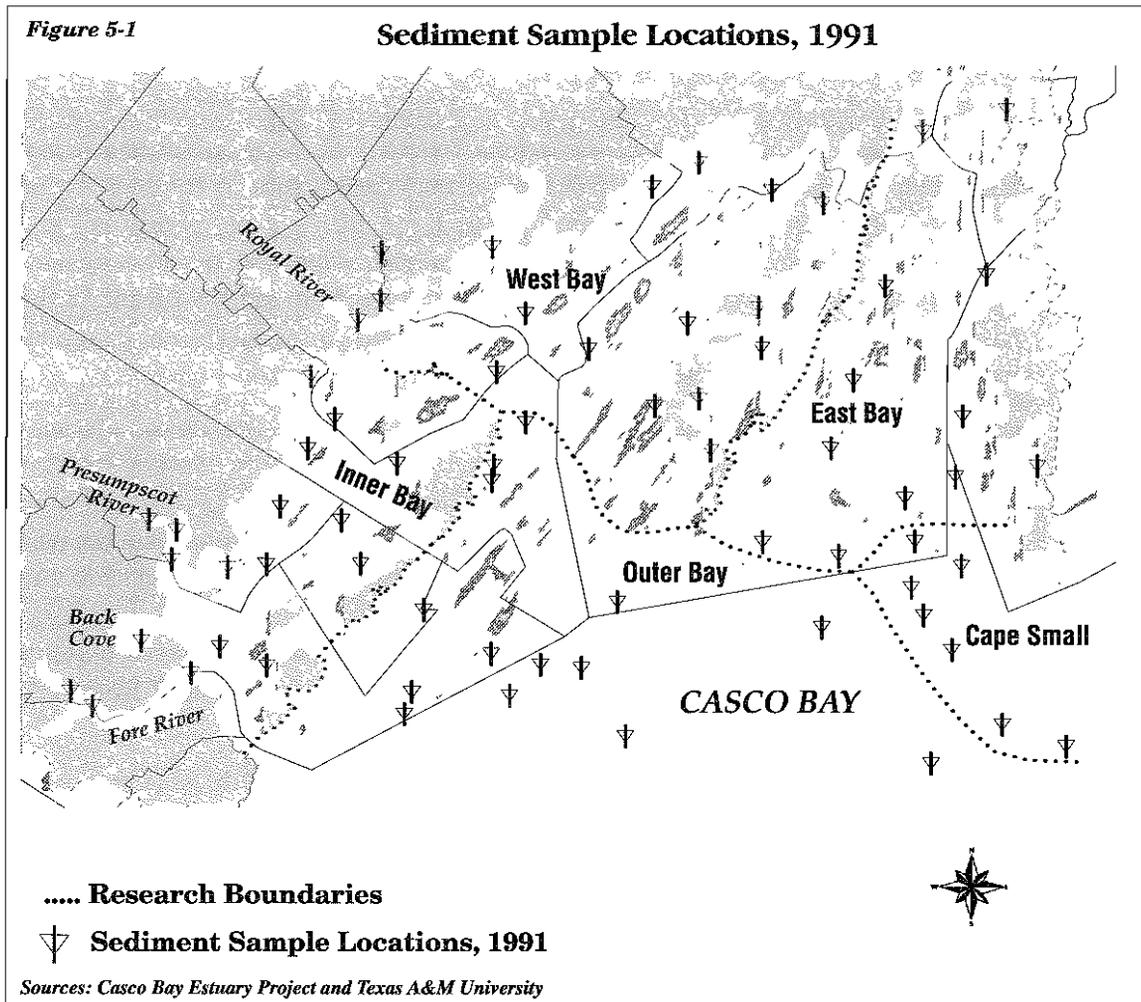
The pesticide DDT is present in relatively low concentrations in Casco Bay. Other pesticides — aldrin, BHC, dieldrin, endosulfan (I, II, and sulfate), endrin, endrin aldehyde, heptachlor, heptachlor epoxide, toxaphene, and hexachlorobenzene — were not detectable (*i.e.*, less than 0.25 part per billion) or barely detectable (Kennicutt *et al.*, 1992).

Butyltins, PCDD/PCDF (*i.e.*, dioxins, furans), and planar PCBs were detected in sediments from all areas of Casco Bay in 1994; however, concentrations were relatively low when compared to other areas nationally (Wade *et al.*, 1995).

Figure 5-1 shows locations sampled in the 1991 study of sediment contamination in Casco Bay. This map shows place names and the regions referred to in Table 5-1 and the following text.

Sources of Toxic Pollution

When it rains or snows, the soil particles and organic matter in runoff water pick up oils, metals, pesticides, and other contaminants. The contaminants adhere to the soil or organic matter rather than mixing readily into water. Once in the bay, organic contaminants may float to the surface to avoid water, forming a sea-surface microlayer. Other contaminants adhere to sediments and particles of organic detritus. Initially, sediment and particles settle to the sea bottom near where they enter marine waters, though over time they may get dispersed by tides, currents, storms, or dredging.



Water that lies over contaminated sediments may even test as clean because the toxics tend not to be water-soluble.

The most common toxic pollutants in Casco Bay are PAHs, a class of organic compounds primarily found in fossil fuels such as oil or coal. Most PAHs found in the sediments of the bay come from combustion sources (i.e., car and truck exhausts, and industrial and residential chimneys) (Kennicutt et al., 1992). PAHs enter the bay through combined sewer overflows and storm drains (particularly those that drain roads and parking lots), licensed discharges, old industrial sites or dumps (Hawes, 1993), spills, deposition of atmospheric pollution from urban sources in and upwind of Maine, and highly developed residential and industrial areas in the bay watershed (Kennicutt et al., 1992).

*Hydrocarbon pollution, another source of PAHs, is aggravated by the roughly 70 reported spills each year in Maine coastal waters. Most spills are small, averaging 20 gallons (Report of the Commission to Study Maine's Oil Spill Cleanup, 1990), with the average "most probable" spill in Portland Harbor being a 45-gallon diesel oil spill from a fishing vessel overflowing its tanks (Maine and New Hampshire Area Contingency Plan). The largest recorded oil spill in Casco Bay was the *Tamano* spill in July 1972, which spilled an estimated*

100,000 gallons of #6 (heavy industrial) fuel. The oil's principal impact was felt on Long Island and other islands in the bay.

Metals in Casco Bay are concentrated in and around Portland Harbor. Sources are numerous, including vehicle emissions, licensed discharges, air deposition, and historic industrial sites. Discharge of toxic pollutants in the bay region began in the 19th century with manufacturing facilities, such as railroad and shipbuilding yards, tanneries, and metal foundries, which released heavy metals into waters and emitted oil-related compounds from smokestacks. At the time, there was no knowledge of how toxic pollutants affected the environmental or public health, and therefore no treatment.

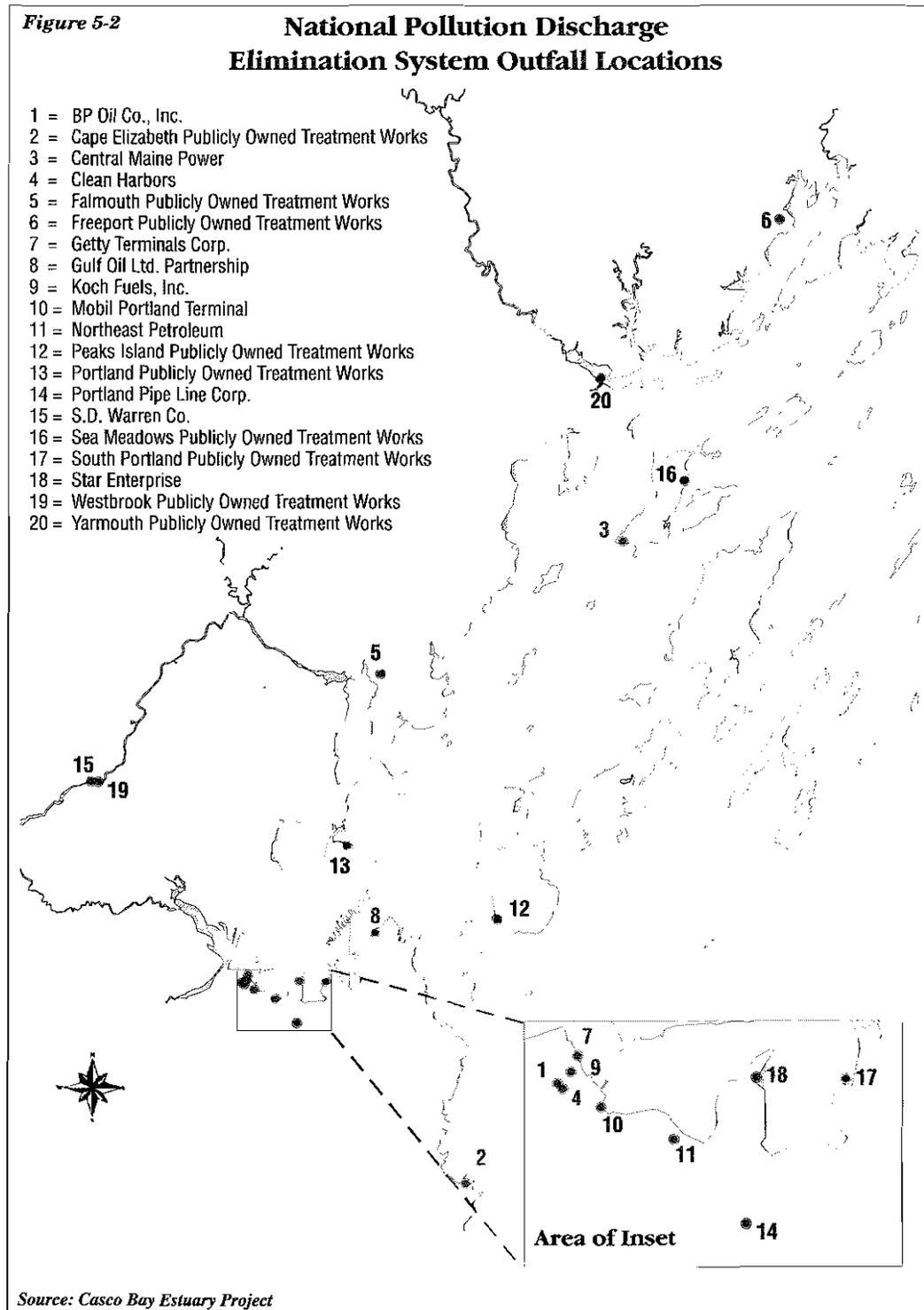
Evidence of these early industries remains in the bay. At the site of a former coal gas works plant, which operated in Portland for almost a century, coal tar can still be seen oozing into the Fore River estuary. Sediments collected near this site have a visible oily sheen and register high levels of combustion-derived oils (PAHs). Digging and construction on historically contaminated sites can unearth and redistribute toxic chemicals through runoff. DDT and chlordane, two banned pesticides, can still be found in the bay, possibly due to leakage from old dumps, illegal disposal by residents or businesses, runoff from residential areas, and deposition from air.

With the advent of electrical power production in the late 19th century, potentially carcinogenic (*i.e.*, cancer-causing) PAHs were emitted from smokestacks and PCBs were used in electric transformers. Later, Portland became a prominent center for unloading and storage of oil, with no booms used until the 1970s to contain spilled oil. Numerous gasoline stations were constructed with underground tanks, many of which have disintegrated over the years (releasing oil, lead, and other toxic by-products). Although PCBs were banned in the 1970s because of their carcinogenic properties, they are still found at high levels in the inner Fore River. Although the sources of this contamination are unknown, they could include old dumps and filled-in areas (*e.g.*, in 1989, PCBs were found in an old dump at Portland's sewage-treatment plant site).

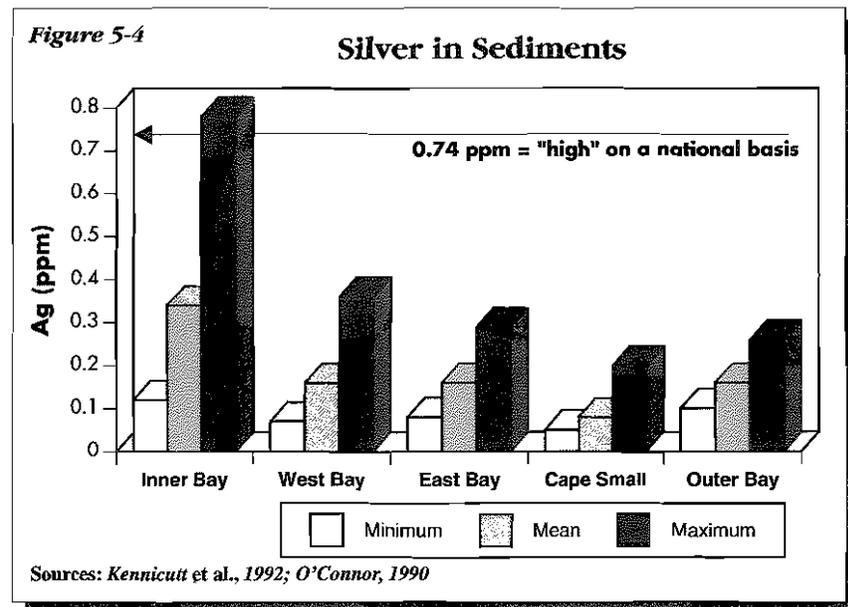
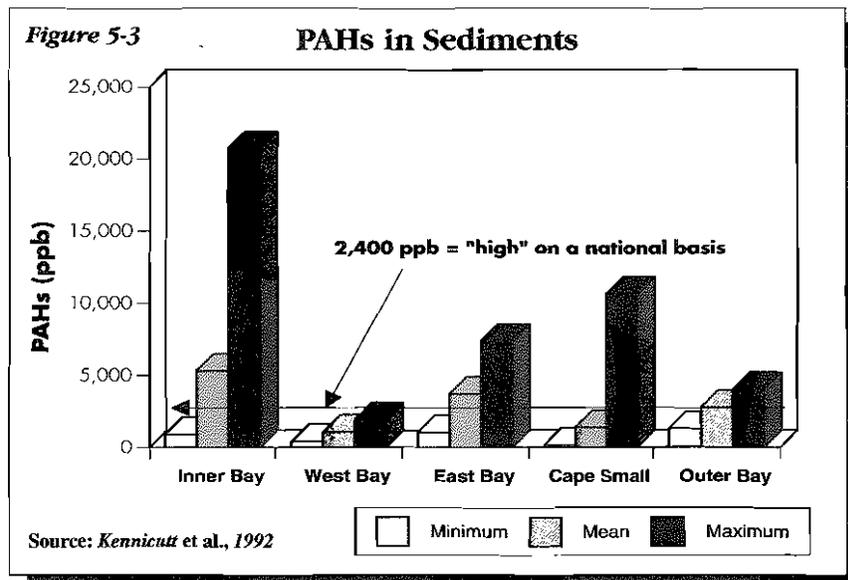
Most point (pipe) discharges into Casco Bay and its watershed are licensed by the Maine Department of Environmental Protection and the U.S. Environmental Protection Agency. There are 17 licensed facilities that are considered significant dischargers in the Casco Bay watershed. They include (in descending order of flow of water that has the potential to contact pollutants — “process wastewater”): S.D. Warren Company paper mill in Westbrook; the sewage treatment plants in Portland, South Portland, and Westbrook; the Central Maine Power Station on Cousins Island in Yarmouth; the sewage treatment plants in Freeport, Falmouth, and Yarmouth; GTE Products Corporation in Standish; and eight oil/water stormwater separator discharges at the oil terminals in South Portland. The majority of these discharges are concentrated in the Portland area (National Oceanic and Atmospheric Administration, 1994).

There are 24 additional minor licensed discharges in the watershed, including industrial facilities, power plants, and small sewage treatment plants. Minor

discharges include sewage treatment for populations of less than 10,000 people and less than one million gallons of flow per day. The sewage treatment plants at Peaks Island and Cape Elizabeth, cooling water at Burnham & Morrill and Bath Iron Works, and industry with small non-toxic discharges are examples of minor discharges. Also a number of other industries discharge into sewage treatment plants and some are required to pretreat their wastes prior to discharge into the municipal sewer.

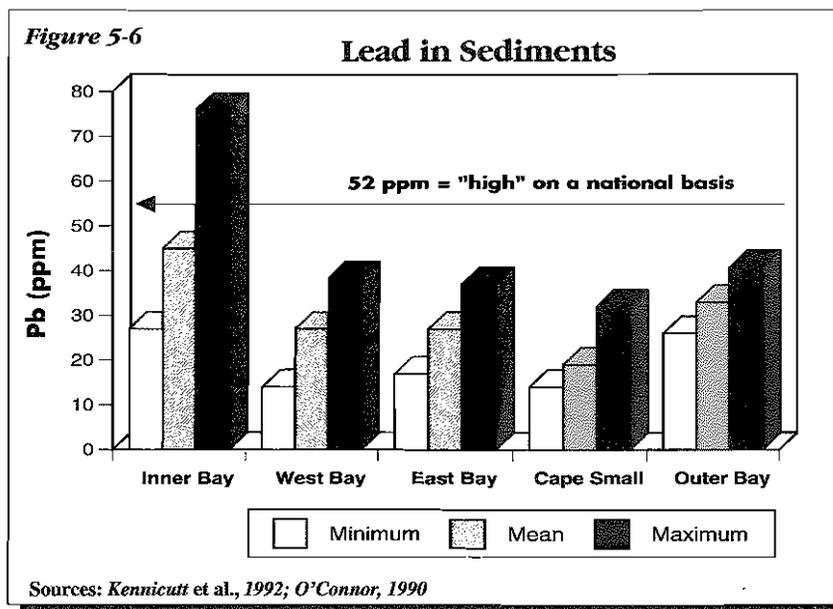
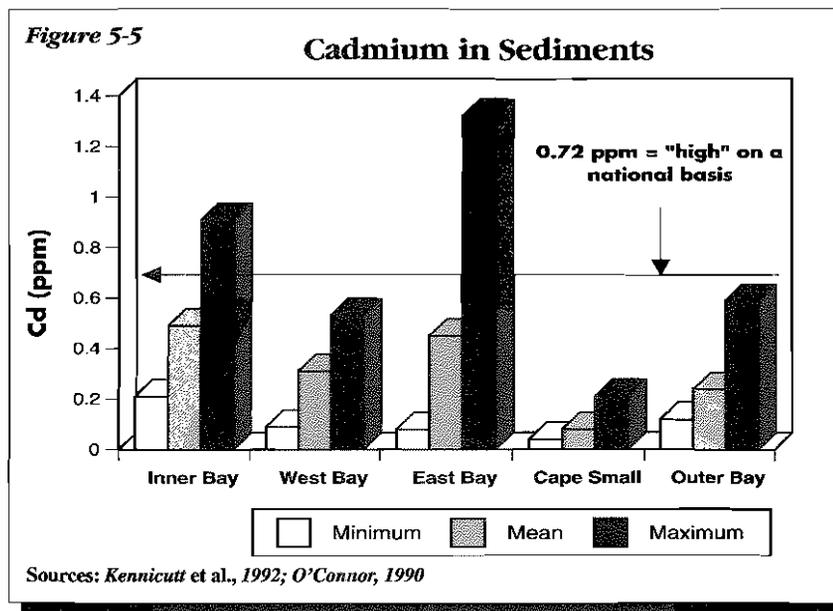


Licensed discharges contribute a variety of pollutants to Casco Bay and its watershed including PAHs, oil and grease, heavy metals, chlorine, suspended solids, organic material, organic matter, fecal coliform bacteria, nitrogen, and phosphorus. The National Oceanic and Atmospheric Administration (1994) estimated typical pollutant discharge concentrations (*i.e.*, not monitored) for the major licensed discharges into Casco Bay. They estimated that sewage treatment plants contribute the greatest relative amounts of lead, cadmium, arsenic, iron, fecal coliform bacteria, nitrogen, phosphorus, and oil and grease. Zinc and mercury contributions are split among sewage treatment plants, power plants, and paper mill facilities, while copper and chromium contributions are principally split between power plant and paper mill facilities. Both paper mills and sewage treatment plants are sources of suspended solids and organic materials that have the potential to deplete oxygen in rivers or the bay. PAHs are discharged



from oil/water separators at the oil terminals; however, their contribution could not be estimated because the discharges are linked to storms and the characteristics of the site. Sources of dioxin and furans include papermaking (e.g., the bleach Kraft paper mills on the Presumpscot, Kennebec, and Androscoggin rivers), industrial processes, and sewage treatment, as well as incineration and forest fires (a minor source).

Air deposition is another likely source of PAHs, dioxins, pesticides, heavy metals, and nutrients. Air emissions in Maine are licensed and the results of an ongoing emissions inventory will assist in determining local contributions. The East Coast of the United States and the industrial sources in western Pennsylvania and Ohio also are potential sources of pollutants deposited from the air into Casco Bay.

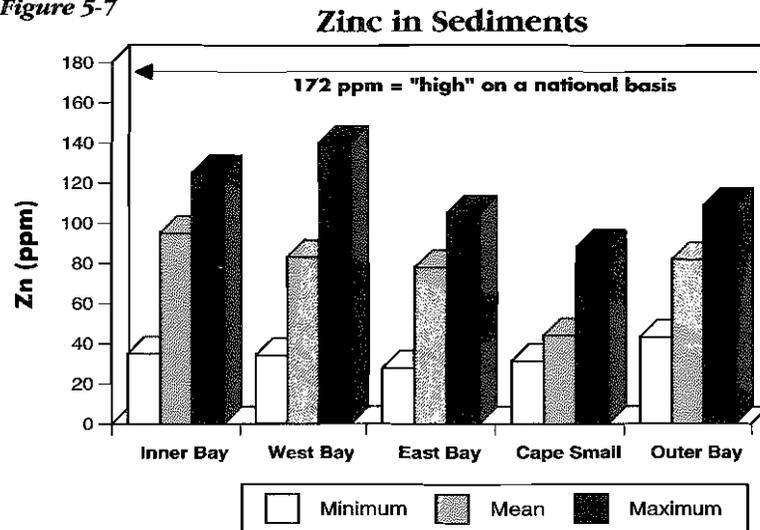


Concentrations of Toxic Pollution

A comprehensive sediment contamination study completed for the Casco Bay Estuary Project in 1991 assessed the presence of 60 contaminants at 65 locations (Kennicutt *et al.*, 1992). *The study found toxic pollutants in virtually all sites with recent accumulations of mud, although these conditions do not occur throughout the bay.*

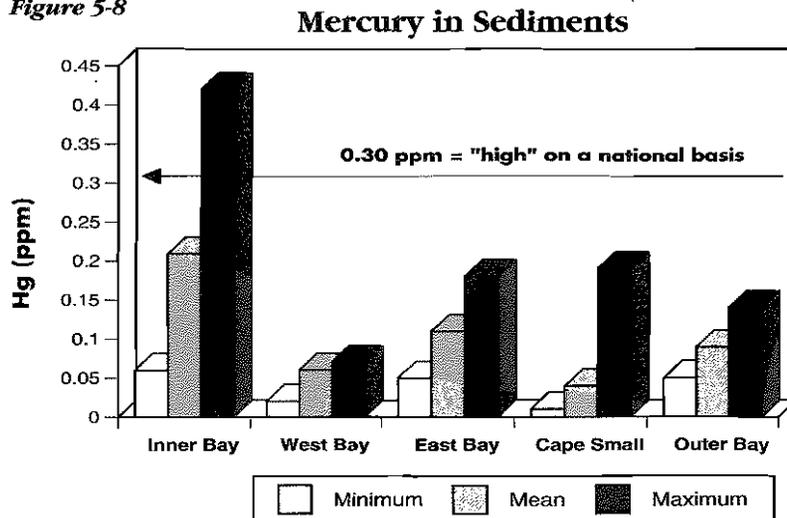
The graphs in Figures 5-3 through 5-11 synthesize information from the 65 sediment sampling sites in five regions of the bay. One sample of sediment was taken at each of the 65 locations. The maximum, minimum, and mean concentrations for each region are graphed so that general comparisons may be made among regions.

Figure 5-7



Sources: Kennicutt *et al.*, 1992; O'Connor, 1990

Figure 5-8



Sources: Kennicutt *et al.*, 1992; O'Connor, 1990

As the graphs indicate, concentrations of contaminants can vary widely within a region. They may even vary within a small area of sediment (e.g., a sample taken for PCB analysis from 1 square foot of mud in the Fore River was 10 times higher than two other samples taken in the same vicinity). The terms “high” and “low” noted in the text refer to concentrations of contaminants in Casco Bay, not to their toxicity concentrations (i.e., some contaminants are very toxic in low levels, while others are not toxic even at high levels; quotation marks around “high” denote comparisons on a national basis) (O’Connor, 1990).

Oils and PAHs

The highest concentrations of PAHs — the most widespread contaminants in the bay — occur in the Fore River, Back Cove, Presumpscot estuary, and the rest of Inner Bay (Kennicutt *et al.*, 1992). Mean concentration of PAHs declines

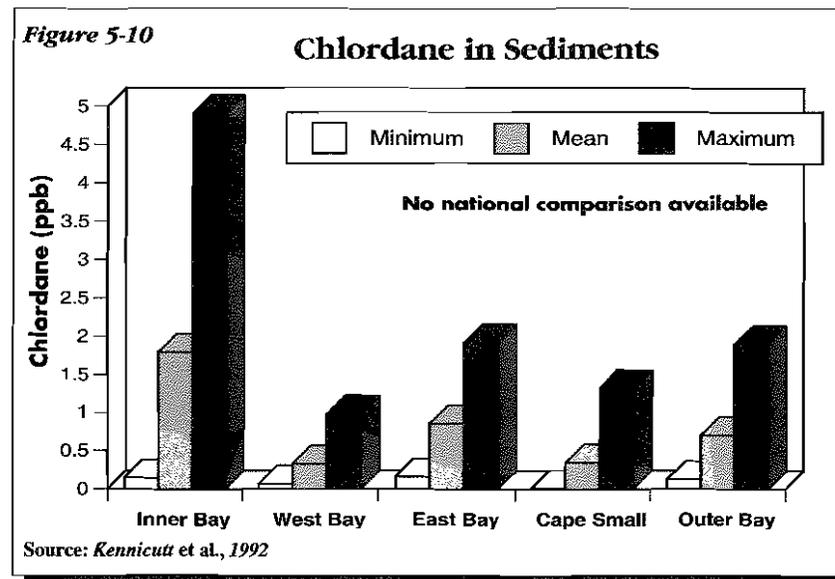
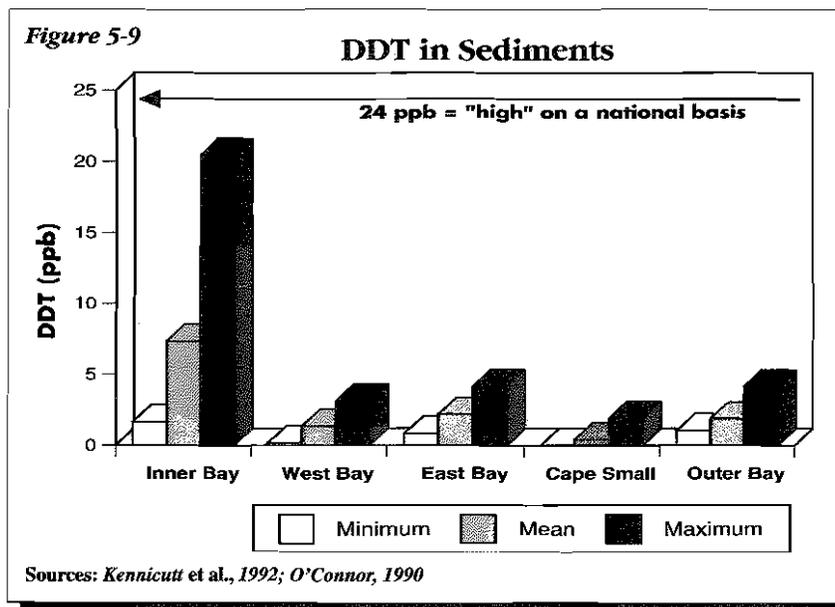
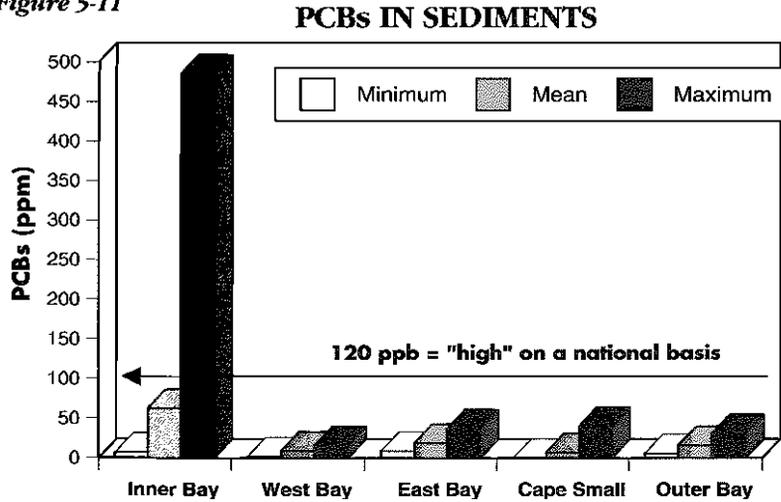


Figure 5-11



Sources: Kennicutt et al., 1992; O'Connor, 1990

the farther one gets from Portland (see Figure 5-3), except for “hot spots” of elevated contaminant levels in East Bay, Outer Bay, and Cape Small. Most of these sites contain “modern mud,” sediment that has been moved by storms and currents from other areas in or near the bay. The National Status and Trends Program, run by the National Oceanic and At-

mospheric Administration, considers PAH levels above 2,400 parts per billion (ppb) to be “high” by national standards (no “high” values were adjusted for variances in sediment type) (O'Connor, 1990). The highest concentrations of PAHs in Casco Bay reach 20,748 ppb (Kennicutt et al., 1992).

Heavy Metals

Concentration of heavy metals varies throughout Casco Bay. Five heavy metals — silver (Ag), cadmium (Cd), lead (Pb), zinc (Zn), and mercury (Hg) — have “elevated” levels due to human activities, with mean concentrations running highest in the Inner Bay (see Figures 5-4 through 5-8). Maximum concentrations of mercury, lead, and silver occur in Inner Bay; the maximum for cadmium is in East Bay; and the maximum for zinc is in West Bay. Using different analytical methods, a 1991 study by Larsen and Gaudette (1995) found elevated levels of lead, copper, cadmium, and zinc in the Inner Bay and elevated levels of cadmium in the East Bay. The National Status and Trends Program considers the following values “high”: 0.74 part per million silver, 0.72 part per million cadmium, 52 parts per million lead, 172 parts per million zinc, and 0.30 part per million mercury (O'Connor, 1990). Five metals — arsenic (As), chromium (Cr), copper (Cu), nickel (Ni), and selenium (Se) — do not appear to be elevated by human activities and are distributed naturally by type of sediment and type of mineral present (Kennicutt et al., 1992).

Pesticides

DDT and chlordane have relatively low concentrations (near or below the detection limit of the analytical equipment) in most of Casco Bay. Maximum concentrations for both DDT and chlordane were in Back Cove (see Figures 5-9 and 5-10), with the highest mean concentrations in the Inner Bay, intermediate concentrations in East and Outer bays, and the lowest mean concentration in West Bay and Cape Small. Nationally, 24 parts per billion is considered “high”

for DDT (O'Connor, 1990). In addition to the relatively high percentage of undegraded DDT in the bay, there are also by-products produced as DDT degrades in the environment. DDT is gradually metabolized into DDE and DDD. DDD predominates in the Inner Bay samples, while DDE predominates elsewhere (DDT in Figure 5-9 is total DDT, which includes DDD, DDE, and undegraded DDT).

All components of chlordane were not measured in the National Status and Trends Program (Kennicutt *et al.*, 1992). However, when similar components are compared, concentrations of chlordane in Casco Bay are lower than most other East Coast estuaries. Other pesticides were not detectable or barely detectable (Kennicutt *et al.*, 1992).

PCBs

PCB concentrations are highest in the Inner Bay, particularly the Fore River (see Figure 5-11), and lowest in Cape Small and West Bay. Concentrations elsewhere are far lower than Inner Bay and correlate to materials in the sediments (especially organic carbon). A "high" level for PCBs, as defined by the National Status and Trends Program, is 120 parts per billion (O'Connor, 1990). The levels in Casco Bay range from 0.4 to 485 parts per billion, with only one sampling site above 120 parts per billion.

Dioxins, Furans, and Butyltins

Concentrations of dioxins, furans, and butyltins were highest near their potential sources, primarily in the Inner and East bays (the latter being due to possible contamination from the Kennebec River). PCDD/PCDF, and especially 2, 3, 7, 8-TCDD, appeared in higher concentrations near the Presumpscot River when compared to other sites in the bay.

Ecological Effects

While the biological impacts of toxic pollution have not yet been studied by the Casco Bay Estuary Project, this section summarizes potential effects on living resources. Toxics have the potential to bioaccumulate and magnify up the food chain. The *Casco Bay Monitoring Plan* includes recommendations for more specific assessment of biological impacts from toxic contaminants.

Bottom-Dwelling Animals

Contaminants collect in "modern mud" (*i.e.*, mud accumulated over the last century); therefore, bottom-dwelling animals that dwell in mud habitats tend to be exposed to the highest levels of contaminants. Animals such as shrimp-like amphipods are particularly sensitive to contaminants and may be unable to live in polluted sediments.

Bottom-dwelling (or benthic) animals play an important role in the food chain. They recycle the organic matter from dead plants and animals that drifts to the bottom. Bacteria act as decomposers, releasing nutrients from organic matter so it can be incorporated into new plant life. These bacteria are fed on by bottom-dwellers such as small shrimp-like crustaceans, worms, mollusks (*e.g.*, clams), and echinoderms (*e.g.*, starfish) who — in turn — are consumed by groundfish (*e.g.*, flounder, cod, and haddock), lobsters, and crabs.

While thorough studies of toxic impacts on benthic life in Casco Bay have not been completed, there is some evidence of damage. Animals that would be expected to occur in the flats of Back Cove are missing, potentially due to such factors as oil-related contaminants, heavy metals, combined sewer overflow discharges, sedimentary disturbances, or a combination of factors (Watling, 1995). Benthic life in the inner Fore River has been dramatically impaired. In bottom samples taken in 1989, some hardy worms were present in much smaller numbers than expected, but mollusks, crustaceans, and other species were absent. Some of the worms collected had oil on their “feet” (parapodia), probably due to petroleum-related contaminants (Doggett, 1995).

Fisheries

Sediment contamination can have serious ramifications for fisheries and marine life in Casco Bay. Fish and crustaceans can absorb toxics directly by exposure to contaminants in the water, and indirectly by eating contaminated food — particularly bottom-dwelling organisms that live and feed among the “modern mud” sediments on the bay’s bottom.

Elevated levels of toxic contaminants in fish and crustaceans can inhibit growth and reproduction, disrupt life processes of the young, change sex ratios, and cause cancer or even death. Toxic contaminants decrease natural immunities, making animals more susceptible to disease and attack by micro-organisms (*e.g.*, fin rot in fish, shell degradation in crustaceans, and tumors in flounder). Some fat-soluble chemicals, such as DDT, are liberated during migration and reproduction, affecting adults, embryos, and newborns. Some species of spawning fish, such as salmon, trout, shad, and alewives, can detect toxic pollutants (*e.g.*, chlorine) and avoid contaminated rivers, but this rerouting can disrupt their migration.

Blue mussels sampled in the outer Fore River had elevated levels of lead in their tissues, while those in the Presumpscot River had elevated levels of mercury (Sowles, 1993). These findings confirm that mussels are accumulating metals, but do not indicate what harm is being done. Mussels are used nationally as an indicator species of toxic pollution.

Livers of flounder caught off the Kennebec River in 1984 were found to have elevated levels of lead, copper, zinc, and PCBs (O’Connor, 1990). Experiments have shown that flounder are prone to develop tumors after eating worms con-

taminated by PAHs (McElroy *et al.*, 1989), and that the presence of contaminants cause them to generate additional toxic by-products which further stimulate tumor growth. These results have not been duplicated since 1984 due to the scarcity of flounder. Fishermen have reported tumors in flounder caught off Casco Bay, but the cause of the tumors has not been determined.

Wildlife

Mammals and birds that feed on benthic organisms or fish may absorb concentrated amounts of contaminants. *Some of the tidal mudflats that represent the most important feeding areas for shorebirds, waterfowl, and wading birds — the Fore River, Back Cove, and Presumpscot River — also have the highest concentration of contaminated sediments in the bay.* Until approximately 20 years ago, these areas received high levels of untreated waste from residences, businesses, and industry.

Human Health

Various toxic pollutants (e.g., PCBs, DDT, some PAHs, and dioxin) concentrate in the liver, fat, and tissue of animals and can cause significant human health impacts in the species that eat them. Bioaccumulative toxic chemicals can cause cancer, adverse reproductive effects, birth and developmental effects, organ damage, and deleterious impacts on the nervous, immune, and endocrine systems. When toxic contaminants pose an unacceptable health risk, a consumption advisory is issued by the state toxicologist. However, the absence of an advisory does not imply the absence of a problem because advisory levels assume that each species represents a person's total exposure to that contaminant — an inaccurate assumption because data and analysis are not available to determine risk. With the exception of testing for dioxin in lobsters and clams, there has been no risk assessment of potential health hazards from eating seafood in Casco Bay.

Dioxin levels in clams in the Presumpscot River were approximately one-third higher than clams sampled from Scarborough, but only half as high as clams sampled in the Kennebec/Androscoggin and Penobscot rivers (Mower, 1995). The levels in clams at all sites sampled were not high enough to issue a consumption advisory. Dioxin levels in lobster meat were elevated only slightly, but were greatly elevated (20 to 30 times greater than the meat) in the tomalley (the lobster's liver and pancreas). In February 1994, an advisory was issued cautioning against consumption of tomalley for all lobsters caught in Maine waters (Mower, 1995). Testing results from the summer of 1994 determined that this advisory will remain in effect indefinitely.

A freshwater fish consumption advisory that was issued for the Presumpscot River south of Westbrook in 1990 was lifted in 1992 because of reduced dioxin levels in fish tissues (Mower, 1995).

Economic Effects

The economic cost of polluted sediments can be seen in reduced stocks of (and market for) fish and seafood. *If contaminants reduce the growth and reproductive success of marine organisms, the productivity of fisheries can decline.* It is hard to assess the impact of contaminants on fisheries, however, due to the complexity of the marine ecosystem.

Beyond an actual decline in stocks, there is the risk of diminished consumer confidence. When studies reveal contamination in sediments, some consumers become concerned and reduce or eliminate seafood purchases, although no studies have tracked consumer responses around Casco Bay.

Economic impacts can also be felt outside the fishing industry. Dredging projects may be delayed or limited by prohibitively expensive disposal options because toxic sediments must be disposed of at hazardous waste landfills. While dredging is required to keep ports and harbors accessible (*e.g.*, in Portland, Yarmouth, and Freeport), upland disposal is at least 10 times more expensive than disposal at sea.

Remediation of contaminated sites in other settings has proven extremely costly. While no remediation is recommended for toxic sediments in Casco Bay at this time, efforts to reduce or eliminate toxic accumulation could prevent costly restoration bills in the future (*e.g.*, the clean-up of PCBs in New Haven Harbor, Massachusetts).

Trends

By the 1970s, heavy industrial production around Portland was in decline, and the passage of the National Environmental Policy Act set the stage for protecting Casco Bay's environment. Federal funds were allocated for sewage treatment, industries were required to treat their discharges, and regulations were enacted to improve solid waste disposal.

During the past quarter-century, the cleanup appears to have begun to produce results. *Preliminary data indicates that metal contamination declined in the mid-1970s, probably in response to use of unleaded gasoline and construction of sewage treatment plants* (indicated by a sediment core taken in inner Casco Bay near Clapboard Island) (Gaudette, 1995). Also, *Historic Sources of Pollution in Portland Harbor* shows that Portland and South Portland lost most of the major heavy industry (*e.g.*, foundries, machine shops, and railroad houses and yards) that were sources of heavy metals.

Results of the 1991 sediment contamination study conducted for the Casco Bay Estuary Project confirm previous studies conducted in 1980 and 1989 (Larsen *et al.*, 1983; and Doggett, 1995), which indicate similar contamination in geo-

graphic distribution (e.g., highest levels of contamination in Inner Bay; low levels elsewhere with some “hot spots”). A study conducted by Larsen and Gaudette (1995) showed significant declines in cadmium, chromium, lead, and zinc. Nickel was unchanged and copper increased in concentration.

Steps taken to reduce the rate of contamination entering the bay include:

- industrial and municipal cooperation with discharge permit limits and pre-treatment programs
- reduction of combined sewer overflows
- better oil-spill prevention
- cleanup of some hazardous waste sites
- implementation of best management practices in road construction, major development, farming, and forestry
- elimination of leaded gasoline
- increased awareness among citizens and boaters regarding safe disposal of toxic materials
- discontinued use of shoreside dumps

To continue reducing levels of sediment contamination, more attention must now be focused on nonpoint sources such as runoff from roads and parking lots. If measures to reduce pollution are taken, the ecosystem will eventually cleanse itself. Contaminated sediments will become “biologically unavailable” as new sediments wash off the land and cover them, and chemical and degradative processes reduce their toxicity. And as cleaner sediments enter the bay, existing contaminants will be made less toxic through further dilution.

Regulatory Measures

No regulations directly address contaminated sediments, except those on dredging administered by the Maine Department of Environmental Protection and the U.S. Army Corps of Engineers. Permits are required from both agencies, along with physical, chemical, and biological testing of the material to be dredged. Most sites in Maine undergo physical and chemical testing at a minimum, and may be required to test toxicity to animals. Under the Maine Department of Environmental Protection Natural Resource Protection Act, the applicant may have to change the timing of the project, notify local fisheries interests, and test for additional contaminants.

Regulations that indirectly address contaminated sediments include water quality classification laws, which consider toxics when issuing licenses for wastewater discharges and the toxicity-testing on animals required for large-volume dischargers. State laws such as the Sensible Transportation Act and the Growth Management Act also play a role in activities and development that relate to contaminated sediment.

Recommendations

While existing regulations have helped, in recent decades, to reduce the volume of toxic contaminants entering Casco Bay, further action is needed. The following measures outline some steps to reduce toxic pollution in Casco Bay. The title of each action is listed below. Following the title is the action number. The actions are described more fully in Chapter 7. Actions that directly relate to this chapter appear in bold typeface; other actions that support this chapter appear in regular typeface.

■ Public Education

- Fund high school students' research. (#1)
- Focus post-secondary educational programs on Casco Bay. (#2)
- Conduct a comprehensive campaign to promote sound household practices. (#3)
- **Educate boaters about low-impact practices, nontoxic boat products, and the need to protect sensitive habitats. (#4)**
- Hold "State of the Bay" conferences. (#7)

■ Technical Assistance

- Provide training in best management practices for contractors, public works crews, road commissioners, and municipal boards and staff. (#4)
- **Establish a reduction and management program for toxic pollutants in Casco Bay communities and small businesses. (#5)**
- **Develop and implement action plans for sub-watershed areas. (#6)**
- **Conduct pollution prevention audits for businesses/industries that affect Casco Bay. (#8)**

■ Regulatory/Enforcement Plan

- Adopt minimum standards for stormwater quality in state and municipal regulatory programs. (#3)

■ Planning and Assessment

- **Develop a comprehensive management strategy for dredge material. (#2)**
- **Develop biological/environmental indicators. (#6)**
- **Develop sediment quality criteria and sediment quality discharge limits that apply to Casco Bay. (#7)**

STEWARDSHIP



CASCO BAY PLAN

Stewardship by all is vital if Casco Bay is to be protected for our use and enjoyment. The Management Committee established the following goal and objectives:

GOAL:

All members of the Casco Bay community act as responsible stewards to protect Casco Bay and its watershed.

OBJECTIVES:

- *Change individual behaviors that are detrimental to the bay.*
- *Raise awareness about the importance of protecting Casco Bay and its watershed.*

STEWARDSHIP

Introduction

“Each of us has a stewardship somewhere in the great social system,” an English minister wrote in 1862. For those of us living in 1996 along the coast of Maine, one of our stewardship responsibilities is to ensure the health of Casco Bay.

This tremendous resource touches the lives of many Maine citizens, as one of every eight Maine residents lives in communities along the bay, and one of every four residents lives within its watershed.

The need for improved stewardship is evident in these findings:

- Thirty-seven percent of the clam flats in Casco Bay are closed to harvesting (May 1995).
- Rivers and streams flowing into Casco Bay carry stormwater runoff with toxic contaminants from roadways, suburban development, agricultural fields, and other sources.
- Mussels, an indicator of toxic pollution, in the Fore and Presumpscot rivers have registered high levels of toxic chemicals.



photo by Cyndy Martin

- The composition of the bottom-dwelling animal community in Fore River and Back Cove has been drastically altered by stormwater runoff and discharges from combined sewer overflows.
- Terns are disappearing from Casco Bay.

Past generations may have thought that large bodies of water like Casco Bay could tolerate human impacts indefinitely. We no longer have the luxury of this naiveté. In recent decades, we have witnessed the degradation of other estuaries like Chesapeake Bay, where striped bass have been devastated by pollution, and Long Island Sound, where severe oxygen depletion has impacted the ecosystem. We are beginning to understand the consequences of contaminated runoff, toxic discharges, and habitat destruction, and we have started to develop measures needed to prevent such damage.

But who is responsible for the fate of Casco Bay? Is it governments — local, state, and federal? Business? Residents? Developers? Farmers? Ultimately, the responsibility rests with each of us who resides in the Casco Bay watershed. As voters who elect local, state, and federal officials, we help determine the government. Working in offices, stores, and industries around the bay, we represent the businesses. And in our homes and yards, we take actions every day that affect the health of the estuary.

Responsible stewardship depends on residents cultivating an awareness of Casco Bay that permeates all their everyday actions — making purchases, running errands, casting ballots, serving on town boards, tending gardens and lawns, maintaining cars, and building houses. Only by becoming stewards of Casco Bay, caring for it consistently and managing its resources responsibly, can we preserve it for generations to come.

Stewardship Roles

Individuals

Each of us in the watershed is intimately connected to the bay’s ecosystem — from the tap water we drink to the wastewater we flush. Sometimes the consequences of our actions are apparent, such as when a boater spills oil or fuel into the bay; other times, they are less visible, as when someone flushes toxic household products down a drain that leads eventually into the bay.

An action that may seem minor when done by one person can have devastating environmental impacts when multiplied by the 270,000 people in the Casco Bay watershed.

*In our homes
and yards, we
take actions
every day that
affect the
health of the
estuary.*

While the careless actions of ordinary citizens can have a terrible collective impact, constructive actions taken by individuals can have an equally great positive impact. Some of the most beneficial actions include:

- *Become educated* about Casco Bay and its watershed. This is an essential first step. The Casco Bay Estuary Project has brochures and reports available (many of which are in local libraries) and a library of reference materials. See Appendix A for a list of reports prepared for the Casco Bay Estuary Project.
- *Landscape with care*. Maintain vegetated areas along the banks of streams and water bodies to absorb stormwater pollution. Minimize lawn size and eliminate use of fertilizers and pesticides on lawns and gardens. If everyone simply took these two actions, pollution in Casco Bay would be reduced.
- *Carefully dispose of oil and household chemicals*. Take used motor oil back to a service station for proper disposal. Pouring it down a storm drain is like dumping it straight into Casco Bay, and pouring it on the ground can pollute both surface water and groundwater. Likewise, minimize use of toxic products like solvents, cleaners, and batteries, and dispose of these items carefully. The Casco Bay Estuary Project office can provide further information on non-toxic alternatives and recommended disposal methods.
- *Get involved*. Join with others to help protect the bay. There are many groups involved — from your local conservation commission, planning board, or town council to nonprofit organizations working to protect the bay and other regional water bodies.

Volunteer Groups

In recent decades, many concerned citizens have joined together to work for a healthier environment in the Casco Bay watershed. Some of these conservation groups are local (*e.g.*, Presumpscot River Watch, Friends of the Royal River, and Sebago Lake Association); some regional (*e.g.*, Friends of Casco Bay and Conservation Law Foundation); some statewide (*e.g.*, Maine Audubon Society and the Natural Resources Council of Maine); and some are national. They have undertaken a wide range of actions, including water quality monitoring, coastal cleanups, land conservation advocacy, and public education.

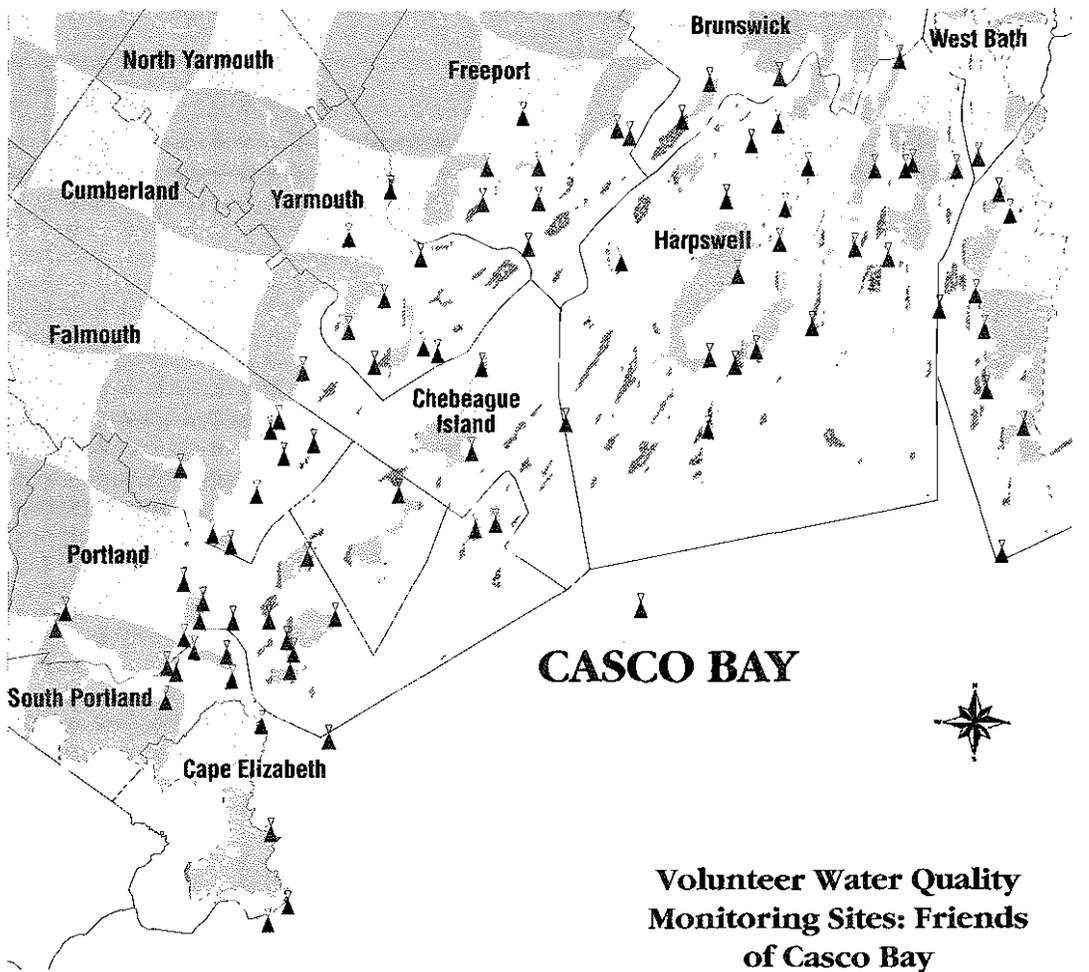
- *Collecting water quality samples*. Systematic water quality sampling provides an “early warning system” for the bay and watershed, revealing the source and location of problems and trends over time.

Hands Across the Bay

The volunteer water quality monitoring program established by Friends of Casco Bay in 1993 with funding from the Casco Bay Estuary Project now provides the most extensive set of water quality data that exists for the bay. In 1994, 150 dedicated citizen volunteers conducted monitoring at selected sites from Cape Elizabeth to Cape Small, between April and October. Teams of trained volunteers measured dissolved oxygen, salinity, pH, temperature, and water clarity in surface water, and reported on wildlife observations, such as nesting ospreys and horseshoe crab activity.

The program establishes baseline data against which to measure improvements or declines in water quality over time, and encourages public awareness by training volunteers and teachers in the science of monitoring water quality and the importance of stewardship. Data collected has already been used by the National Oceanic and Atmospheric Administration and the U.S. Fish and Wildlife Service, validating the credibility of using trained volunteers to collect scientific data.

Figure 6-1



-  *Casco Bay Watershed Boundary*
-  *Volunteer Water Quality Monitoring Sites*

Sources: Friends of Casco Bay and Casco Bay Estuary Project

Government has not pursued widespread and systematic water quality sampling due to the expense, but several nonprofit groups have undertaken the task, relying on volunteer help from interested citizens and students. Friends of Casco Bay, Presumpscot River Watch, Friends of the Royal River, area school science classes, and Maine Audubon Society are monitoring water quality in area rivers and the bay. The more volunteers who participate, the more complete a picture will be made of the watershed and bay's health.

- *Sponsoring clean-up days.* Marine debris poses a threat to wildlife as well as an aesthetic blight. Annual clean-up days, such as those sponsored during the National Coastweek celebration each fall and the local "Land-Sea-Land" event in June, help raise public awareness and improve the environment. *By recording data on debris collected, volunteers establish baseline information to help determine the effectiveness of MARPOL (an international treaty ratified in 1988 that prohibits ocean disposal of plastics and requires ports to provide facilities for ship's trash).*
- *Protecting sensitive habitats through voluntary land conservation.* Many productive and sensitive marshes, fields, and woodlands surround Casco Bay, providing essential wildlife habitat. Nonprofit land trusts, other nonprofit conservation groups, and state and federal resource agencies help conserve land through gifts and conservation easements (which provide tax benefits for the donor) and occasional purchases.
- *Advocating stronger environmental policies.* Statewide organizations like the Natural Resources Council of Maine and the Maine Audubon Society have traditionally advocated in the state legislature for the cleanup of Casco Bay, being joined in recent years by members of local and regional Casco Bay organizations.
- *Educating the public.* Members of bay-related nonprofit groups distribute written materials, attend government meetings, speak at community gatherings, and make presentations in schools.
- *Protecting wild islands through voluntary stewardship.* Overuse and/or abuse of islands by recreational visitors can pose a threat to the health and ecological integrity of islands and their wildlife. Through a user maintenance program carried out by the Maine Island Trail Association, members learn a philosophy of



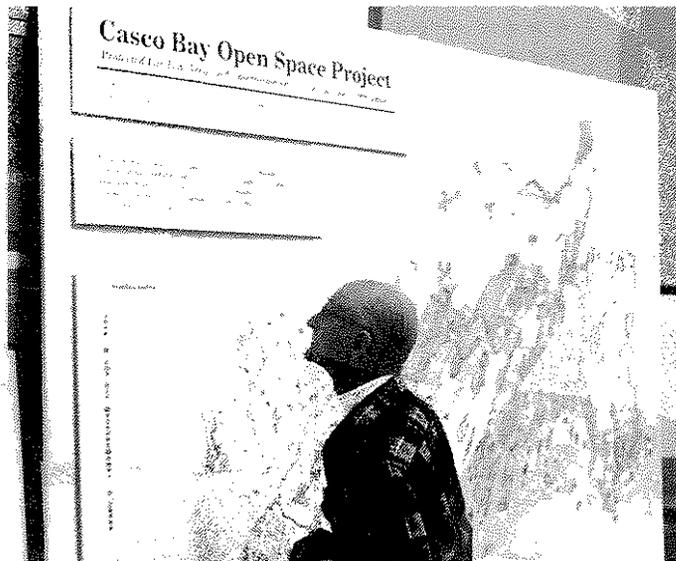
photo courtesy of Friends of Casco Bay

thoughtful use and care for the islands, monitor use and condition of islands, and set an example for other island visitors.

Maine Coast Heritage Trust has completed an open space inventory of conservation lands in the lower Casco Bay watershed. The project produced an 8-foot-square map that depicts a broad range of conservation interests, such as wildlife habitat, wetlands, trail corridors, and scenic views.

The inventory, which involved extensive research in 12 Casco Bay communities, revealed that despite high natural values, less than 5 percent of the land with scenic, cultural, or ecological significance has received any

form of permanent protection. **The final map depicts a region with abundant but threatened natural values.** The 1980s brought unprecedented development pressures to these coastal areas. With the recent slowdown in growth, communities now have an opportunity to protect areas of high conservation value. To encourage community groups and municipal governments to take action, Maine Coast Heritage Trust has produced a training manual to use in protecting local open space.



Local Businesses and Industry

In the past two decades, businesses in Greater Portland have made significant headway in reducing their direct discharge of polluted water into area rivers and the bay. Many businesses continue this progress by taking further actions such as the following:

- *Minimizing use and carefully managing chemicals, oils, and hazardous wastes.* Many businesses must use cleaners, solvents, and other chemicals. If spilled onto paved areas or soils, these materials eventually find their way into Casco Bay or groundwater. Reduced reliance on hazardous chemicals and proper handling of such materials is essential for the region's environmental health.
- *Following "best management practices" for commercial and residential development and natural resource activities.* Responsible practices in site development and maintenance can minimize environmental impacts on the bay. Limiting parking areas and properly managed application of fertilizers and pesticides can reduce polluted stormwater runoff, while maintaining vegetated areas along stream banks can decrease stormwater runoff and erosion.

*"We have
met the
enemy and
he is us."*

— Pogo

Many non-governmental groups advocate for Casco Bay and its watershed. These groups include:

Casco Bay Island Development Association
Congress of Lakes Association
Friends of Casco Bay
Friends of the Royal River
Friends of Presumpscot River
Gulf of Maine Aquarium
Gulf of Maine Marine Educators Association
Highland Lake Association
Island Institute
Lakes Environmental Association
Land Trusts
League of Women Voters
Maine Audubon Society
Maine Coast Heritage Trust
The Nature Conservancy
New Meadows River Association
Portland Harbor Marine Debris Council
Presumpscot River Watch
Sebago Lake Association
Waterfront Alliance

Similarly, natural resource industries (*e.g.*, farming and logging) can employ techniques to minimize impact. The Maine Department of Environmental Protection and the Soil and Water Conservation District provide information and guidance on best management practices for developers, farmers, and loggers to prevent stormwater pollution.

In addition to reducing pollution in-house, many businesses join in advocacy efforts for Casco Bay. One of Maine's key competitive advantages for business is its quality of life; actively promoting the health of Casco Bay helps ensure that asset remains. Business promotes the bay by committing to:

- *Sponsoring Casco Bay events.* These might include clean-up days, conferences, or the printing of educational materials.
- *Joining and contributing to Casco Bay organizations.* This provides credibility and funds for bay groups, while demonstrating the company's environmental commitment and strong spirit of working cooperatively found among Maine's business leaders and volunteer organizations.
- *Encouraging research on marine and watershed issues.*

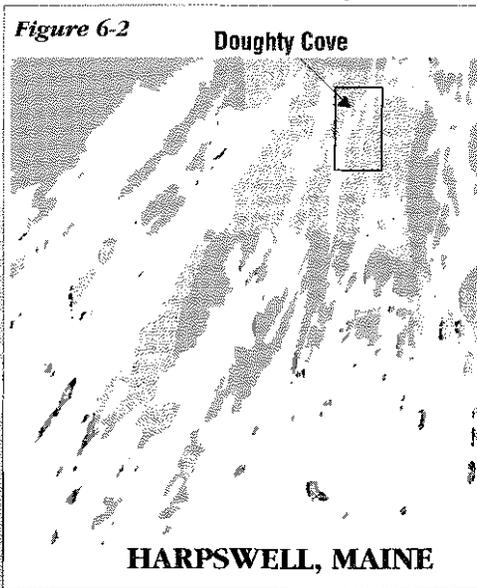
Municipal Officials

As the primary regulators of local land use and development, municipal governments have a strong influence on the future of Casco Bay. They build and operate sewer systems, manage shellfish flats, plan for their community's future, and maintain conservation and recreation areas. For sound land-management decisions to be made, local officials need technical information and support.

Constrained by limited staff and budgets, municipal officials rarely have the luxury of considering long-term issues. Yet to ensure the health of Casco Bay, local governments often work with vision and initiative to:

- *Eliminate combined sewer overflows.* These sewer outfalls (which dump raw sewage in the bay when the treatment facilities reach capacity) are major sources of pollution. *Plans have been made to eliminate most of the combined sewer overflows in Portland, South Portland, and Westbrook, but funding remains an obstacle.*

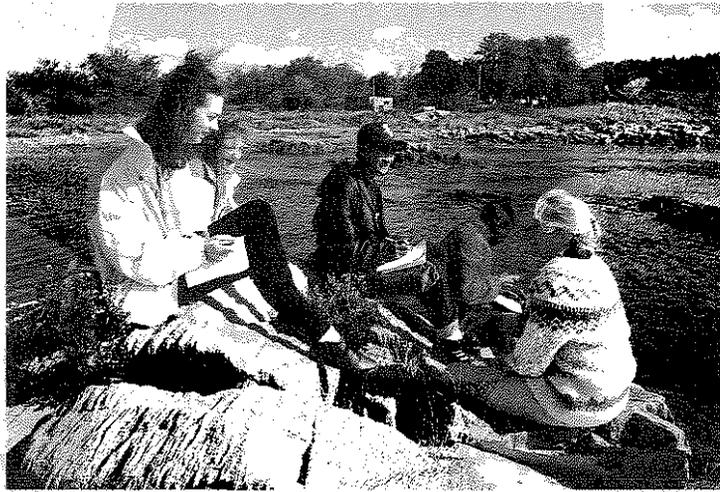
Clam flats are an integral part of Maine's natural and economic history, but many of Casco Bay's flats are closed due to coastal pollution or lack of state resources to monitor the flats. Motivated volunteers on the marine resources committee in Harpswell, working in concert with a marine biologist and landowners next to Doughty Cove, eliminated four potential sources of pollution: a cottage outhouse, a failed septic system, washing machine discharge pipes, and a sewage straight pipe. The town has now reopened 20 acres of productive clam flats.



- *Reduce stormwater pollution through land-use controls.* Development densities, pavement and landscaping, construction practices, and farming methods all affect stormwater pollution. Through the education of local developers, and careful reviews by code enforcement officers and planning boards, these problems can be minimized at little cost (and sometimes a savings) to the applicant.
- *Actively enforce regulations that protect the environment and adopt more stringent regulations when needed.*
- *Monitor, manage, and improve shellfish flats.* For many Casco Bay communities, particularly those in the East Bay, clamming once made a significant contribution to the local economy. Now, 37 percent of the bay's flats are closed, resulting in lost jobs and dollars. *Motivated local governments and volunteers are an invaluable resource when it comes to reopening closed shellfish flats (see box insert).*
- *Encourage recycling and proper waste disposal.* Municipalities in the Casco Bay watershed have made progress recycling paper, glass, and plastics. More needs to be done to help households and businesses dispose of hazardous wastes like oil, household cleaners, pesticides, batteries, and other commonly used chemical products. Since these materials are more expensive to collect and handle, progress has been slower.
- *Involve schools.* School science classes and clubs are a source of people power to take on environmental projects in town, and such involvement gives students firsthand knowledge of watershed issues and responsible stewardship.
- *Use Geographic Information System (GIS) computer-based mapping.* GIS puts a tremendous amount of information about land onto computer maps, where it can be used to support sound decision-making about local land use

Island ecosystems are among the most fragile and sensitive features of Casco Bay. With the islands experiencing pressure from growing human populations and increased development, their ecological future will be influenced by the young people currently in school.

Through “down-to-earth” field-based learning, more than 100 students from Portland High School helped contribute to a healthy future for Long Island, one of the bay’s larger islands. Portland High School received funding from the Casco Bay Estuary Project to do an ecological characterization of Long Island. Under the guidance of their teachers, students visited the island to take soil and water samples, study geology, collect and analyze marine debris, and interview island residents



Portland High School students on Long Island.
photo by Cyndy Martin

about issues such as waste disposal and the importance of the lobster industry. Students then wrote up an ecological characterization report containing stewardship recommendations.

Biology teacher Cyndy Martin says, “Participants gained a deep sense of personal gratification that results from being a steward, helping to preserve our natural world. And they really got excited about making a contribution to their community.” The Town of Long Island was equally gratified to have the report.

and development. GIS is being used at the town level to advance municipal initiatives and help implement the *Casco Bay Plan*.

- *Protect Open Space.* Local municipalities protect open space through numerous means, from zoning areas for resource protection to acquiring land for the use and enjoyment of citizens.

Regional Entities

Unlike some states, Maine does not have a strong governmental entity at the regional level. Instead, it has many smaller regional organizations that tend to specialize in one activity or another. These regional entities provide opportunities for stewardship.

In Casco Bay, three regional organizations in particular play key roles:

- *The Portland Water District* promotes water quality education and protection in the upper bay watershed, working to maintain Sebago Lake as a clean source of drinking water for Greater Portland.

- *The Cumberland County Soil and Water Conservation District* provides technical help to municipalities, farmers, and builders to minimize soil erosion and improve nutrient management and stormwater management.
- *The Greater Portland Council of Governments* has professional planners to assist member municipalities with planning issues, including information on effective stormwater runoff control.

State Government

State government has jurisdiction over natural resources held in the public trust: subtidal waters below mean low tide and extending 3 miles out to sea; lakes and ponds greater than 10 acres; in area freshwater wetlands, rivers, and streams; and the plants and animals. To ensure stewardship of this public domain, the state regulates large development projects to prevent unreasonable impact and protect rare and valuable habitat. In the marine environment, the state manages subtidal lands, regulates alteration of coastal wetlands and sand dunes, governs the harvesting of fish and shellfish, and regulates the discharge of contaminants.

The Maine Department of Environmental Protection has recently created a Watershed Division, reflecting a growing awareness that effective management of water quality must take watersheds into account.

"The approach in the past has been to look at projects on the basis of individual impact. But having spent 15 years as a regulator, it has become painfully obvious to me there has to be a better way. Watershed planning allows us to look at the big picture, regardless of regulatory authority, and teach people to better manage natural resources themselves."

— Don Witherill, Director, Division of Watershed Management,
Maine Department of Environmental Protection

Federal Government

The federal government also has an important role to play in protecting Casco Bay. In addition to sponsoring the National Estuary Program (which enabled development of this *Casco Bay Plan*), it holds three major roles:

- Regulating direct pollution discharges, dredging, ocean disposal, discharges of dredged and fill material into wetlands and other waters, and fishing
- Conducting studies and providing information on bay pollution, wildlife habitat, and clean-up activities
- Providing grants and technical assistance

Recommendations

In the final analysis, responsible stewardship depends on an educated and caring citizenry. The first step in assuring sound stewardship, therefore, is widespread public education about the values and needs of the bay. As this chapter demonstrates, that process has already begun. Local and regional volunteer groups, governmental agencies, and schools are actively working to foster a strong stewardship ethic among watershed residents.

The following actions, recommended as part of the *Casco Bay Plan*, would extend the work of existing groups and ensure more widespread commitment to bay stewardship. The title of each action is listed below. Following the title is the action number. The actions are described more fully in Chapter 7.

■ Public Education

- **Fund high school students' research. (#1)**
- **Focus post-secondary educational programs on Casco Bay. (#2)**
- **Conduct a comprehensive campaign to promote sound homeowner practices. (#3)**
- **Educate boaters about low-impact practices, non-toxic boat products, and the need to protect sensitive habitats. (#4)**
- **Develop an environmental habitat kit and guide maps to Casco Bay for the general public. (#5)**
- **Create an educational site demonstrating how vegetation reduces stormwater runoff. (#6)**
- **Hold "State of the Bay" conferences. (#7)**
- **Extend the State Planning Office's new "Marine Volunteer Program" to Casco Bay. (#8)**

■ Technical Assistance

- **Establish a reduction and management program for toxic pollutants in Casco Bay communities and small businesses. (#5)**

■ Regulatory/Enforcement Plan

- **Comply with the pumpout law. (#4)**
- **Improve local enforcement of the Subsurface Wastewater Disposal Rules. (#6)**
- **Require proof of legal waste disposal upon transfer of property. (#6)**

■ **Planning and Assessment**

- **Develop municipal programs to protect water resources and clam flats from septic system discharges. (#1)**
- **Develop a comprehensive management strategy for dredge material. (#2)**
- **Research the impact of tax codes on habitat conservation. (#4)**
- **Develop a plan to restore degraded habitats in Casco Bay. (#5)**

NOTES



DEVELOPING NEW SOLUTIONS



CASCO BAY PLAN

The problems affecting Casco Bay today differ in fundamental respects from those of the past. The problems are complex and interrelated, involving dynamic interaction between land and sea, cultural activities, and natural processes.

DEVELOPING NEW SOLUTIONS

Introduction

Some of the problems affecting Casco Bay today differ in fundamental respects from those of the past. The basic regulatory and technological solutions that reduced end-of-pipe discharges do not address diffuse and pervasive problems like nonpoint-source pollution, toxic contamination, and habitat loss. These are ecosystem problems, not limited to a single natural resource or contained within any political boundary. The problems are complex and interrelated, involving dynamic interaction between land and sea, cultural activities, and natural processes.

The *Casco Bay Plan* is a major step toward solutions that will protect and foster our precious resources. Rather than reflecting a government mandate imposed through regulation and enforcement, the *Casco Bay Plan* was developed by concerned residents of the bay and watershed. The *Plan* reflects the diversity of people involved and the complex natural and cultural communities of Casco Bay.

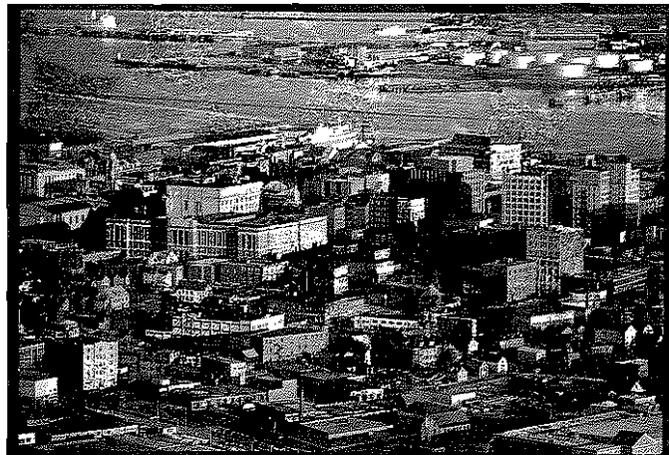


photo by Christopher Ayres

The solutions proposed in the *Plan* involve many interlocking issues and must be considered as part of a total ecosystem approach. Some actions may have both ecological and economic benefits (e.g., reducing stormwater may benefit clam flats, habitat, and the economic viability of dredging), while other actions involve trading benefits and losses (e.g., reopening clam flats may diminish shorebird habitat). To elucidate these connections, each of the actions recommended in the *Casco Bay Plan* has been cross-referenced with each of the five priority issues for resource protection.

Through an extensive planning process, the Casco Bay Estuary Project encouraged communication and cooperation among diverse interest groups and individuals throughout the watershed. The *Plan* sets forth actions to improve the health of Casco Bay through collaborative effort, efficient use of existing laws, and citizen stewardship. The *Plan* emphasizes creation of partnerships and approaches to managing the region that are governed not by political boundaries, but by the needs of the natural environment. Each action emphasizes reducing the current level of pollution, thereby diminishing the cost required to address problems in the future.

This chapter of the *Casco Bay Plan* outlines the need for actions and how they will be accomplished. More detailed chapters follow, describing how the *Plan* will be implemented and funded.

The *Plan* works to translate scientific information into effective policy-making and to promote innovative education and responsible stewardship. To focus its efforts and set achievable goals, the *Casco Bay Plan* selected five priority issues to address in the watershed:

- Stormwater in Casco Bay
- Clam Flats and Swimming Areas
- Habitat Protection
- Toxic Pollution in Casco Bay
- Stewardship

These five priority issues are described in the preceding chapters in terms of problems, trends, costs, and relevant regulations. Actions to address these issues are discussed in this chapter, grouped into the following four categories:

- Public Education
- Technical Assistance
- Regulations/Enforcement
- Planning and Assessment

Public Education Actions

The future of Casco Bay rests in the hands of the watershed's citizens and leaders. The success of virtually every action in the *Plan* depends on public education, involvement, and support. A citizenry that values the bay and its resources will support its restoration and protection.

Public education actions have been designed to serve several purposes:

- help build community awareness and appreciation for the bay, the watershed, and its ecosystem and history, as well as its intrinsic and economic values
- promote understanding about issues facing the bay and watershed, and demonstrate why they are important and how they can be resolved
- bridge the gap between scientific study and public policy by promoting dialogue and experiential activities
- foster a sense of stewardship for the bay and its watershed
- increase communication and cooperation

Each action recognizes the need for strong public support and individual commitment to solve the problems facing Casco Bay. About 270,000 people live in the watershed of Casco Bay. It is the cumulative impact of many individual actions that makes a difference.

The public education actions stress the need to provide cohesive information and educational opportunities at all age levels throughout the watershed. Without this strong foundation, we cannot expect to achieve the desired environmental change.

The *Plan* addresses education on all levels, including:

- K-12 schools
- Post-secondary institutions
- General information for the public
- Nonprofit organizations and others

Public Education Action #1

Fund High School Students' Research

- ▲ **NEED:** There is a need to encourage research funded through grant programs for schools within the watershed to conduct research related to the bay. A growing number of high schools are already pursuing bay- and watershed-related science curricula and many more opportunities exist.

- ▲ **HOW:** The Maine Coastal Program at the Maine State Planning Office has been instrumental in encouraging water quality monitoring by high schools. The Maine Coastal Program has an ongoing Shore Stewards/Partners in Monitoring Program that offers competitive mini-grants to support local water quality monitoring, outreach, and educational programs. This initiative should be used to encourage greater involvement by schools located in the Casco Bay watershed.

- ▲ **WHEN:** Year 2 and ongoing

- ▲ **WHERE:** Watershed-wide

- ▲ **WHO:** Maine Coastal Program/Maine State Planning Office in conjunction with area high schools

- ▲ **COST:** \$2,000 per grant, \$8,000 total per year

- ▲ **COST TO:** Maine Coastal Program

- ▲ **POTENTIAL FUNDING SOURCES:** Maine Coastal Program, Maine State Planning Office, Shore Stewards Fund at the Maine Community Foundation, and the Maine Science Fund

- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Clam Flats and Swimming Areas
 - √ Habitat Protection
 - √ Toxic Pollution in Casco Bay
 - √ Stewardship

Public Education Action #2

Focus Post-Secondary Educational Programs on Casco Bay

- ▲ **NEED:** No area colleges or universities currently focus their studies or research on Casco Bay. These institutions could contribute greatly to the study of Casco Bay, in regard to both science and policy.
- ▲ **HOW:** Numerous possibilities exist for research and educational programs. The University of Southern Maine has recently begun an undergraduate environmental science and policy major. Graduate level economic and environmental research on conflicts and opportunities could also be pursued through the University of Southern Maine's Muskie Institute. Bowdoin College is developing a Center for Marine Studies, and Southern Maine Technical College has several marine programs. Local groups and agencies can also benefit from the work of student interns. Summer interns from Bates College work with the Lakes Environmental Association. Another possibility is to encourage the Sea Grant Program at the University of Maine, currently in Orono, to focus on Casco Bay and collaborate with the University of Southern Maine. The Casco Bay Implementation Committee (as described in Chapter 9) can work with these institutions and research opportunities at other institutions of higher learning.
- ▲ **WHEN:** Years 3-5
- ▲ **WHERE:** Casco Bay region
- ▲ **WHO:** The Casco Bay Estuary Project will coordinate with area colleges and universities including the University of Southern Maine, Southern Maine Technical College, Bowdoin College, University of New England, University of Maine, and the Sea Grant Program at the University of Maine
- ▲ **COST:** Not yet determined
- ▲ **COST TO:** Colleges or universities
- ▲ **POTENTIAL FUNDING SOURCES:** Area colleges and universities
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Clam Flats and Swimming Areas
 - √ Habitat Protection
 - √ Toxic Pollution in Casco Bay
 - √ Stewardship

Public Education Action #3

Conduct a Comprehensive Campaign to Promote Sound Household Practices

- ▲ **NEED:** Individual actions and attitudes play a major role in protecting the bay. Many citizens would like to “do the right thing” but are not sure what that is. Other citizens are not aware of the impacts caused by simple household practices. A comprehensive campaign to promote sound household practices is needed to reduce domestic sources of water pollution.
- ▲ **HOW:** Television, cable, and radio stations in the area have shown a strong interest in supporting environmental causes and raising awareness about Casco Bay. Public service announcements would be developed to educate the public about sound lawn and garden care, household chemical disposal, car maintenance, septic system maintenance, vegetative planting, and other everyday actions that affect water quality. Information could also be distributed through Casco Bay Lines, marinas, realtors, and garden supply centers. These materials will be produced to be useful throughout the state.
- ▲ **WHEN:** Year 1 and ongoing
- ▲ **WHERE:** Radio, cable television, network television stations in greater Portland, and regional businesses
- ▲ **WHO:** A task force created by the Casco Bay Estuary Project, to include area realtors, bankers, television and radio stations, business leaders, environmental organizations, University of Maine Cooperative Extension, Maine Coastal Program/Maine State Planning Office, Maine Department of Environmental Protection’s Nonpoint Source Program, U.S. Natural Resource Conservation Service, U.S. Fish and Wildlife Service’s Gulf of Maine Project, and others
- ▲ **COST:** \$20,000 per year
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** Media and businesses in concert with U.S. Environmental Protection Agency and Maine Coastal Program funds
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Clam Flats and Swimming Areas
 - √ Habitat Protection
 - √ Toxic Pollution in Casco Bay
 - √ Stewardship

Public Education Action #4

Educate Boaters About Low-Impact Practices, Non-Toxic Boat Products, and the Need to Protect Sensitive Habitats

- ▲ **NEED:** Casco Bay and the lakes in the watershed are used extensively by recreational and commercial boaters, yet they receive virtually no information about low-impact boating practices. In focus groups held by the Casco Bay Estuary Project, participants frequently voiced the need to educate boaters about habitat protection, non-toxic supplies, and proper disposal of debris, septic waste, and used oil. Public and private marinas provide ideal locations for boater education.
- ▲ **HOW:** Develop materials for distribution through marinas and towns. These materials will be produced to be useful throughout the state. Work with recreational boating groups toward awareness of coastal habitat concerns and voluntary guidelines.
- ▲ **WHEN:** Year 1 and ongoing
- ▲ **WHERE:** Distribute through marinas, towns, public boat ramps, state parks, boatyards, yacht clubs, and other boating groups and businesses
- ▲ **WHO:** A coalition of locally based groups interested in boater education with support and guidance from the Maine Coastal Program at the Maine State Planning Office
- ▲ **COST:** \$10,000 first year; \$3,000 each year thereafter
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** Maine Coastal Program/State Planning Office; Post-CCMP funding from U.S. Environmental Protection Agency and Clean Vessel Act funding from U.S. Fish and Wildlife Service
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Clam Flats and Swimming Areas
 - √ Habitat Protection
 - √ Toxic Pollution in Casco Bay
 - √ Stewardship

Public Education Action #5

***Develop an Environmental Habitat Kit
and Guide Maps to Casco Bay
for the General Public***

- ▲ **NEED:** A wide variety of people use Casco Bay for recreation but don't understand the importance of specific habitats. A habitat kit and guide maps would encourage interested citizens to become more familiar with the bay and understand the adverse impact of certain activities.
- ▲ **HOW:** Prepare a field guide with habitat information and maps.
- ▲ **WHEN:** Year 4
- ▲ **WHERE:** Distribute the kits to boaters and recreational users of Casco Bay via marinas, the Casco Bay section of the Maine Island Trail Association, Casco Bay Lines, Maine Audubon Society, and other organizations and businesses
- ▲ **WHO:** A task force will be created, with an area nonprofit organization as coordinator, to develop and distribute the field guide. The task force will include the U.S. Fish and Wildlife Service's Gulf of Maine Project, U.S. National Marine Fisheries Service, Maine Department of Marine Resources, and Maine Department of Inland Fisheries and Wildlife, along with area nonprofit groups and others.
- ▲ **COST:** \$25,000
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCE:** U.S. Fish and Wildlife Foundation
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Habitat Protection
√ Stewardship

Public Education Action #6

***Create an Educational Site
Demonstrating How Vegetation
Reduces Stormwater Runoff***

- ▲ **NEED:** Few people understand the importance that vegetative plantings and the use of best management practices play in minimizing stormwater runoff and stabilizing shorelines. Planting a vegetated buffer strip (with accompanying educational signage) in a suitable and prominent public location would educate the public about the role landscaping can play in reducing water pollution.
- ▲ **HOW:** Demonstrate the use of certain best management practices to treat stormwater runoff from a parking area. The City of Portland's Back Cove area offers a visible and heavily used site.
- ▲ **WHEN:** Years 1, 2, and 3
- ▲ **WHERE:** Back Cove shoreline, near Baxter Boulevard parking lot
- ▲ **WHO:** The City of Portland and the Maine Department of Environmental Protection, in conjunction with the Cumberland County Soil and Water Conservation District
- ▲ **COST:** \$59,000
- ▲ **COST TO:** City of Portland, Maine Department of Environmental Protection, and Cumberland County Soil and Water Conservation District
- ▲ **POTENTIAL FUNDING SOURCE:** U.S. Environmental Protection Agency 319 Funds and the City of Portland
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Stormwater in Casco Bay
√ Stewardship

Public Education Action #7

Hold “State of the Bay” Conferences

- ▲ **NEED:** Sharing information about Casco Bay pollution and use issues currently takes place in a piecemeal manner among a wide variety of groups. Conferences allow for consistent exchange of monitoring and scientific information, support ongoing dialogues and problem-solving, and further action to protect the bay and its watershed.
- ▲ **HOW:** Plan and hold a conference (to include identifying key discussion issues, scientific data to be presented, and speakers).
- ▲ **WHEN:** Year 2 and then biennially
- ▲ **WHERE:** Greater Portland
- ▲ **WHO:** Casco Bay Estuary Project with co-sponsors
- ▲ **COST:** \$10,000 per conference
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** Maine Coastal Program/Maine State Planning Office, foundation support, Sea Grant Program at University of Maine, business and corporate sponsors, and Post-CCMP funds from the U.S. Environmental Protection Agency
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Clam Flats and Swimming Areas
 - √ Habitat Protection
 - √ Toxic Pollution in Casco Bay
 - √ Stewardship

Public Education Action #8

***Extend the State Planning Office's New
"Marine Volunteer Program" to Casco Bay***

- ▲ **NEED:** Volunteers in Casco Bay, with a minimum of financial and technical assistance, can work to inform citizens about the importance of coastal resources. The Maine Coastal Program at the Maine State Planning Office manages a new Penobscot Bay Marine Volunteer Program that uses trained volunteers to lead coastal protection and education projects. Working with the Maine State Planning Office, additional volunteers could focus on Casco Bay.
- ▲ **HOW:** The Maine Coastal Program/State Planning Office could establish a second volunteer program in Casco Bay, possibly coordinating with University of Maine Cooperative Extension for training.
- ▲ **WHEN:** Years 2-4
- ▲ **WHERE:** Casco Bay
- ▲ **WHO:** Maine Coastal Program/State Planning Office, in conjunction with Cooperative Extension in Cumberland County and Friends of Casco Bay and other volunteers
- ▲ **COST:** \$30,000
- ▲ **COST TO:** Maine Coastal Program/Maine State Planning Office
- ▲ **POTENTIAL FUNDING SOURCE:** Maine Coastal Program/Maine State Planning Office
- ▲ **PRIORITY ISSUE ADDRESSED:** √ Stewardship

Public Education Action #9

***Continue Friends of Casco Bay's
Successful Volunteer Water Quality
Monitoring Program***

- ▲ **NEED:** The Friends of Casco Bay has conducted a successful volunteer water quality monitoring program for the past three years. More than 150 volunteers have been involved in the program, which includes program planning and coordination, training the volunteers in quality assurance/quality control procedures, data management, and reporting of the results. These volunteers have become true stewards of the bay and provide valuable information about the health of the bay through both sampling and observation.
- ▲ **HOW:** The Friends of Casco Bay would continue to administer the volunteer monitoring program for Casco Bay.
- ▲ **WHEN:** Annually
- ▲ **WHERE:** Casco Bay
- ▲ **WHO:** Friends of Casco Bay
- ▲ **COST:** \$40,000 per year (An additional \$25,000 per year is included in the monitoring plan for profile monitoring from the Friends of Casco Bay's boat.)
- ▲ **COST TO:** Casco Bay Estuary Project, in conjunction with Friends of Casco Bay fundraising efforts
- ▲ **POTENTIAL FUNDING SOURCE:** Not yet determined
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Stewardship
√ Habitat Protection

Technical Assistance Actions

Technical assistance is defined as providing specific, practical education to target audiences that have the ability to change actions or behavior. Technical assistance programs offer proactive information that recipients can apply in making decisions. In some cases, they provide the only source of environmental education for groups whose actions affect Casco Bay.

Municipalities play a vital role in protecting Casco Bay and are a primary target for technical assistance. Home-rule grants municipalities broad authority to plan for and regulate land use within their communities. They can also influence the actions of residents through standards that govern land use activities, education in the schools, and types of community services provided.

While many municipalities have professional staff, most local decisions are made by volunteers who serve on town councils (or boards of selectmen) and planning boards. Technical assistance directed at these individuals can have a significant impact on their decision-making.

Businesses are another important audience for technical assistance. Many regional businesses welcome assistance that will help them reduce the environmental impacts of their activities, often resulting in cost savings.

The following set of actions is intended to be part of a comprehensive Technical Assistance Program (delivered through the coordinated efforts of existing agencies that currently provide assistance within the watershed). Actions range from field training on best management practices for municipal road crews and private contractors to individualized pollution-prevention assistance for businesses and assistance for local shellfish committees that want to reopen closed clam flats.



photo by Christopher Ayres

Technical Assistance Action #1***Provide Technical Assistance
to Help Reopen Clam Flats***

- ▲ **NEED:** Currently, 37 percent of Casco Bay's clam flats are closed (as of May 1995). When provided with information on the causes of closure and the costs and benefits of reopening areas, municipalities, municipal boards, and volunteers can play a pivotal role in reopening flats.
- ▲ **HOW:**
 - Continue the work of the Maine Department of Marine Resources and provide an informational summary of its work in training volunteers in conducting shoreline surveys and volunteer water quality monitoring.
 - Describe and enhance communication between the Maine Department of Marine Resources, Maine Department of Environmental Protection, and municipalities for the overboard discharge financing review process and the small community grants program.
 - Obtain increased commitment from municipalities to correct pollution sources by demonstrating the value to the town of opening shellfish areas.
 - Work at providing a continuing funding source for these actions.
- ▲ **WHEN:** Year 1 and ongoing
- ▲ **WHERE:** Efforts will be directed at municipalities around the bay, particularly those with the largest acreage of closed flats. Candidate towns include Brunswick, Cumberland, Falmouth, Freeport, Harpswell, Long Island, Phippsburg, Portland, Yarmouth, and West Bath.
- ▲ **WHO:** The Maine Department of Marine Resources will provide training in conducting shoreline surveys and water quality monitoring, and assistance in shellfish area management. The Maine Department of Environmental Protection will provide information/coordination on funding for overboard discharge removal and the small community grant program. The Maine State Planning Office and/or Maine Department of Human Services will provide training programs on septic system management. The U.S. Natural Resources Conservation Service and local soil and water conservation districts can assist in developing treatment options. The Casco Bay Estuary Project will provide coordination where necessary, and research possible funding sources. The Friends of Casco Bay will work with communities on reopening clam flats.
- ▲ **COST:** \$80,000 in Year 1; \$10,000 per year thereafter
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** Gulf of Maine Council, Maine Department of Marine Resources, Maine Department of Environmental Protection, Maine Coastal Program/Maine State Planning Office, municipalities, and others
- ▲ **PRIORITY ISSUE ADDRESSED:** √ Clam Flats and Swimming Areas

Technical Assistance Action #2

***Provide Technical Assistance to Monitor
and Open Public Swimming Areas***

- ▲ **NEED:** Few public swimming areas in Casco Bay are monitored for bacterial pollution, which poses a potential public health risk. While municipalities are responsible for issuing swimming advisories when beaches are polluted, most have no beach management programs in place and no knowledge of ambient water quality.
- ▲ **HOW:** To improve municipal management of public swimming areas in Casco Bay, it is necessary to:
- inventory public swimming areas
 - establish municipal programs to monitor water quality at swimming beaches and provide public information
 - conduct sanitary surveys on pollution sources, as needed
 - eliminate pollution sources, as necessary

A coordinated technical assistance program would be designed to assist municipalities to gather this information and establish ongoing management programs where appropriate.

- ▲ **WHEN:** Year 1
- ▲ **WHERE:** Coastal communities with public swimming areas
- ▲ **WHO:** The Maine Department of Environmental Protection and Maine Department of Human Services to provide technical assistance and laboratory analysis with assistance from the Friends of Casco Bay
- ▲ **COST:** \$0
- ▲ **COST TO:** Maine Department of Environmental Protection
- ▲ **POTENTIAL FUNDING SOURCES:** Maine Department of Environmental Protection, municipal funds, Friends of Casco Bay
- ▲ **PRIORITY ISSUE ADDRESSED:** ✓ Clam Flats and Swimming Areas

Technical Assistance Action #3

*Train Installers and Pumpers
of Septic Systems*

- ▲ **NEED:** Improperly installed septic systems can cause septic-system failure, prompting closure of nearby shellfish beds and swimming areas. Focus groups organized by the Casco Bay Estuary Project repeatedly voiced a need for training local contractors in septic-system installation.
- ▲ **HOW:** A training program would be offered to instruct contractors on septic-system installation techniques and pumpers on septic-system inspection techniques. Methods to notify residents, including seasonal residents, will be researched.
- ▲ **WHEN:** Yearly, beginning Year 1
- ▲ **WHERE:** Watershed-wide
- ▲ **WHO:** A designated technical assistance provider, in conjunction with the Maine Department of Human Services and the Portland Water District, would provide training programs (with municipalities sending installers and pumpers from their communities).
- ▲ **COST:** Maine Department of Human Services staff time and Casco Bay Estuary Project staff time, estimated at \$10,000 annually
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** Maine Department of Human Services and Casco Bay Estuary Project
- ▲ **PRIORITY ISSUE ADDRESSED:** √ Clam Flats and Swimming Areas

Technical Assistance Action #4

Provide Training in Best Management Practices for Contractors, Farmers, Public Works Crews, Road Commissioners, and Municipal Boards and Staff

- ▲ **NEED:** Best management practices (BMPs) are effective techniques for reducing stormwater runoff and erosion from developed and agricultural landscapes. Although the state offers a series of manuals that outline these practices, many municipal and private-sector workers are not yet using them.
- ▲ **HOW:** A technical assistance program would reach targeted audiences who conduct or review land use activities that can cause erosion, stormwater runoff, and sedimentation (e.g., municipal road crews, public works crews, contractors, farmers [including recreational farmers], and municipal staff and boards). The Maine Department of Environmental Protection has established a Nonpoint-Source Training Center to provide training programs on erosion/sedimentation BMPs, stormwater BMPs, and marina BMPs. Target audiences include contractors, engineers, planners, and marina operators.
- ▲ **WHEN:** Yearly, beginning Year 1
- ▲ **WHERE:** Initially 12 municipalities bordering Casco Bay, expanding as funds become available
- ▲ **WHO:** The technical assistance provider will coordinate training with towns and the Maine Department of Environmental Protection Nonpoint-Source Training Center, Maine Department of Transportation Local Roads Programs, Natural Resources Conservation Service, Maine Municipal Association, Portland Water District, Cumberland County Soil and Water Conservation District, and Greater Portland Council of Governments.
- ▲ **COST:** \$10,000 yearly
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** Maine Department of Environmental Protection, Maine Department of Transportation, U.S. Consolidated Farm Services Agency, and training fees
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Clam Flats and Swimming Areas
 - √ Toxic Pollution in Casco Bay

Technical Assistance Action #5

Establish a Reduction and Management Program for Toxic Pollutants in Casco Bay Communities and Small Businesses

- ▲ **NEED:** Many sources of toxic pollution can be reduced or eliminated through responsible household management and pollution prevention (e.g., non-toxic lawn and garden care; proper disposal of oils, batteries, and hazardous materials; clean car care and boat maintenance; and reduced automobile use). Reduced generation of toxics could mean cleaner sediments and less contaminant accumulation in seafood.
- ▲ **HOW:** A task force would be formed to develop a pilot program for toxic pollutant disposal, modeled after the City of Lewiston's Toxic Plan.
- ▲ **WHEN:** Task force convening in Year 2, with program beginning in Year 4
- ▲ **WHERE:** Pilot project in the watershed
- ▲ **WHO:** The task force would coordinate with municipalities, the Maine Department of Environmental Protection Pollution Prevention Program, Maine Coastal Program/Maine State Planning Office, Regional Waste Systems, U.S. Coast Guard, and others to design a toxic pollutants disposal program for Casco Bay.
- ▲ **COST:** \$10,000 per year in Years 4 and 5
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** Maine Department of Environmental Protection Pollution Prevention Program
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Toxic Pollution in Casco Bay
 - √ Stewardship

Technical Assistance Action #6

Develop and Implement Action Plans for Sub-watershed Areas

- ▲ **NEED:** Locally developed action plans to prevent and control nonpoint-source pollution in sub-watersheds of the larger Casco Bay watershed are a vital piece of the puzzle in protecting not only Casco Bay, but also smaller, local areas of importance. Five sub-watersheds exist and make up the Casco Bay watershed, Royal River watershed, and Sebago Lake watershed. Both the Presumpscot River and Royal River watersheds have initiated locally driven planning processes for water quality protection. Sub-watershed planning is needed in the Coastal, Fore River, and Sebago Lake watersheds.
- ▲ **HOW:** Using the Nonpoint Source Pollution Potential Index and a prioritization scheme under development by the Maine Department of Environmental Protection, sub-watersheds will be evaluated for potential nonpoint-source pollution impacts. Field-screening of stream habitat and water quality will be conducted to supplement the screening. Based on the prioritized list developed, education, outreach, and training will take place. The Maine Department of Environmental Protection will help raise awareness of nonpoint-source pollution issues at the municipal level. Where local support for prevention or restoration activities exists (or can be developed), professionals can help local groups develop watershed projects using watershed management guidelines now under development by the Maine Department of Environmental Protection.
- ▲ **WHEN:** Years 3 and 4
- ▲ **WHERE:** Coastal watershed, Fore River watershed, and Sebago Lake watershed
- ▲ **WHO:** Locally driven, working with such groups as the Maine Department of Environmental Protection, Maine State Planning Office, Portland Water District, Cumberland County Soil and Water Conservation District, and Greater Portland Council of Governments
- ▲ **COST:** Determined by size and scope of individual projects
- ▲ **COST TO:** Partners involved in projects
- ▲ **POTENTIAL FUNDING SOURCE:** U.S. Environmental Protection Agency 319 and 604 (b) funds administered by the Maine Department of Environmental Protection, locally raised funds, and municipalities
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Clam Flats and Swimming Areas
 - √ Habitat Protection
 - √ Toxic Pollution in Casco Bay
 - √ Stewardship

Technical Assistance Action #7

***Provide Technical Assistance
Necessary for Habitat Protection***

- ▲ **NEED:** With less than 5 percent of Maine’s land in public ownership, voluntary conservation measures at the local level are needed to protect important habitats in the watershed. Local governments and groups need information about high-value habitats in their jurisdiction and assistance in pursuing non-regulatory protection of habitat.

The U.S. Fish and Wildlife Service has completed a study of habitat values in Casco Bay that documents existing usage and explores future habitat protection issues (through a “build-out” analysis of land areas available for development).

- ▲ **HOW:** A technical assistance program would offer the following support to municipalities, land trusts, and conservation commissions:

- Collect and distribute information on habitat locations, values, and uses.
- Provide wildlife biologists to advise local groups on biological aspects of habitat protections.
- Work with communities to protect habitat areas documented by Maine Department of Inland Fish and Wildlife and in the U.S. Fish and Wildlife Service habitat analysis.
- Develop a coordinated approach to voluntary conservation activities that focus on work with landowners to encourage actions to protect habitat.

- ▲ **WHEN:** Year 1 and ongoing

- ▲ **WHERE:** 12 coastal communities bordering Casco Bay

- ▲ **WHO:** The Casco Bay Estuary Project, in conjunction with municipalities and regional land conservation groups, U.S. Fish and Wildlife Service, U.S. National Marine Fisheries Service, Maine Department of Marine Resources, and Maine Department of Inland Fisheries and Wildlife

- ▲ **COST:** \$10,000 per year

- ▲ **COST TO:** U.S. Fish and Wildlife Service, Maine Department of Inland Fisheries and Wildlife, Maine Department of Marine Resources, foundations

- ▲ **POTENTIAL FUNDING SOURCE:** Not yet determined

- ▲ **PRIORITY ISSUES ADDRESSED:** √ Habitat Protection
√ Stewardship

Technical Assistance Action #8

***Conduct Pollution-Prevention Audits for
Businesses/Industries that Affect Casco Bay***

▲ **NEED:** Businesses and industries that use toxic chemicals can pollute Casco Bay through contaminated stormwater runoff caused by accidental spillage, improper storage, disposal of hazardous materials or direct discharge into the sewer system.

▲ **HOW:** The Maine Department of Environmental Protection Pollution Prevention Program will identify the business/industry sector with the greatest risk of pollution (based on types and quantities of toxic materials stored on-site). These businesses will be contacted by the Maine Department of Environmental Protection and offered pollution prevention audits.

In addition, a Pollution Prevention Resource Library will be established at the Southern Maine Office of the Department of Environmental Protection for use by area businesses and interested citizens.

▲ **WHEN:** Year 1 and ongoing

▲ **WHERE:** Casco Bay watershed

▲ **WHO:** Maine Department of Environmental Protection Pollution Prevention Program

▲ **COST:** Per individual project

▲ **COST TO:** Maine Department of Environmental Protection

▲ **POTENTIAL FUNDING SOURCE:** Maine Department of Environmental Protection

▲ **PRIORITY ISSUES ADDRESSED:** ✓ Stormwater in Casco Bay
✓ Toxic Pollution in Casco Bay

Regulatory/Enforcement Actions

There are countless possible actions that could be taken to protect and improve the health of the Casco Bay watershed, including greater enforcement of existing regulations (or measures that require legal authority). The *Casco Bay Plan* has deliberately chosen not to pursue environmental protection through a major expansion of current regulations, emphasizing — instead — the need for information, education, and technical assistance as the means to change the behavior of individuals and groups.

However, there are existing regulations that require improvement or enforcement, and certain issues that require the authority of a regulation to have sufficient impact. For that reason, this portion of the *Casco Bay Plan* recommends specific regulatory actions.



photo by Christopher Ayres

Regulatory/Enforcement Action #1

Clarify the Use of the Natural Resource Protection Act for Habitat Protection

- ▲ **NEED:** Habitat protection can be accomplished through both regulatory and non-regulatory means. Current efforts are being focused on using non-regulatory, voluntary approaches such as easements, land purchases, and cooperative agreements with willing landowners. In some instances, a voluntary approach may not be available. The Natural Resource Protection Act (38 MRSA SS 480-A to 480 V) is the primary state statute that provides the regulatory ability to protect habitat in Maine. However, protection under the law is not realized until the Maine Department of Inland Fisheries and Wildlife designates and maps “significant wildlife habitat.” Currently, it is not clear when the Maine Department of Inland Fisheries and Wildlife will map habitat areas to enable protection under the Natural Resources Protection Act. A policy is needed that defines when Inland Fisheries and Wildlife will and will not map and what will be the alternative methods used for habitat protection.

- ▲ **HOW:** The Maine Department of Inland Fisheries and Wildlife and the Maine Department of Environmental Protection will develop a policy that will outline when the Natural Resource Protection Act will and will not be used to protect “significant wildlife habitats” in Maine. The policy will outline when the regulatory approach will be triggered and when alternative protection methods will be used.

- ▲ **WHEN:** Year 1 and ongoing

- ▲ **WHERE:** Statewide

- ▲ **WHO:** The Maine Department of Inland Fisheries and Wildlife will be responsible for establishing a policy for mapping significant wildlife habitats.

- ▲ **COST:** \$0

- ▲ **COST TO:** Maine Department of Inland Fisheries and Wildlife

- ▲ **POTENTIAL FUNDING SOURCE:** Maine Department of Inland Fisheries and Wildlife

- ▲ **PRIORITY ISSUE ADDRESSED:** ✓ Habitat Protection

Regulatory/Enforcement Action #2

***Monitor Enforcement of Combined Sewer
Overflow Reduction Plans in Portland,
South Portland, and Westbrook***

- ▲ **NEED:** Portland, South Portland, Westbrook, and the State of Maine all have combined sewer overflows that reduce water quality in the bay. Given that each is under a consent agreement with the U.S. Environmental Protection Agency and/or Maine Department of Environmental Protection to minimize sources of stormwater and sewage, their progress should be monitored to ensure that implementation of plans remains on schedule.

- ▲ **HOW:** Each municipality has prepared a Combined Sewer Overflow Reduction/Treatment Plan that outlines a schedule for implementation. Although Maine's Department of Environmental Protection and the U.S. Environmental Protection Agency will be enforcing these plans, a non-governmental group should also monitor progress.

- ▲ **WHEN:** Year 1 and ongoing

- ▲ **WHERE:** Portland, South Portland, and Westbrook

- ▲ **WHO:** Friends of Casco Bay, Maine Department of Environmental Protection, U.S. Environmental Protection Agency

- ▲ **COST:** \$0

- ▲ **COST TO:** Friends of Casco Bay, Maine Department of Environmental Protection, U.S. Environmental Protection Agency

- ▲ **POTENTIAL FUNDING SOURCES:** Bonds, user fees, federal funds

- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Clam Flats and Swimming Areas
 - √ Habitat Protection
 - √ Toxic Pollution in Casco Bay
 - √ Stewardship

Regulatory/Enforcement Action #3

***Adopt Minimum Standards for
Stormwater Quality in State and
Municipal Regulatory Programs***

- ▲ **NEED:** Existing state and municipal regulatory programs have not adopted a minimum standard for stormwater quality. Minimum stormwater quality standards have been developed and need to be included in state and municipal land use regulations.
- ▲ **HOW:** The Maine Department of Environmental Protection has included stormwater quality standards in the revised Site Location Act. Model ordinances have been developed for stormwater quality. The Maine State Planning Office will make these available to Casco Bay communities and coordinate technical assistance through appropriate organizations.
- ▲ **WHEN:** Year 2
- ▲ **WHERE:** Statewide
- ▲ **WHO:** Maine Department of Environmental Protection and Maine State Planning Office
- ▲ **COST:** \$0 (staff time)
- ▲ **COST TO:** Cost to control stormwater will be to those with development projects.
- ▲ **POTENTIAL FUNDING SOURCE:** Not applicable
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Clam Flats and Swimming Areas
 - √ Habitat Protection
 - √ Toxic Pollution in Casco Bay

Regulatory/Enforcement Action #4

Comply with the Pumpout Law

- ▲ **NEED:** Maine's Pumpout Law (MRSA Title 38, section 423B) was passed in 1989, requiring some marinas to provide pumpouts for boaters. Although compliance was required by June 1, 1990, there has been no subsequent examination of compliance or enforcement action. The law does not specify which state agency is responsible for ensuring compliance.
- ▲ **HOW:** The Maine Department of Environmental Protection will work to attain full compliance.
- ▲ **WHEN:** Year 1 and ongoing
- ▲ **WHERE:** Watershed-wide
- ▲ **WHO:** The Maine State Planning Office maintains a database of marine facilities to track marinas. The Maine Department of Environmental Protection enforces the law. Friends of Casco Bay operates the mobile pumpout boat. The U.S. Coast Guard can help track compliance. Additionally, the Maine State Planning Office has funds available to assist marinas in purchasing pumpout facilities.
- ▲ **COST:** \$0
- ▲ **COST TO:** Maine Department of Environmental Protection
- ▲ **POTENTIAL FUNDING SOURCE:** Not yet determined
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Clam Flats and Swimming Areas
√ Stewardship

Regulatory/Enforcement Action #5

Improve Local Enforcement of the Subsurface Wastewater Disposal Rules

▲ **NEED:** Lax enforcement of the State Subsurface Wastewater Disposal Rules allows failing septic systems to pollute clam flats and water quality. The Maine Department of Human Services is required to review municipal enforcement regularly but this has not occurred. The following factors contribute to the current enforcement problems:

- Septic systems are only inspected during construction, so there is no assurance that an installed system provides adequate wastewater treatment.
- Enhanced quality control for plumbing inspectors is needed.
- Contractors who install systems are not licensed or monitored.
- Compensation of licensed plumbing inspectors does not encourage enforcement activities.

The Maine Department of Human Services should enforce current laws and make changes necessary to encourage greater enforcement (through compensation or revocation of licensed plumbing inspectors certification for inadequate performance and a compensation schedule that acknowledges enforcement). Municipalities should enforce the Subsurface Wastewater Disposal Rules, using them to protect their clam flats, swimming areas, and water quality.

▲ **HOW:** The Maine Department of Human Services can increase enforcement of existing state laws and determine which amendments are needed to encourage further enforcement. Municipalities can work with their licensed plumbing inspectors to review the range of current activities and establish procedures for greater enforcement. In coastal communities with clam flats and swimming areas, the plumbing inspector can be actively involved in shoreline surveys, correcting sources of wastewater pollution that impact clam flats and swimming areas. The Maine Department of Environmental Protection has authority to take action in cases where septic systems malfunction into surface waters.

▲ **WHEN:** Year 1 and ongoing

▲ **WHERE:** Statewide

▲ **WHO:** Municipalities and the Maine Department of Human Services

▲ **COST:** \$50,000 yearly

▲ **COST TO:** Maine Department of Human Services, for additional personnel to monitor local plumbing inspectors

▲ **POTENTIAL FUNDING SOURCE:** Maine Department of Human Services

▲ **PRIORITY ISSUES ADDRESSED:** ✓ Clam Flats and Swimming Areas
✓ Stewardship

Regulatory/Enforcement Action #6

***Require Proof of Legal Waste Disposal
Upon Transfer of Property***

- ▲ **NEED:** Many septic systems in the municipalities surrounding Casco Bay were installed before the plumbing code was updated in 1974, and so may provide little or no treatment of sewage. Given their potential deleterious effect on water quality, these systems must be updated if clam flats and swimming areas are to be kept open or reopened.
- ▲ **HOW:** Develop regulations requiring those who transfer property to demonstrate that their system meets the current code. A task force would be created to determine the appropriate methods for determining if a septic system should be updated prior to transfer.
- ▲ **WHEN:** Year 2
- ▲ **WHERE:** Shoreland zone and watersheds that impact clam flats and swimming areas
- ▲ **WHO:** The Casco Bay Estuary Project will convene a task force of bankers, plumbing inspectors, site evaluators, and staff of the Maine State Planning Office, Maine Department of Environmental Protection, and Maine Department of Human Services, which should review regulations and propose changes to the Legislature.
- ▲ **COST:** \$0
- ▲ **COST TO:** Party transferring property
- ▲ **POTENTIAL FUNDING SOURCE:** Those transferring property
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Clam Flats and Swimming Areas
√ Stewardship

Planning and Assessment Actions

This *Plan* recognizes that the Casco Bay ecosystem and the human communities that share in it are dynamic, with needs and issues that evolve over time. The planning and assessment actions in this section outline additional study that is needed to guide future policies and activities.

Planning and Assessment Action #1

Develop Municipal Programs to Protect Water Resources and Clam Flats from Septic System Discharges

- ▲ **NEED:** Many towns have identified septic system/sewer issues in their comprehensive plans, but no programs currently exist to help municipalities regularly inspect and manage residential septic systems.
- ▲ **HOW:** The Casco Bay Estuary Project funded a study in the Town of Brunswick to assess methods for providing regular inspection and maintenance of septic systems. The study catalogued structural and non-structural methods, including development of a municipal wastewater management district. Other municipalities in the watershed could conduct a similar review of infrastructure (*i.e.*, sewage treatment plant capacity) and options for managing septic system maintenance.
- ▲ **WHEN:** Year 3 and ongoing
- ▲ **WHERE:** Watershed-wide
- ▲ **WHO:** Municipalities, with assistance provided by the Greater Portland Council of Governments, Maine State Planning Office, and the Maine Department of Human Services Division of Health Engineering
- ▲ **COST:** \$10,000 yearly
- ▲ **COST TO:** Municipalities and the Maine State Planning Office
- ▲ **POTENTIAL FUNDING SOURCE:** Maine Coastal Program/Maine State Planning Office
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Clam Flats and Swimming Areas
√ Stewardship

Planning and Assessment Action #2***Develop a Comprehensive Management Strategy for Dredged Material***

- ▲ **NEED:** Dredging of rivers and harbors in Casco Bay is needed to sustain the economic and recreational value of harbors. However, disposal of dredged material has become expensive and difficult in cases where sediments contain toxic materials. The Maine State Planning Office is the ongoing coordinator of all state agencies on policy issues to address dredging concerns throughout the state.
- ▲ **HOW:** The Casco Bay Estuary Project would work with the Portland Harbor Waterfront Alliance and other groups and agencies on a strategy to:
 - Reduce input of toxic materials to harbor sediments
 - Assess, categorize, and quantify material that requires dredging
 - Develop practicable alternatives for contaminated dredged material disposal
 - Work with the U.S. Army Corps of Engineers to develop plans for closure (including remediation and restoration) of the Portland Harbor disposal sites when needed
 - Research selection of new sites
 - Improve dredging and disposal techniques
- ▲ **WHEN:** Year 1 and ongoing
- ▲ **WHERE:** Casco Bay
- ▲ **WHO:** The Casco Bay Estuary Project, working with the Portland Harbor Waterfront Alliance, Friends of Casco Bay, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. National Marine Fisheries Service, Maine State Planning Office, and state and federal natural resource agencies
- ▲ **COST:** \$15,000
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** Maine Coastal Program/Maine State Planning Office, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Habitat Protection
√ Toxic Pollution in Casco Bay

Planning and Assessment Action #3

Review Implementation of the National Shellfish Sanitation Program

- ▲ **NEED:** The Casco Bay Estuary Project has found that there is widespread public confusion about how the National Shellfish and Sanitation Program (NSSP) is administered in Maine. While the public (including clam diggers) understandably would like to maximize the area of open flats, public health is of overriding concern. Because the Casco Bay area is the most populated watershed in Maine, pollution problems are many. Certain areas in the foreseeable future may never be safe for the harvesting of shellfish. Additional areas, however, might be safely opened to shellfish harvesting in Casco Bay. An effort should be made to clear up some of this confusion.
- ▲ **HOW:** A public workshop will be convened by the Maine Department of Marine Resources to review, explain, and discuss the NSSP, its implementation, and possible areas of improvement in both increased acreage of flats open and increased public health. Workshop proceedings will be published and will be used to assist the Maine Department of Marine Resources in future planning and administration of the program.
- ▲ **WHEN:** Year 1
- ▲ **WHERE:** Casco Bay watershed area
- ▲ **WHO:** The Maine Department of Marine Resources, Friends of Casco Bay, municipal officials and shellfish committees, state legislators, State Attorney General's Office, U.S. Food and Drug Administration, and the public
- ▲ **COST:** \$0
- ▲ **COST TO:** Maine Department of Marine Resources
- ▲ **POTENTIAL FUNDING SOURCE:** Not yet determined
- ▲ **PRIORITY ISSUE ADDRESSED:** ✓ Clam Flats and Swimming Areas

Planning and Assessment Action #4

***Research the Impact of Tax Codes
on Habitat Conservation***

- ▲ **NEED:** For habitat to be preserved, it must be economically feasible for private landowners to maintain land in an undeveloped state. The state tax code and municipal implementation of the code must be reviewed in this context to determine their impact on private landowners.
- ▲ **HOW:** A private consultant would review the impact of the current state tax code, and see if municipal applications of the code are consistent. A task force of state and municipal representatives will review the consultant's findings to determine if changes should be proposed to the State Legislature.
- ▲ **WHEN:** Year 3
- ▲ **WHERE:** Statewide
- ▲ **WHO:** Working with representatives of the Maine Municipal Association, Maine Coast Heritage Trust, Island Institute, local land trusts, Maine Farm Bureau, Small Woodlot Association, private landowners, and others, a task force will design the scope of work, select an impartial consultant, and review the findings.
- ▲ **COST:** \$40,000
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCE:** Foundations
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Habitat Protection
√ Stewardship

Planning and Assessment Action #5

***Develop a Plan to Restore Degraded
Habitat in Casco Bay***

- ▲ **NEED:** Ecological restoration could reverse some damage done by past development activities around Casco Bay. To restore the bay's health, more information is needed on the location and nature of degraded habitats, the type and cost of restoring these areas, the groups or agencies that could pursue restoration, and the possible funding sources. An agency or entity should be given responsibility for implementing the restoration plan.
- ▲ **HOW:** A private consultant would be retained to prepare a plan for restoring degraded habitats in Casco Bay.
- ▲ **WHEN:** Plan completed by Year 4
- ▲ **WHERE:** Coastal communities
- ▲ **WHO:** A task force with representatives from the Gulf of Maine Project of the U.S. Fish and Wildlife Service, Maine Department of Inland Fisheries and Wildlife, Maine Audubon Society, Maine Coast Heritage Trust, and others would oversee project design, consultant selection, and project implementation.
- ▲ **COST:** \$40,000 over 2 years
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** U.S. Fish and Wildlife Service, National Fish and Wildlife Foundation, foundations, abutters, U.S. Army Corps of Engineers Restoration Program and Planning Assistance
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Habitat Protection
√ Stewardship

Planning and Assessment Action #6***Develop Biological/Environmental Indicators***

- ▲ **NEED:** Water quality influences the types of plants and animals that will live in a lake, stream, river, or estuary. Alterations of the biological community can indicate chronic water quality impacts, while chemical water quality measures provide only a snapshot of current conditions. State water quality regulations provide for use of biological criteria, and freshwater criteria have been developed. Criteria for marine and estuarine waters, however, still need to be established.
- ▲ **HOW:** Biological/environmental indicators will be researched and tested in Maine so that a marine monitoring plan can be developed. Literature research on potential environmental indicators has begun, and will continue until suitable indicators are developed.
- ▲ **WHEN:** Years 3-5
- ▲ **WHERE:** Marine and estuarine waters of the coast of Maine
- ▲ **WHO:** The Maine Department of Environmental Protection will form a task force composed of representatives of the scientific community and others.
- ▲ **COST:** \$30,000 to \$50,000/year in the developmental stage; \$100,000 in the testing stage
- ▲ **COST TO:** Maine Department of Environmental Protection, U.S. Environmental Protection Agency, Gulf of Maine Program
- ▲ **POTENTIAL FUNDING SOURCES:** U.S. Environmental Protection Agency, Maine Department of Environmental Protection
- ▲ **PRIORITY ISSUES ADDRESSED:**
 - √ Stormwater in Casco Bay
 - √ Toxic Pollution in Casco Bay
 - √ Habitat Protection

Planning and Assessment Action #7

Develop Sediment Quality Criteria and Sediment Quality Discharge Limits that Apply to Casco Bay

- ▲ **NEED:** There is a need for statewide sediment quality standards that apply to Casco Bay and reflect the published levels that the Maine Department of Environmental Protection and U.S. Environmental Protection Agency follow when making regulatory decisions. At present, there are some water quality standards that are published in the U.S. Environmental Protection Agency “Gold Book”; however, toxic contaminant levels in the water do not adequately predict or relate to sediment quality. Since it is cheaper to treat potential contamination prior to discharge, toxins in effluents and stormwater should be reduced to avoid contaminating sediment.
- ▲ **HOW:** The U.S. Environmental Protection Agency is developing sediment criteria that the Maine Department of Environmental Protection and Casco Bay Estuary Project could use to create sediment quality standards applicable to Casco Bay.
- ▲ **WHEN:** The statewide sediment quality standards will continue to be developed, a few each year, by the U.S. Environmental Protection Agency. Guidance on adapting these to Casco Bay should be developed in Year 3 by the U.S. Environmental Protection Agency. Once the U.S. Environmental Protection Agency develops sediment quality criteria, the Maine Department of Environmental Protection will be encouraged to develop discharge limits that apply to Casco Bay.
- ▲ **WHERE:** Casco Bay
- ▲ **WHO:** U.S. Environmental Protection Agency and Maine Department of Environmental Protection
- ▲ **COST:** Adapt sediment quality standards to Casco Bay if needed, \$20,000 to \$30,000; develop sediment quality discharge limits, \$100,000; adapt discharge limits, \$20,000
- ▲ **COST TO:** U.S. Environmental Protection Agency
- ▲ **POTENTIAL FUNDING SOURCE:** U.S. Environmental Protection Agency
- ▲ **PRIORITY ISSUE ADDRESSED:** ✓ Toxic Pollution in Casco Bay

Planning and Assessment Action #8

***Develop a Grant Program to Support
Local Habitat Protection Activities***

- ▲ **NEED:** To successfully protect important habitat, local groups need funding support. Many communities in the Casco Bay watershed have identified habitat protection as a priority in their comprehensive plans, but they lack money to carry it through the planning process to implementation. The work done to protect local habitats should be consistent with Maine Department of Inland Fisheries and Wildlife priorities and the U.S. Fish and Wildlife Service study (available from the Casco Bay Estuary Project) and communities' approved comprehensive plans.
- ▲ **HOW:** The Casco Bay Estuary Project, working in cooperation with federal and state wildlife agencies, will provide small grants to local governments and community groups for projects to establish plans to protect valuable habitat. These funds will be used for such items as legal research, acquisition plans, funding development, and plan preparation.
- ▲ **WHEN:** Year 2 and ongoing
- ▲ **WHERE:** Watershed-wide
- ▲ **WHO:** Casco Bay Estuary Project with input from others
- ▲ **COST:** \$10,000 in grants each year
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCES:** National U.S. Fish and Wildlife Service Foundation grants, Wildlife Habitat Development Funds from U.S. Consolidated Farm Services Agency
- ▲ **PRIORITY ISSUE ADDRESSED:** ✓ Habitat Protection

Planning and Assessment Action #9

***Research Whether State Subsurface
Wastewater Disposal Rules Adequately
Prevent Coastal Pollution***

- ▲ **NEED:** The State Subsurface Wastewater Disposal Rules may not be adequately preventing pollution, according to a study of Maquoit Bay conducted for the Casco Bay Estuary Project by Horsley & Witten, Inc. The study assumed that septic systems on Maine's rocky coast, even if constructed in accordance with the Maine State Plumbing Code, may still be seeping septic waste into coastal waters. A combination of shallow coastal soils and shallow depth to bedrock can produce septic system failure, even when no surficial signs of failure are evident over the septic system.
- ▲ **HOW:** The Maine Department of Human Services should review samples taken by Horsley & Witten, Inc., from Maquoit Bay and conduct further research on how regulatory changes could reduce pollution (*e.g.*, by promoting innovative alternatives to subsurface wastewater disposal systems).
- ▲ **WHEN:** Year 2
- ▲ **WHERE:** Coastwide
- ▲ **WHO:** A task force led by the Maine Department of Human Services along with Maine State Planning Office, Maine Department of Environmental Protection, and other interested parties
- ▲ **COST:** \$20,000
- ▲ **COST TO:** Casco Bay Estuary Project
- ▲ **POTENTIAL FUNDING SOURCE:** Maine State Planning Office
- ▲ **PRIORITY ISSUE ADDRESSED:** ✓ Clam Flats and Swimming Areas

Planning and Assessment Action #10***Research the Contribution of
Deposition of Pollutants from the Air***

- ▲ **NEED:** The question of the magnitude of deposition of pollutants from the air has become more important as other sources of pollution have been identified and significantly reduced. The U.S. Environmental Protection Agency, the Maine Department of Environmental Protection, and the Casco Bay Estuary Project have jointly worked to control point and nonpoint sources of pollution in and around Maine's waters. Water quality conditions in Maine have improved greatly in the past two decades.

A comprehensive assessment of heavy metals and organic chemicals in the sediments of Casco Bay was completed in 1991 (Kennicutt *et al.*, 1992). Pollutants of concern identified by this study include PAHs, PCBs, lead, mercury, cadmium, silver, and zinc. All of these pollutants are elevated in the sediments in inner Casco Bay near licensed waste discharges, the urban population center of Greater Portland, and sites identified in a Casco Bay Estuary Project funded study on "dirty history" (Hawes, 1993). However, the results from the eastern part of the bay raised concerns because "hot spots" of PAHs and cadmium were found in sediments of eastern Casco Bay, away from any population center, waste discharge, or known historic source. Although at much lower concentrations, a similar pattern was observed for PCBs, DDT, and chlordane, and in a subsequent study on "dioxins" (2, 3, 7, 8 — substituted PCDD/PCDF) (Wade *et al.*, 1995).

The second major scientific study undertaken by the Casco Bay Estuary Project was a circulation model of the bay (Gong *et al.*, 1995). The model did not indicate possible sources for the "hot spots" in the inner reaches of eastern Casco Bay.

- ▲ **HOW:** Monitor the wet and dry air deposition of pollutants of concern, such as cadmium and PAHs, on "well-placed islands." If it appears that pollutants of concern are being deposited from the air, then a trajectory analysis will be undertaken. Potential sources upwind of the deposition area will be identified and sampled. Dispersion from sources of pollutants of concern will be modeled. Also, estimates would be made of the potential benefits if a source were cut back or cut off entirely.
- ▲ **WHEN:** Year 1 (or as soon as funding is secured)

- ▲ **WHERE:** Casco Bay and its watershed
- ▲ **WHO:** The Maine Department of Environmental Protection with help from the U.S. Environmental Protection Agency Office of Air Quality Planning and Standards
- ▲ **COST:** \$100,000
- ▲ **COST TO:** Not yet determined
- ▲ **POTENTIAL FUNDING SOURCE:** U.S. Environmental Protection Agency Office of Air Quality Planning and Standards
- ▲ **PRIORITY ISSUES ADDRESSED:** √ Stormwater in Casco Bay
√ Toxic Pollution in Casco Bay

MEASURING PROGRESS



CASCO BAY PLAN

MEASURING PROGRESS:

The Casco Bay Monitoring Plan

Introduction

The *Casco Bay Plan* is committed to preventing pollution, improving water quality, and protecting and restoring important fish and wildlife habitat in Casco Bay. To accomplish these goals, the *Casco Bay Plan* outlines 34 actions to be completed over a five-year period (between July 1996 and July 2001), and sets forth an implementation strategy that will continue protecting the bay into the future. Each action is intended to contribute to the goals of improved water quality, habitat protection, and a healthy bay.

How will progress toward these goals be measured?

Government officials and the public need information to judge progress in protecting and restoring Casco Bay and to document significant changes in the estuary over time. In recent years, emphasis has been placed on “accountability,” “managing by results,” and “outcomes.” Every action undertaken must be cost-effective and focused. To judge progress, the *Casco Bay Plan* defines ways to measure progress, monitor change over time, and report these findings to all interested parties.



Stages of Change

The process of change over time entails four important stages.

First Stage: Behavioral Change

Most of the *Casco Bay Plan* actions involve efforts to change behavior. There is a strong emphasis on public education and municipal technical assistance. Changes in behavior may not directly affect the environment, but they lead to actions that will. For example, a first-stage change might involve a municipality requiring the use of best management practices during construction of new projects.

Second Stage: Pollution Reduction

When behavior is changed, actual discharges to water, air, or soil can be reduced. Extending the previous example, a second-stage outcome would involve actual reductions of contaminated nonpoint-source stormwater washing into the bay (as a result of people using best management practices).

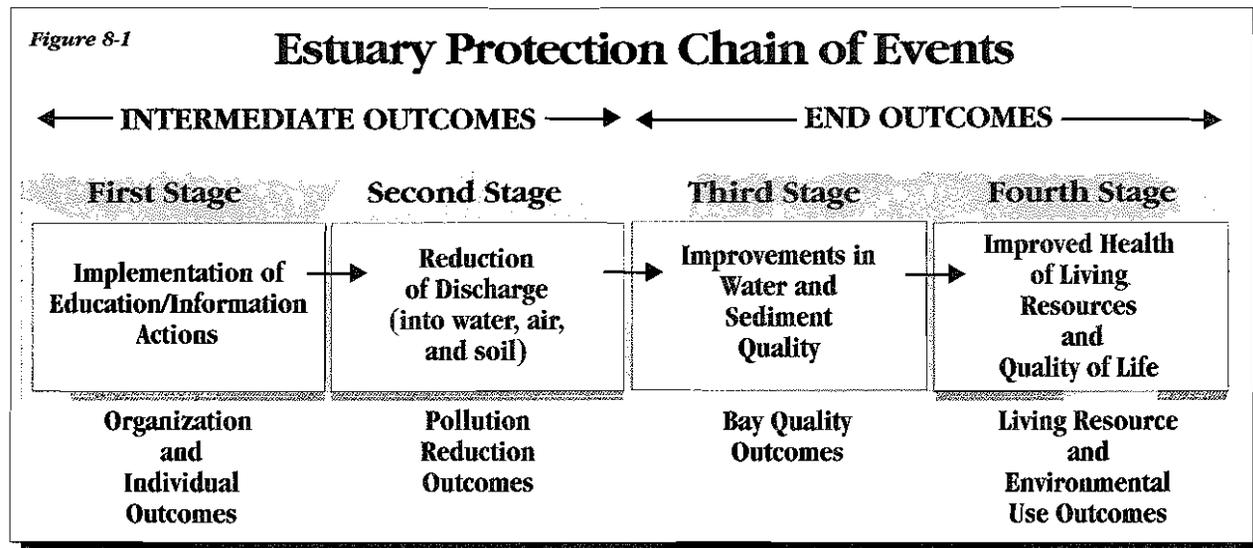
Third Stage: Improvement in Water and Sediment Quality

With actual pollution reduced, improvements in the bay's water and sediment quality may be evident. In the example, water and sediment quality in the bay will improve due to the municipal action to require best management practices and the impact of the actual use of such practices.

Fourth Stage: Health of the Living Resource

The final stage, and ultimate goal, is improving the health of the ecosystem. The health of the region's ecology and economy have improved in the fourth stage due to actions taken and the resulting improvement in water and sediment quality.

First- and second-stage outcomes generally occur soon after actions are undertaken, while third- and fourth-stage outcomes may not come until much later (often years after actions have been taken). However, first- and second-stage outcomes provide early indications of end outcomes. The *Casco Bay Plan* is generally aimed at affecting behaviors of governments, businesses, households, and boaters to ensure that improved environmental behavior by these groups will eventually improve the bay's overall health.



Monitoring Plans

To establish baseline information on the current status of the environment and to measure change over time, the *Casco Bay Plan* proposes that four areas of monitoring take place: environmental monitoring, local government action monitoring, public attitudes and actions monitoring, and programmatic monitoring. Monitoring changes in these areas will be an important management tool in implementing the *Plan* and guiding environmental change.

Environmental Monitoring

Environmental monitoring is the key to determining if the outcome sought has been achieved. The key purpose of the *Casco Bay Plan* is to protect and improve the health of Casco Bay. Environmental monitoring is critical to establishing a baseline of information, to assess trends over time, and to determine if actions are having an impact on the environment.

Environmental indicators can help measure progress toward improved water quality, habitat quality, and ecosystem health. These third- or fourth-stage monitoring activities provide baseline information, establish trends, and act as an assessment tool to track change in the environment over time. It is not practical or cost-effective to measure every parameter of the bay. Therefore, a few indicators will be carefully selected to provide some indication of the overall health of the bay.

With goals and objectives established by the Management Committee, environmental indicators were developed to measure outcomes for the estuary that best meet the goals and objectives.

An environmental monitoring plan has been completed and establishes actions necessary to measure change.

Tracking the Progress of Local Governments

Municipalities play a vital role in the protection of Casco Bay. In Maine, home-rule grants municipalities the authority to plan for and regulate land use within their communities. Municipalities also have the ability to influence the behavior of their citizens through the standards that govern land use activities, education in the schools, and the types of services provided in their communities.

In developing the *Casco Bay Plan*, the major role municipalities play in first-stage environmental protection activities has become more clear. In fact, municipalities influence all of the priority areas identified by the *Plan*. With this understanding, the *Casco Bay Plan* is designed as an aid to municipalities in meeting their growing needs.

The *Casco Bay Plan* recognizes the major role municipalities collectively play in protecting Casco Bay, but it also recognizes that each municipality in the Casco Bay watershed is governed independently; therefore, regulations, procedures, and policies differ from town to town. To better understand and influence municipal decisions that impact the health of the bay, a second component of monitoring the *Plan* will be to track the progress made by local governments.

To track the progress of the local government protection efforts, a "Government Action Checklist" has been developed. The checklist covers key government activities affecting the *Casco Bay Plan's* five priority issues. Items covered include questions on stormwater management, clam flats and swimming areas, habitat issues, and toxics.

Information obtained from the Government Action Checklist acts as baseline information for local actions. Biennially, the checklist will be readministered to determine if there has been change. The checklist acts as a strong guide suggesting where technical assistance is needed by municipalities. It also helps municipalities to prioritize efforts and assess their actions on a regional basis. In general, the checklist increases awareness of the relationship between local governments and environmental consequences.

The intent of the checklist is to provide helpful, useful information to communities and to others who can assist communities. The *Casco Bay Plan* places major emphasis on providing technical assistance to municipalities. This checklist will monitor how effective that technical assistance is.

The checklist was administered in 1996 and will be administered biennially thereafter.

Public Attitudes and Actions Survey

Households and boaters play a major role in preventing pollution and protecting Casco Bay. Households affect water quality by their use of fertilizers and pesticides, disposal of contaminants (e.g., paint and cleaning materials), disturbing habitat, and upkeep of private septic systems. Boaters impact water quality by dumping waste, mishandling fuel, and damaging habitat.

Recognizing these issues, the *Casco Bay Plan* places major emphasis on educating the public and boaters and encouraging them to act in ways beneficial to the bay. A key issue is the extent to which attitudes and behaviors change over time as a result of these educational efforts designed especially for them.

A major way to assess the status of and changes in household and boater attitudes and behavior is to conduct a survey periodically about pollution prevention activities. Although changes in attitudes and behavior are first-stage outcomes, they lead to actual physical changes, such as reducing the amount of contaminants discharged into the bay, improved water quality, and, ultimately, the improved health of the bay.

A statistical survey of households and boaters will do two things. First, it will provide a baseline of information on current attitudes and actions. This information can then be used immediately to guide program design of current efforts and resources. Second, the survey will be readministered every five years to assess change over time and to determine if current programs were effective.

A survey was administered to a statistically significant sample by a professional market research firm in 1996. The survey will be administered every five years and will be a valuable management tool, as well as an assessment tool.

Programmatic Monitoring

Programmatic monitoring will be conducted by the Casco Bay Estuary Project for all actions outlined in the *Casco Bay Plan*. Each action in the *Plan* outlines the time frame in which the action is to be accomplished. To ensure that the actions are being undertaken in the time frames approved in the *Plan*, and are accomplishing the intended results, programmatic monitoring will be conducted each year with a report presented to the Implementation Committee each July.

The purpose of programmatic monitoring is to ensure that actions are being completed. Successful management of the project depends on an accurate assessment of the status of implementation of the *Casco Bay Plan* actions.

Summary

There are four separate components of the overall monitoring plan for Casco Bay:

- Environmental Monitoring
- Tracking the Progress of Local Governments
- Public Attitudes and Action Survey
- Programmatic Monitoring

Taken together, these four components will enable the Casco Bay Estuary Project to obtain baseline information, to carefully assess the outcome of environmental protection efforts of the *Casco Bay Plan*, and to provide significant information to the public and the numerous groups interested in the health of the bay.

Monitoring will be the key to ensuring the accountability of the *Casco Bay Plan*. By establishing a program to measure outcomes at the outset of the *Plan* implementation, we will be better able to determine if we are meeting our goals.

To obtain more in-depth information regarding any of the areas to be monitored, please call the Casco Bay Estuary Project. A separate document has been prepared.

NOTES



IMPLEMENTATION



CASCO BAY PLAN

It is only through the collective effort of groups, agencies, businesses, and citizens that the actions outlined in this Plan can be achieved.

IMPLEMENTATION

Implementing and Financing the Casco Bay Plan

Introduction

Every single person or group has the ability — or responsibility — to prevent the pollution of Casco Bay. But it is only through the collective effort of groups, agencies, businesses, and citizens that the actions outlined in the *Plan* can be achieved.

Fortunately, there are many individuals and organizations already addressing specific bay issues. Groups that have worked cooperatively to develop the *Casco Bay Plan* will continue collaborating on its implementation. The *Plan* represents a unique opportunity to build on existing activities and take further steps to sustain the health of Casco Bay.

This chapter describes the process used to consider management options for the bay and outlines a proposed structure for public review.

Options for Managing Casco Bay

Throughout the process of documenting environmental issues, developing plans, providing grants, and conducting research, the Casco Bay Estuary Project has sought to address the critical question: Who will be responsible for the long-term management and stewardship of the Casco Bay ecosystem and how will this be accomplished? Three written reports were prepared for the project over the past four years to provide background and guidance concerning how the *Casco Bay Plan* might be implemented.

One report, *Review of Water Quality Planning Programs Relative to Casco Bay*, assessed seven programs similar to the Casco Bay Estuary Project that have operated in Maine over roughly the past 20 years. The report, by Metcalf and Eddy, Inc., assessed how well each program was able to implement its goals. While every program provided different lessons for Casco Bay, some common recommendations for successful implementation did emerge, including the need to find local solutions (without large federal subsidies) and the need for implementation committee members with sufficient authority to enact the recommended measures.

The ability to resolve watershed issues in Maine is hampered by the absence of any regional authority. In the Casco Bay watershed, for example, there are 41 separate municipalities with “home-rule” authority on issues that impact the region’s environment.

To explore the questions of regional versus local control, a report entitled *The Regulation and Management of Casco Bay* was prepared for the Casco Bay Estuary Project by the Marine Law Institute at the University of Maine School of Law (1992). This report reviewed the existing regulatory framework governing the project’s five priority issues and considered four regional management agencies that could serve as models for managing Casco Bay: (1) the Cape Cod Commission, (2) the San Francisco Bay Conservation and Development Commission, (3) the Puget Sound Water Quality Authority, and (4) the Cobbossee Watershed District (in Maine).

Several critical factors surfaced in a review of the four regional agencies:

- Each regional management agency was created for a specific purpose (*i.e.*, existing institutions are not capable of managing critical issues).
- A regional agency should only be established if it will not duplicate functions performed elsewhere.
- A regional agency is more likely to generate local support if it works with existing programs at the local level.
- Linkages and networking with existing programs give a regional agency the benefit of ongoing programs.
- The need for a regional management approach depends on its function.
- To be successful, any regional agency needs professional staff.
- Regional management requires significant grassroots support.

The Management Committee of the Casco Bay Estuary Project discussed the concept of creating a watershed district to provide a “single-purpose” agency that could focus on improving water quality in Casco Bay. Formation of a watershed district, which is guided by state law in Maine, requires significant local support (demonstrated through municipalities and residents or by local referendum). An application to form a district must be approved by the State Board of Environmental Protection after a public hearing, and then be ratified by a vote of municipalities that form the district.

To assess possible management models, the Casco Bay Estuary Project hired Charles S. Colgan, Ph.D. (at the University of Southern Maine's Muskie Institute) to prepare a report entitled *Options for a Management System for the Casco Bay Estuary: A Discussion Paper*. This report, which reviewed a wide range of centralized and decentralized management options for Casco Bay, outlined the following criteria for selecting an appropriate management system:

- effectiveness of the management system
- cost of implementation
- use of existing resources
- plans for effective communication
- political acceptability
- geographic scope of responsibilities

Regardless of which management system is selected, the system must perform certain ongoing functions to be effective, such as:

- policy planning
- decision-making
- implementation
- monitoring
- information flow

In November 1993, the Casco Bay Estuary Project held two public forums, entitled *Managing Casco Bay for the Future: Who Should Protect Casco Bay?*, to discuss possible management strategies and gather responses from local government officials, business owners, industry leaders, fishers, farmers, environmental conservation groups, and concerned citizens. While consensus regarding a management approach was not reached, the forums did foster discussion of the timing, feasibility, funding, and political acceptability of regional management and local control options.

A recurrent theme in public forums and reports has been the need to use existing resources and not duplicate functions performed elsewhere. The Casco Bay Estuary Project's Management Committee took this concern seriously in developing its strategy to implement the *Casco Bay Plan*. Recognizing that all organizational and governmental budgets are currently stretched, the Management Committee worked to extend the concept of ecosystem planning by building on existing resources and efforts.

There is not widespread support for a new form of regional authority in the Casco Bay watershed, but there is general agreement that Casco Bay should be managed on a regional scale through the coordinated efforts of existing groups. Local control will be developed through a "compact" signed by agencies, non-profit organizations, other groups, and individuals who come together to collectively protect Casco Bay. The Management Committee has developed a plan that recognizes Maine's strong "home-rule" tradition and emphasizes environmental protection at the local level.

Management Structure for *Plan* Implementation

The *Casco Bay Plan* sets forth actions that need to be taken in five spheres: monitoring, public education, technical assistance, regulation, and planning. Each action addresses one or more of the five priority issues described in the *Plan*: stewardship, clam flats and swimming areas, stormwater management, habitat protection, and toxic pollution.

In implementation, the organization will change from a “top-down” to a “locally driven” organization with agencies, non-profit organizations, other groups, and individuals coming together and signing a “compact” demonstrating their commitment to protecting Casco Bay. The project will be governed by a committee that will focus on policy issues and results and will conduct an annual evaluation of the project’s effectiveness, as well as the effectiveness of the Board. Every two years the Board will determine if the project should continue, change, or dissolve. An independent director/coordinator housed in a “host” organization will report to the Board. That person will be responsible for coordinating with other groups and task forces, fund raising, leveraging projects, and *Plan* implementation. The organization will be housed in a “host” organization in order to share facilities and support services.

Board Structure

Numerous agencies, organizations, and individuals bring extraordinary collective knowledge and expertise needed to protect Casco Bay and to implement the *Casco Bay Plan*. By coming together, these individuals and representatives of larger groups are able to work collectively toward common goals. The current Management Committee of the Casco Bay Estuary Project will be dissolved and a new Board will come together, consisting of members who bring passion toward environmental protection, energy to follow through, and authority to bring the weight of their organization to bear in implementing the *Plan*. The new Board will bring the ability to focus on policy issues. For those members representing state agencies, the members will be requested by the Board and appointed by the Governor of Maine. The Board will consist of the following:

1. *Maine Department of Environmental Protection, Commissioner*

The Maine Department of Environmental Protection has established an agenda that includes pollution prevention, watershed management, technical assistance, nonpoint-source stormwater management, and environmental monitoring. These issues are critical to the long-term success of the *Casco Bay Plan*.

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2. *Maine State Planning Office, Director*

The Maine State Planning Office serves as the lead agency in coastal planning and supports Maine's role in Gulf of Maine management. Coordination with Gulf issues will be important since the Casco Bay watershed must be managed in the context of the larger Gulf watershed. Also, the comprehensive planning program has been transferred from the Maine Department of Economic and Community Development to the Maine State Planning Office.

3. *Maine Department of Marine Resources, Commissioner*

The Maine Department of Marine Resources is the lead agency responsible for shellfish harvesting. Its role in implementation is vital for determining whether Casco Bay's clam flats can be harvested and for increasing awareness of Maine's marine resources through public education. The Department of Marine Resources also acts as a consultant to regulatory agencies (state and federal) and to developers on projects that impact marine habitat, marine fisheries, and navigation.

4. *Portland Water District, General Manager*

Through education and technical assistance to municipalities in the upper watershed, the Portland Water District protects not only the drinking water and public health of area residents, but also contributes to the overall protection of water quality in Casco Bay. Technical assistance and educational efforts in the lower watershed could be a logical extension of their work.

5. *Friends of Casco Bay, BayKeeper*

Friends of Casco Bay is a grassroots organization that works to improve and protect the bay's environmental health by taking a cooperative approach to solving pollution problems and by creating a strong association with bay businesses, marine entities, and regulatory agencies. With Casco Bay Estuary Project funding, Friends of Casco Bay has implemented a water quality monitoring program. It has developed projects involving marine debris collection, oil recycling, mobile pumpout programs, and clam-flat restoration. Friends of Casco Bay could assist with the recommended *Plan's* monitoring and public education activities.

6. *U.S. Environmental Protection Agency, Maine State Office, Manager*

The U.S. Environmental Protection Agency administers the National Estuary Program under Section 320 of the Clean Water Act (which authorizes the agency to work in partnership with a state to develop a management plan and monitor its implementation). Seventy-five percent of estuary project funding comes from the U.S. Environmental Protection Agency. The agency also has oversight of many environmental protection programs that affect Casco Bay, including point-source per-

mits, wetlands permits, construction of treatment plants, groundwater protection, dredging, and nonpoint-source protection. In addition, the agency has extensive technical expertise that it can lend to Casco Bay protection efforts.

7. *U.S. Fish and Wildlife Service, Director, Gulf of Maine Project Office*

The U.S. Fish and Wildlife Service works to protect wildlife and important habitats. The Gulf of Maine Office has completed a habitat study for the Casco Bay Estuary Project and plays a crucial role in monitoring, planning, public education, and regulatory activities.

8. *Maine Department of Inland Fisheries and Wildlife, Commissioner*

The Maine Department of Inland Fisheries and Wildlife works to protect wildlife and important habitats. Its knowledge and understanding of habitat issues would be crucial in monitoring, planning, public education, and regulatory actions.

9. *University of Southern Maine, President*

The University of Southern Maine, the region's major state-run educational institution, has both undergraduate and graduate programs related to coastal policy and planning issues. The University owns Wolfe's Neck Farm in Freeport, a property donated to the University for use in environmental education.

10. *Environmental Education (K-12) Representative*

To foster further environmental education in the Casco Bay watershed, a committee member would be appointed who represents the environmental education community.

11/12. *Business Representatives (two)*

The Governor would appoint two business representatives, since most regional businesses depend — directly or indirectly — on Casco Bay for their livelihood and the bay depends on their responsible operating practices.

13/14. *Citizen Representatives (two)*

Two citizen representatives will represent public involvement in stewardship and protection of the bay.

15/16/17/18/19. *Municipal Representatives (five)*

Because many of the *Plan's* initiatives must be implemented through local ordinances and actions, municipal involvement is critical. A Greater Portland Council of Governments representative may act as one of the municipal representatives.

20. *Casco Bay Island Development Association*

Island residents in Casco Bay have a unique perspective on problems and issues affecting the bay. The Committee's island representative would be appointed by the Casco Bay Island Development Association, a non-profit group that represents the bay's populated islands.

21. *Cumberland County Soil and Water District, District Office Manager*

The Cumberland County Soil and Water District, a non-regulatory agency, provides technical assistance, education, and outreach to landowners, municipalities, and private groups on watershed management, erosion and sedimentation control, and stormwater management. The District has managed the Casco Bay Technical Assistance Program, a pilot program to deliver technical assistance to municipalities on stormwater management, clam-flat restoration, swimming-beach monitoring, and training for septic system installers and pumpers.

Funding the *Casco Bay Plan*

Implementation of the *Casco Bay Plan* will take place in a challenging political and financial environment. Federal funding sources are declining and state budget constraints are apt to preclude any funding allocations or broad-based taxes or fees that could support implementation during the first five years. In the absence of traditional state and federal support, municipalities will be acutely challenged to fund critical services.

Despite the apparent dire funding environment, both the U.S. Environmental Protection Agency and the Maine Department of Environmental Protection have identified watershed management and the evolution of watershed management institutional capability as central to their resource management and protection strategies in the future. The importance of watershed management is substantiated by the U.S. Environmental Protection Agency's ongoing commitment to provide \$200,000 in post-planning implementation funds for a four-year period beginning in 1996 (contingent upon Congressional appropriation) and by the Maine Department of Environmental Protection's support of flat funding at \$90,000 in general funds (contingent upon legislative approval).

Recognizing the financial limitations and political sentiments, the implementation of the *Casco Bay Plan* must focus available funds wisely, develop a fundraising organization to seek funds to support the *Plan's* actions, and lay the groundwork for a mix of new funding opportunities that will be needed to replace U.S. Environmental Protection Agency and Maine Department of Environmental Protection funds in the future.

Funding Approach

To fund implementation of the *Plan*, a detailed five-year budget is proposed. Beyond that period, alternative funding ideas are proposed to provoke discussion and potentially fund future pollution prevention and habitat protection projects. *The budget for implementation continues the philosophy of the entire program: There is a role for all to play in the protection of Casco Bay. Strong federal, state, and local support will continue to work together.*

In the absence of new funding sources, the Casco Bay Estuary Project will use \$290,000 in anticipated funds to build on past achievements, funding a core program that will:

- Support the staff necessary to advance implementation efforts
- Manage data, especially in support of the Monitoring Plan
- Begin to fund actions outlined in the *Plan*
- Monitor the environmental trends and health of the bay

Beyond this core program, the Casco Bay Estuary Project will attempt to secure between \$185,000 and \$480,000 per year in additional funds from diverse sources to support actions outlined in Chapter 7:

- public education
- technical assistance for local communities
- regulatory changes
- planning and assessment actions

Based on actions outlined in Chapter 7, the total proposed implementation budget for fiscal years 1997-2001 (including only direct costs to the Casco Bay Estuary Project, not those costs incurred by other state/federal agencies and nonprofit organizations) is outlined in Table 9-1. *While the proposed budget is intended to be as specific as possible at this time, it should be viewed as one subject to change.*

The implementation budget is divided into three components:

1. Core Operations include:
 - Casco Bay Implementation Committee
 - Staff and data management support
2. Programming includes:
 - Public Education Actions
 - Technical Assistance Actions
 - Regulatory/Enforcement Actions
 - Planning and Assessment Actions
3. Monitoring includes:
 - Environmental monitoring
 - Municipal monitoring
 - Public attitudes and actions monitoring

Table 9-1 Proposed Implementation Budget
1997 through 2001

PROGRAM BUDGET:	FY97	FY98	FY99	FY00	FY01
Core Operation:					
Director/Admin.	\$100,000	\$105,000	\$110,250	\$115,700	\$121,500
Data Management	25,000	26,250	27,562	28,940	30,387
Subtotal					
Core Operation	\$125,000	\$131,250	\$137,812	\$144,640	\$151,887
Programming:					
Public Education	\$ 70,000	\$ 73,000	\$ 63,000	\$98,000	\$ 63,000
Technical Assistance	110,000	40,000	40,000	50,000	50,000
Regulatory/Enforcement	0	0	0	0	0
Planning and Assessment	15,000	145,000	85,000	45,000	25,000
Subtotal Programming	\$195,000	\$258,000	\$188,000	\$193,000	\$138,000
Monitoring:					
Environmental (Tier 1)	\$155,000	\$165,000	\$155,000	\$165,000	\$255,000
Municipal	0	0	5,000	0	5,000
Public	0	0	0	0	20,000
Subtotal Monitoring	\$155,000	\$165,000	\$160,000	\$165,000	\$280,000
TOTAL EXPENSES	\$475,000	\$554,250	\$485,812	\$502,640	\$569,887

Source: Finance Plan

Funding Sources

Funding sources for each of the recommended actions have been proposed. As noted, they include an annual allocation of \$200,000 from the U.S. Environmental Protection Agency and a \$90,000 annual allocation from the Maine Department of Environmental Protection to promote watershed management.

The Maine Surface Water Fund is the proposed primary source of support for monitoring the health of Casco Bay. However, there are many competing uses for funds and approval is yet to be secured. Other state and federal grant funds may be available to support the *Plan's* actions. Coastal Zone Management funds (administered by the Maine State Planning Office) and Clean Water Act Section 319 funds (administered by the Maine Department of Environmental Protection) are two programs targeted to assist implementation.

Table 9-2 outlines all funding sources proposed at this time. If the listed sources are unavailable, the Casco Bay Estuary Project will search for new funding sources.

Table 9-2

**Proposed Funding Sources for
Plan Implementation 1997-2001**

FUNDING SOURCES	FY97	FY98	FY99	FY00	FY01
Post-CCMP Funding (US EPA & ME DEP)	\$290,000	\$290,000	\$290,000	\$290,000	\$ 90,000
CWA 604(b) (Planning)	0	0	0	0	0
CWA 319 (Implementation)	0	0	0	0	0
ME CZM	25,000	55,000	15,000	35,000	78,000
ME Surface Water Fund	50,000	50,000	35,000	30,000	65,000
US Fish & Wildlife Service	10,000	10,000	30,000	55,000	10,000
US EPA	0	100,000	0	0	0
Gulf of Maine Council	80,000	10,000	10,000	10,000	10,000
Sea Grant	0	0	0	0	0
Portland Water District	0	0	0	0	25,000
Foundation Grants	20,000	25,000	23,000	33,000	40,000
New Sources	0	14,250	62,812	29,640	231,887
NPDES Permit Fees	0	0	20,000	20,000	20,000
TOTAL INCOME	\$475,000	\$554,250	\$485,812	\$502,640	\$569,887

Source: Finance Plan

Future Funding Mechanisms

Some stable funding sources for the first four years of implementation will allow the Casco Bay Estuary Project to generate vital trend information about the bay's ecology and undertake numerous actions to prevent pollution and protect important habitats.

To continue this work beyond the four-year time frame, new sources of funding will be needed. The current financial restructuring efforts underway at federal and state levels make it difficult to anticipate which funding mechanisms may be available in the future to protect and restore Casco Bay. Table 9-3 outlines a sampling of such possible future mechanisms in terms of likelihood, potential, and stability.

Each potential future funding mechanism is discussed briefly in the following paragraphs.

Fees for Service are not currently proposed for use during the initial five years of implementation and beyond.

Table 9-3

Assessment of Potential Future Funding Mechanisms

SOURCE	PAID BY*	ADMIN.**	AUTHORITY***	POTENTIAL****	STABILITY
Fees for Service	Beneficiary	Exists	Possible	Moderate	Cyclical
Water/Sewer Fees	Beneficiary	Change	Possible	Moderate	Stable
Abutter Donations	Beneficiary	Exists	Possible	Low	Cyclical
Mooring Fees	Beneficiary	Change	Possible	Low	Stable
Saltwater Fish Lic.	Beneficiary	Change	Possible	Low	Stable
Boat Reg. Fees	Beneficiary	Change	Possible	Low	Stable
NPDES Fees	Polluter	Change	Possible	Moderate	Stable
Utility District	Polluter	Change	Possible	Moderate	Stable
Fines	Polluter	Exists	Possible	Low-High	Erratic
Special Tax District	Beneficiary	Change	Unlikely	Moderate	Stable
Impact Fees	Polluter	Change	Unlikely	Moderate	Cyclical
Marine Fuel Tax	Beneficiary	Change	Unlikely	Moderate	Seasonal
Shellfish Tax	Beneficiary	Change	Unlikely	Low	Seasonal
Local Option Tax	Public	Change	Unlikely	High	Stable

NOTES:

- * Indicates whether funding burden falls on polluters and/or beneficiaries of Casco Bay or on the general public.
- ** Indicates whether the administrative mechanism is already in operation, needs adjustment, or must be created.
- *** Indicates whether the chance of securing necessary legal authorization is high, moderate, or low.
- **** Indicates whether the potential revenues vs. Casco Bay Estuary Project's financial needs are high, moderate, or low.

Source: Finance Plan

Water and Sewer Fees are currently a common and stable fee administered by water districts based on water consumption by households. Management of water quality in the receiving waters of sewage treatment plants is not similarly funded and the feasibility of extending jurisdiction for this function to water districts should be explored. Some form of surcharge on sewer rates could provide funds for managing and protecting Casco Bay (enacted through political and legislative effort).

Abutter Donations are a potential funding source for projects that focus on assessing or restoring a specific geographic area.

Municipal Mooring Fees could be increased as a means to fund local GIS or technical assistance fees.

Saltwater Fishing License Fees offer a future funding source. Although proposed legislation to create a recreational saltwater fishing license failed to pass in 1995, the issue may be revisited.

Boat Registration Fees that apply to direct users of the bay give municipalities an opportunity to finance Casco Bay protection. Legislative approval would be necessary for this measure.

National Pollutant Discharge Elimination System Permit Fees: Currently there is no legal ability to obtain funds from permit holders; however, this idea should be researched.

Utility Districts involve the establishment of a public utility to service uses that impact scarce and publicly controlled, owned, provided, or regulated resources. One possibility for a utility district in Casco Bay involves a septic system district that would assume the proper operation and maintenance of septic systems within a defined area.

Fines generated by pollution offenses have traditionally been unpredictable. However, recent legislation established a mechanism that will allow environmental litigation settlements and fines to support applied scientific research on the sources and corrective strategies for marine pollution. This legal mechanism should be reviewed and amended to benefit Casco Bay.

Betterment Districts are special self-imposed taxing authorities that levy a surcharge on property taxes in a defined area where specific services are delivered.

Impact Fees are imposed on new real estate development activities to offset the financial impact on municipalities. Impact fees could assist municipalities with the cost of managing nonpoint-source pollution.

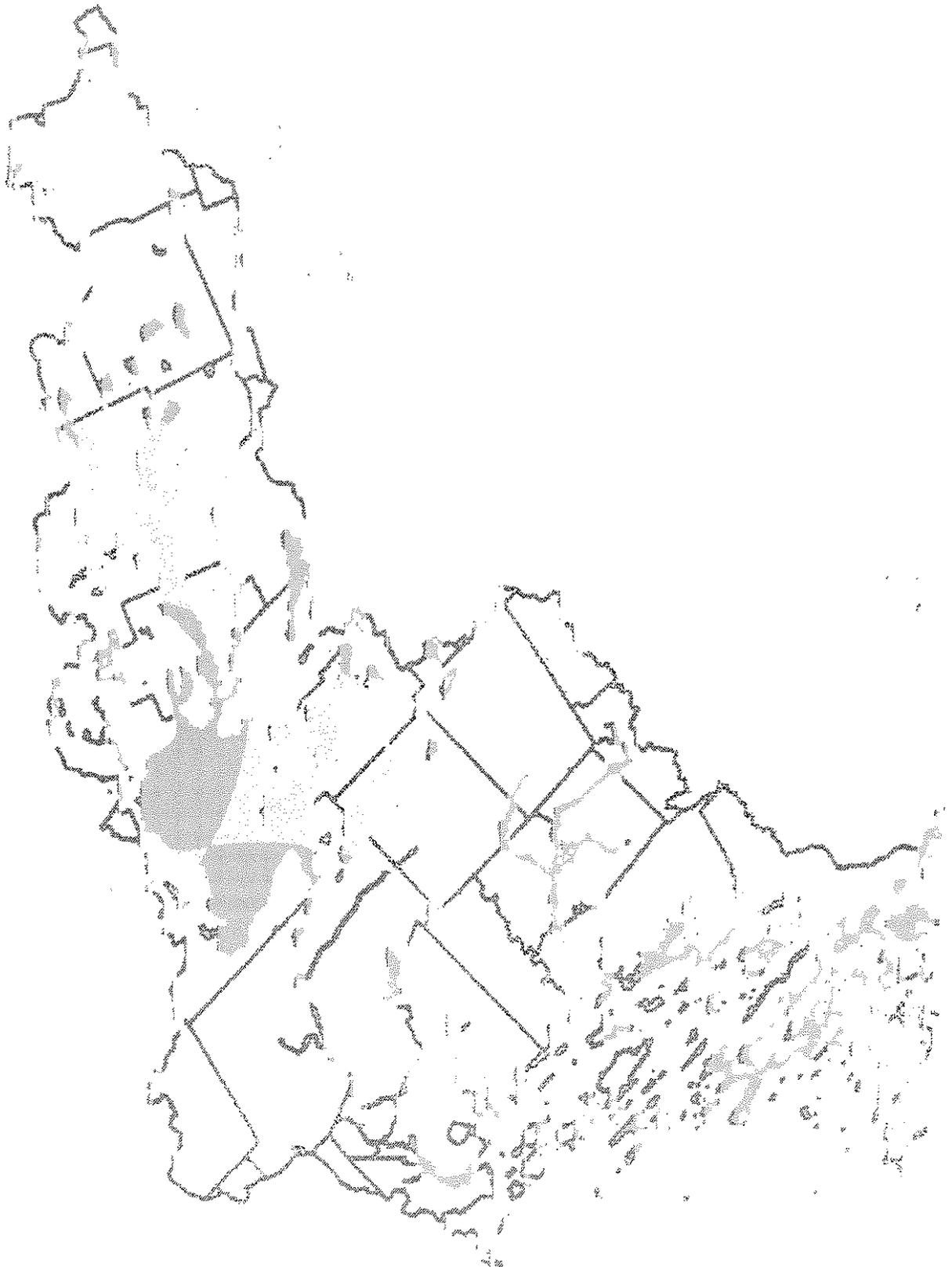
Marine Fuel Tax, imposed by the state or region on fuel pumped at marinas, could be used to fund protection/management efforts in Casco Bay. This tax targets beneficiaries who are occasional polluters.

Shellfish Tax on clams could be a logical source of support for clam-flat restoration efforts.

Local Option Taxes would require that the Legislature give local municipalities the option to levy a sales-tax surcharge. While the Legislature has historically opposed such an option, the changing political landscape may influence the way it is viewed in the future. Such funds can be focused by municipalities on protection efforts.

Funding for implementation of the *Casco Bay Plan* is based on a five-year cycle. A detailed budget is proposed for the first five years of implementation, with plans for longer term funding offered. A complete copy of the Finance Plan, which outlines funding for all proposed actions, is available through the Casco Bay Estuary Project.

NOTES



FEDERAL COORDINATION



CASCO BAY PLAN

FEDERAL COORDINATION

Coordinating with Federal Programs

Federal Consistency Review

The *Casco Bay Plan* will require extensive coordination among local, state, and federal programs. The federal consistency process can further this coordination by allowing state and local governments to review federal assistance programs to ensure they are consistent with state and local actions.

Many federal programs entail such a review process, including the National Estuary Program, the Coastal Zone Management Act, and the nonpoint-source program. In addition, a government-wide consistency requirement was established in 1982, creating a centralized process by which state and local governments comment on certain applications for federal assistance before they are implemented. The federal government must either resolve the issues raised or explain why they did not.

Consistency review provides two benefits to the Casco Bay Estuary Project. First, it ensures that federal agencies will not promote or conduct activities that are inconsistent with the goals, objectives, and actions of the *Casco Bay Plan*. Second, the review enables the Casco Bay Estuary Project to work to ensure federal programs in Maine support implementation of the *Casco Bay Plan* and to gather appropriate data on activities.

The consistency review process is not regulatory and the following strategy was selected because it presents the least intrusive alternative to meet the statutory requirements under Section 320 of the Clean Water Act.

Conducting Federal Consistency Reviews

The Federal Office of Management and Budget lists almost 500 programs that states can review, and Maine has chosen to review all the eligible programs. The Maine State Planning Office

coordinates this review, sending out a monthly summary of federal grants and actions to state and local government agencies, and forwarding comments to the appropriate federal agency.

Under Section 320 of the Clean Water Act, National Estuary Projects must conduct a consistency review. Estuary projects review any program appearing in the Catalog of Federal Domestic Assistance, which lists 1,370 federal programs administered by 52 agencies.

For the Casco Bay Estuary Project, this review entails two parts:

- A one-time review to identify and attempt to resolve possible inconsistencies between *Casco Bay Plan* goals and objectives and existing federal or federally assisted programs
- Development of a procedure for identifying and resolving inconsistencies between the *Casco Bay Plan* and future federal activities

Meeting Consistency Review Requirements

The initial survey of programs in the category of domestic assistance identified 72 programs that could be inconsistent with the *Casco Bay Plan* (see Table 10-1). When the 72 programs were reviewed to determine if they were consistent with the goals, objectives, and actions of the *Casco Bay Plan*, no inconsistencies were found. This is not surprising given the cooperative approach taken by the Casco Bay Estuary Project, which ensured that the *Plan* was developed with and reviewed by many agencies responsible for these programs. In fact, numerous federal programs could potentially support the goals, objectives, and actions of the *Plan*; therefore, successful implementation will depend on coordinating with the agencies that administer these programs.

To ensure that the federal programs remain consistent with the *Casco Bay Plan*, an ongoing review process must be established. The Casco Bay Estuary Project will request that the Maine State Planning Office send the monthly summary of federal activities to the staff member, who will review these reports and respond with comments. Staff will also contact federal agencies that might support implementing the *Plan*.

Of these 72 programs, six are not part of the state review process and will be treated under a separate review process. Five of them are U.S. Department of Agriculture programs supporting farmers and landowners. To ensure consistency with the five U.S. Department of Agriculture programs, the Casco Bay Estuary Project will coordinate directly with the local office of the Natural Resource Conservation Service and Consolidated Farm Services and review its annual work plan. This process, which continues the coordination that occurred during development of the *Casco Bay Plan*, will be formalized in a Memorandum of Agreement between the Casco Bay Estuary Project and federal Natural Resource Conservation Service and Consolidated Farm Services offices in Maine. Federal consistency will continue to be coordinated by the Maine State Planning Office.

The sixth program is the U.S. Environmental Protection Agency's construction grants program that historically funded municipal wastewater treatment plants. Since Congress is no longer funding this program, it does not require a separate review mechanism. If Congress again provides grants to communities under this authority, a review mechanism would need to be established.

The *Casco Bay Plan* and the Maine Coastal Program

Like the National Estuary Program, the Coastal Zone Management Act has a federal consistency requirement. Federal actions occurring in or affecting the coastal zone must be consistent with the enforceable policies of a state's coastal zone management program. In 1978, Maine established a coastal program and therefore has the authority to perform consistency reviews. In 1988, the National Oceanic and Atmospheric Administration and U.S. Environmental Protection Agency signed a memorandum of understanding outlining the expected relationship between the National Estuary Program and the Coastal Zone Management Program. Two parts of this document affect the relationship between the *Casco Bay Plan* and the Maine Coastal Program. The first is that the *Casco Bay Plan* will be submitted to the coastal program for a consistency review; the second is that the *Plan* should become part of the state's coastal program.

The *Casco Bay Plan* will be submitted to the Maine Coastal Program for a voluntary review. (Because the *Plan* is not considered a direct federal action, it does not require this review; however, actions taken by federal agencies to implement the *Plan* could be direct actions and would require review.) Since the Maine State Planning Office is represented on the Casco Bay Estuary Project Management Committee, it has already worked closely with Casco Bay staff to develop the *Plan*. The *Casco Bay Plan* will be incorporated into the Maine Coastal Program. This will help ensure institutional permanence for the *Plan* and support from federal coastal zone management to support implementation of the actions.

The *Casco Bay Plan* can be incorporated into the Maine Coastal Program by including the goals and objectives of the *Plan* as advisory policies to the Coastal Program. Since they do not affect the enforceable policies or constitute a significant change to the Maine Coastal Program, they will not require formal amendment of the program.

By incorporating the goals and objectives of the *Casco Bay Plan* into the Maine Coastal Program, the Maine State Planning Office would ensure that the *Plan* is incorporated into existing coastal protection efforts.

Endangered Species Act and National Historic Preservation Act Reviews

National Historic Preservation Act

Pursuant to Section 106 of the National Historic Preservation Act, U.S. Environmental Protection Agency Region I has had discussions with the Maine State Historic Preservation Officer, whose functions fall under the jurisdiction of the Maine Historic Preservation Commission. Under Section 106 of the National Historic Preservation Act, federal agencies must take into account the effects of proposed federal or federally assisted undertakings on historic properties included in, or eligible for inclusion in, the National Register of Historic Places. The National Historic Preservation Act and its implementing regulations (36 CFR Part 800) also generally provide for the federal agency or its designee to consult with the State Historic Preservation Office and, as applicable, with the Advisory Council on Historic Preservation on such undertakings. In addition, applicable state historic preservation laws and regulations must be complied with.

The U.S. Environmental Protection Agency believes that due to the nature of the activities contemplated under the *Casco Bay Plan* (i.e., public education, technical assistance, regulatory/enforcement, planning and assessment, and monitoring actions), the *Plan* will have no effect on historic properties within its scope. The State Historic Preservation Office shares this view.

Insofar as project implementation activities are concerned, it shall be the policy of the *Casco Bay Plan* that, if any federal agency implements, funds, or approves actions contemplated under this *Plan*, it shall, in accordance with Section 106 of the National Historic Preservation Act and its implementing regulations, notify the State Historic Preservation Office. In addition, if any such activities would result in effects on historic properties under this *Plan*, the federal agency shall complete Section 106 consultation prior to initiating the activity. Moreover, all entities implementing activities under the *Plan* must satisfy any applicable requirements to consult with the State Historic Preservation Office under state law.

Endangered Species Act

In addition to working with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service on the development of the *Plan*, the U.S. Environmental Protection Agency has also sought information from U.S. Fish and Wildlife and National Marine Fisheries Service regarding the presence of federally listed threatened or endangered species in the vicinity of Casco Bay. National Marine Fisheries Service has responded that the endangered shortnose

sturgeon is present in the estuarine complex of the Sheepscot, Kennebec, and Androscoggin rivers. The U.S. Fish and Wildlife Service has responded that the endangered roseate tern, the threatened bald eagle, and the threatened piping plover are present in the vicinity of the bay. The presence of these species is also discussed in Chapter 4 of this *Plan*.

Pursuant to Section 7 of the Endangered Species Act, if any federal agency authorizes, funds, or carries out an action contemplated by the *Plan* that may affect federally listed threatened or endangered species (or the designated critical habitat of such species), the federal agency must consult with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service to ensure appropriate protections are in place. In addition, federal agencies must “conference” with the Services, as appropriate under Section 7, to ensure federal activities consider potential jeopardy to species that have been proposed for listing under the Endangered Species Act but whose listing has not yet been finalized.



Table 10-1

Programs Potentially Inconsistent with the Casco Bay Plan

Catalog of Federal Domestic Assistance #	Program Title	Agency*	Subject to Review by Executive Officer	Subject to 319 Review
10.063	Agricultural Conservation Program	USDA	No	Yes
10.064	Forestry Incentives Program	USDA	No	Yes
10.068	Rural Clean Water Program	USDA	No	Yes
10.069	Conservation Reserve Program	USDA	No	Yes
10.072	Wetlands Reserve Program	USDA	No	No
10.416	Soil and Water Loans	USDA	Yes	Yes
10.664	Cooperative Forestry Assistance	USDA	Yes	Yes
10.760	Water and Waste Disposal Systems for Rural Communities	USDA	Yes	Yes
10.763	Emergency Community Water Assistance Grants	USDA	Yes	No
10.764	Resource Conservation and Development Loans	USDA	Yes	No
10.765	Watershed Protection and Flood Prevention Loans	USDA	Yes	Yes
10.766	Community Facilities Loans	USDA	Yes	No
10.768	Business and Industrial Loans	USDA	Yes	No
10.769	Rural Development Grants	USDA	Yes	No
10.770	Water and Waste Disposal Loans and Grants	USDA	Yes	No
10.854	Rural Economic Development Loans and Grants	USDA	Yes	No

Catalog of Federal Domestic Assistance #	Program Title	Agency*	Subject to Review by Executive Officer	Subject to 319 Review
10.901	Resource Conservation and Development	USDA	Yes	Yes
10.904	Watershed Protection and Flood Prevention	USDA	Yes	Yes
10.906	River Basin Surveys and Investigations	USDA	Yes	No
11.300	Economic Development - Grants for Public Works and Development Facilities	Commerce	Yes	No
11.305	Economic Development - State and Local Economic Development Planning	Commerce	Yes	No
11.405	Anadromous Fish Conservation Act Program	NOAA	Yes	Yes
11.426	Financial Assistance for Ocean Resources Conservation and Assessment Program	NOAA	Yes	No
11.427	Fisheries Development and Utilization Research and Development Grants and Cooperative Agreements Program	NOAA	Yes	No
11.429	Marine Sanctuary Program	NOAA	No	No
11.433	Marine Fisheries Initiative	NOAA	Yes	No
11.439	Marine Mammal Data Program	NOAA	Yes	No
11.463	Habitat Conservation	NOAA	Yes	No
12.100	Aquatic Plant Control	Army Corps	Yes	Yes
12.101	Beach Erosion Control Projects	Army Corps	Yes	Yes
12.104	Floodplain Management Services	Army Corps	Yes	Yes
12.106	Flood Control Projects	Army Corps	Yes	Yes

Catalog of Federal Domestic Assistance #	Program Title	Agency*	Subject to Review by Executive Officer	Subject to 319 Review
12.107	Navigation Projects	Army Corps	Yes	Yes
12.108	Snagging and Clearing for Flood Control	Army Corps	Yes	Yes
12.109	Protection, Clearing, and Straightening of Channels	Army Corps	Yes	Yes
12.110	Planning Assistance to States	Army Corps	Yes	No
12.610	Joint Land Use Studies	Army Corps	Yes	No
12.613	Growth Management Planning Assistance	Army Corps	Yes	No
14.218	Community Development Block Grants	Housing and Urban Development	Yes	No
14.244	Empowerment Zones Program	Housing and Urban Development	No	No
15.252	Abandoned Mine Land Reclamation Program	Interior	Yes	Yes
15.600	Anadromous Fish Conservation	FWS	Yes	Yes
15.605	Sport Fish Restoration	FWS	Yes	No
15.611	Wildlife Restoration	FWS	Yes	No
15.612	Endangered Species Conservation	FWS	Yes	No
15.614	Coastal Wetlands Planning, Protection, and Restoration Act	FWS	Yes	No
15.615	Cooperative Endangered Species Conservation Fund	FWS	Yes	No
15.616	Clean Vessel Act	FWS	Yes	No
15.617	Wildlife Conservation and Appreciation	FWS	Yes	No

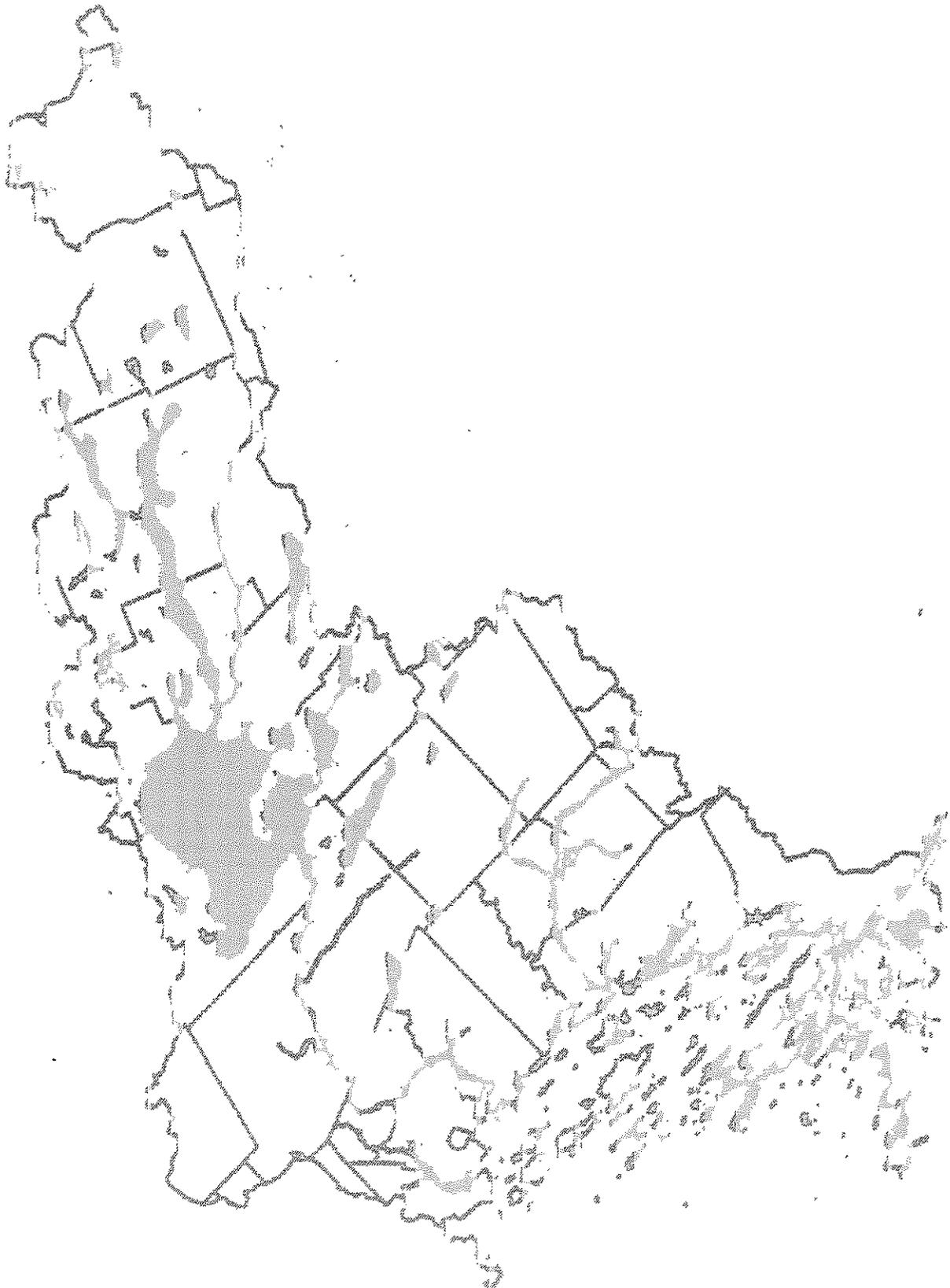
Catalog of Federal Domestic Assistance #	Program Title	Agency*	Subject to Review by Executive Officer	Subject to 319 Review
15.918	Disposal of Federal Surplus Real Property for Parks, Recreation, and Historic Monuments	National Park Service	No	No
15.919	Urban Park and Recreation Recovery Program	National Park Service	Yes	No
20.006	State Access to the Oil Spill Liability Trust Fund	Transportation	Yes	No
20.007	Bridge Alterations	Transportation	Yes	No
20.106	Airport Improvement Program	Transportation	Yes	Yes
20.205	Highway Planning and Construction	Transportation	Yes	Yes
20.219	National Recreational Trails Program	Transportation	Yes	No
20.500	Federal Transit Capital Improvement Grants	Transportation	Yes	No
20.509	Public Transportation for Non-urbanized Areas	Transportation	Yes	Yes
20.512	Federal Transit Technical Assistance	Transportation	Yes	No
20.515	State Planning and Research	Transportation	Yes	No
66.419	Water Pollution Control - State and Interstate Program Support	USEPA	Yes	No
66.433	State Underground Water Source Protection	USEPA	Yes	No
66.435	Water Pollution Control - Lake Restoration Cooperative Agreement	USEPA	Yes	No
66.454	Water Quality Management Planning	USEPA	Yes	No
66.456	National Estuary Program	USEPA	Yes	No
66.460	Nonpoint Source Implementation Grants	USEPA	Yes	No

Catalog of Federal Domestic Assistance #	Program Title	Agency*	Subject to Review by Executive Officer	Subject to 319 Review
66.461	Wetlands Protection - State Development Grants	USEPA	Yes	No
66.502	Pesticide Enforcement Program	USEPA	Yes	Yes
66.505	Water Pollution Control - Research, Development, and Demonstration	USEPA	Yes	No
66.506	Safe Drinking Water Research and Demonstration	USEPA	Yes	No
66.600	Environmental Protection Consolidated Grants - Program Support	USEPA	Yes	No
66.708	Pollution Prevention Grants Program	USEPA	Yes	No
66.802	Superfund State Sites - Specific Cooperative Agreements	USEPA	Yes	Yes
66.804	State Underground Storage Tank Program	USEPA	Yes	Yes
81.065	Nuclear Waste Disposal Siting	USEPA	Yes	Yes
83.104	Acquisition of Flood Damaged Properties	FEMA	Yes	No

***NOTES:**

- USDA = U.S. Department of Agriculture
- Commerce = U.S. Department of Commerce
- NOAA = National Oceanic and Atmospheric Administration
- Army Corps = U.S. Army Corps of Engineers
- Interior = U.S. Department of Interior
- FWS = U.S. Fish and Wildlife Service
- Transportation = U.S. Department of Transportation
- USEPA = U.S. Environmental Protection Agency
- FEMA = Federal Emergency Management Agency

NOTES



DEVELOPING THE PLAN



CASCO BAY PLAN

Having established a committee structure to encourage participation, the Casco Bay Estuary Project embarked on a five-year process to develop this Casco Bay Plan. During that period, information was gathered, ideas were presented, and disagreements were discussed.

DEVELOPING THE CASCO BAY PLAN

Introduction

Strong public involvement has been critical throughout development of the *Casco Bay Plan*. The *Plan* will only be implemented if it represents the will of the community. Recognizing this fundamental necessity at the outset, the Casco Bay Estuary Project designed a consensus-based process to involve all members of the community.

Organization

To develop a plan that reflects the interests and active participation of the community, the project established four committees: a Management Committee and three advisory committees.

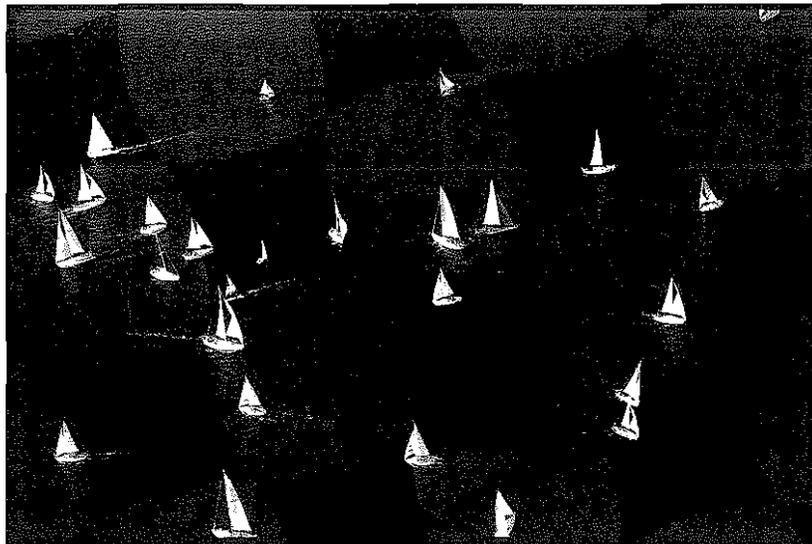
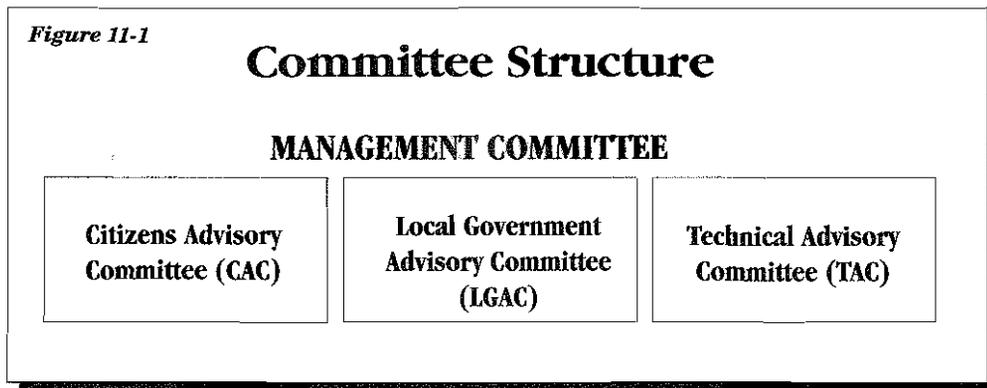


photo by Christopher Ayres

The Management Committee is responsible for overseeing the project, directing work, and developing the *Casco Bay Plan*. The other three committees — the Citizens Advisory Committee, the Technical Advisory Committee, and the Local Government Advisory Committee — provide the public, technical experts, and local governments with a strong voice in the project. Three members of each advisory committee serve on the Management Committee, along with representatives of the U.S. Environmental Protection Agency and four state agencies: Maine Departments of Environmental Protection, Marine Resources, and Economic and Community Development (formerly), and the Maine State Planning Office. This balance has encouraged discussion as the groups worked toward a shared vision for the bay.

Having established a committee structure to encourage participation, the Casco Bay Estuary Project embarked on a five-year process to develop the *Casco Bay Plan*. During that period, information was gathered, ideas were presented, and disagreements were discussed. The *Casco Bay Plan* reflects the consensus that was reached on actions needed to better protect Casco Bay.



The Process

The process to develop the *Casco Bay Plan* began in November 1990 with a public forum held in Brunswick. This forum briefed participants about Casco Bay issues and sought their views on priority concerns. The forum drew more than 120 participants and generated a list of 75 questions, potential problems, and actions.

The information generated at that forum provided the basis for the work of the project. The Management Committee began working on the issues of concern by funding research and education projects and conducting demonstration projects. For example, one common question at the forum was, “What influence does the Kennebec River have on Casco Bay?” A study was commissioned to determine the currents and flushing rates in Casco Bay, including the influence of the Kennebec River. Another common question was, “What is the extent of contamination by heavy metals and PCBs [polychlorinated biphenyls]?” A project was designed to determine contaminant levels in sediments of Casco

Bay. Information from these and other Casco Bay Estuary Project studies has demonstrated the nature and extent of certain threats and helped determine future actions.

Setting Priorities

The Management Committee recognized that to be effective it must limit the number of priority issues the project would tackle. Beginning with a list of 21 potential threats to Casco Bay, the Management Committee worked with a professional facilitator to develop ranking criteria that were used to narrow the list to five priority issues. This “short list” was discussed in April 1992 at a second public forum held in Brunswick. Despite a spring snowstorm, 40 people met to comment on the priority issues. The five priority issues agreed upon during this process are the five issues addressed by the *Plan*.

Having set the priority issues, the Management Committee developed goals and objectives for each issue. Each issue was then the subject of an “expert roundtable.” Composed of technical experts and government representatives, these groups brainstormed lists of possible actions and ranked them in order of importance. The Management Committee then used these lists to develop draft action plans for a preliminary Comprehensive Conservation and Management Plan that spelled out the work for the remaining three years of the Casco Bay Estuary Project.

Before finalizing the preliminary plan, eight focus groups were held to gather comments on the draft action plans from representatives of the following interests:

- waterfront organizations and industry
- homeowners, septage haulers, and plumbers
- fishing community, clam diggers, and marina owners and operators
- real estate and land use, including brokers and contractors
- local elected officials and planning board members
- municipal government staff
- environmental advocates
- farmers and foresters

Focus-group participants suggested changes to specific actions and advised the Management Committee to consider six overarching themes as the project continued:

- **Regulatory Overhead:** People are overwhelmed by the maze of environmental regulations.
- **Cooperative Approach:** Technical assistance and help are needed and government should be supportive.
- **Bottom-up Approach:** Broad participation in environmental policy development is necessary.
- **Economy and Taxes:** Economic value of protection and true cost of development must be demonstrated.
- **Logical Approach:** Flexibility in achieving the desired goal is wanted.
- **Public Education:** Education plays an essential role in environmental protection.

After the plan was changed to incorporate the focus groups' comments, a final public forum was held in October 1992 in Portland, where more than 60 people gave comments. These comments were incorporated in the preliminary Comprehensive Conservation and Management Plan before it was released in October 1992.

Developing the *Casco Bay Plan*

During 1994, after two years of undertaking the work outlined in the preliminary Comprehensive Conservation and Management Plan to better understand the priority issues, the staff of the Casco Bay Estuary Project began working on the *Casco Bay Plan*. The first step was the development of discussion papers on each priority issue that contained a detailed description of the problem and a range of possible actions to address it.

As with the preliminary Comprehensive Conservation and Management Plan, these were reviewed by both experts in the field and focus groups of stakeholders. Each step resulted in significant revisions of the drafts.

The focus groups for the review of these drafts consisted of representatives from:

- municipal staff and officials
- waterfront owners and businesses
- development interests
- residential interests
- environmental organizations
- rural landowners
- local boards and conservation organizations
- fishermen, lobstermen, and clambers

Several common themes emerged from the focus groups. These themes were:

- **Management Responsibility:** Who is responsible for carrying out activities should be discussed. However, there was no consensus on what approach was best.
- **Clarity:** Clearly define the problems and threats and the proposed actions to address them.
- **Develop a Vision:** Present a clear vision of what the project is trying to achieve.
- **Establish Priorities:** Clearly identify which actions are most important.
- **Specific Solutions:** Solutions should be targeted to specific problems rather than broad-brush approaches.
- **Costs:** Costs and who will incur them need to be discussed. The costs should be reasonable.
- **Existing Regulations:** The effectiveness of existing regulations must be considered.
- **Education:** Educational activities are very important to the long-term management of Casco Bay.
- **Information:** High quality information on the condition of Casco Bay is needed.

The draft action papers were rewritten to address the issues raised by the focus groups. The problems and threats were more clearly identified, the actions made more specific, and estimated costs outlined. The drafts for each priority issue were then sent to 50 different experts representing 27 different organizations and state agencies. Comments were solicited on both the accuracy of the reports and the merit of the recommendations.

Throughout this review process, the Management Committee and the Citizens Advisory Committee assessed whether the actions could be supported by interested groups, government officials, and the general public.

The revised action papers were subsequently developed into the draft *Casco Bay Plan*, which was released for a two-month public comment period in early November 1995. The draft *Plan* included more than 30 draft recommendations for action, grouped into four categories: public education, technical assistance, regulations/enforcement, and planning and assessment. Almost 90 individuals or groups provided a wide range of comments on the draft *Plan* (see *Appendix F*). Management Committee members were present at two public comment meetings on the *Plan* in early December, where a variety of supportive and constructive comments were heard. A number of commenters expressed criticism about the proposed implementation strategy; as a result, a special committee was formed to develop another implementation strategy to be taken back to the Management Committee for review and adoption (see *Chapter 9*).

Local Government Input

From the beginning of the project, the Management Committee has been cognizant of the important role of local governments in protecting Casco Bay. To ensure their input in the *Plan*, the Local Government Coordinator for the project met with local town boards, commissions, and staff to keep them informed and to solicit their comments. Local experience with five priority issues strongly influenced the actions being proposed.

In February 1995, the Casco Bay Estuary Project met with elected officials from the 12 communities abutting the bay to obtain feedback on the *Plan* and to discuss how best to reach elected officials. Officials encouraged staff to continue meeting with their municipal boards and staff to gather comments on the proposed actions.

Lecture Series

To provide the public with more information on the *Plan's* proposed actions, the Casco Bay Estuary Project sponsored a series of public lectures in 1994 and 1995. For example, in Brunswick in the spring of 1995, Chris Heinig of MER Assessment Corp. presented the results of his study on the economic analysis of the bay's soft-shell clam industry, and the Town of Harpswell discussed how project grant money was used to successfully reopen polluted clam flats. In South Portland, researchers from Horsley & Witten, Inc., demonstrated how their computer model of nutrient-loading in Brunswick's Maquoit Bay can be used to predict land use impacts on water quality in similar sensitive embayments. Dufresne-Henry, Inc., presented case studies demonstrating the cost-effectiveness of best management practices. Following each presentation, comments were solicited on the draft actions.

Long-Term Management

Since the beginning of the Casco Bay Estuary Project, the recurrent question has been, "Who will be responsible for making sure the actions are completed and the work to improve the bay's health continues?" To address this question, the project has undertaken a number of studies and activities. In 1990, the project commissioned a study entitled *Review of Water Quality Planning Programs Relative to Casco Bay* (Metcalf and Eddy, Inc.). This study reviewed resource protection programs in Maine to determine what worked and what didn't.

*Who will be
responsible for
making sure the
actions are
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continues?*

The Regulation and Management of Casco Bay was a study done by the Marine Law Institute at the University of Southern Maine to review the existing regulatory framework and long-term management options for Casco Bay. In addition to analyzing the existing regulatory framework, it examined management options in use in other areas for lessons helpful to the Casco Bay Estuary Project.

The study identified a number of critical factors regarding regional options. They included the need to determine the adequacy of existing mechanisms to manage critical resources, work in support of existing programs at local levels, determine which functions are needed (e.g., regulatory and planning), and having local support and local representation on such an entity.

In 1994 Charles Colgan, Ph.D., of the University of Southern Maine, developed a paper to facilitate discussion of management options available to the project. *Options for a Management System for the Casco Bay Estuary: A Discussion Paper* examined various management options and presented a range of choices from a decentralized network to a centralized regional management authority. It examined each option in terms of its effectiveness, relative cost, how it used existing resources, its ability to provide for good information flow, and its perceived political acceptability.

The paper did not draw any conclusions. However, valuable lessons were learned from two public forums held in November 1994 to discuss the options. The 150 people who attended these forums, including local government officials, business owners, industry leaders, fish harvesters, farmers, environmentalists, and concerned citizens, discussed both their concerns with regional approaches and the advantages of such an approach.

The major concerns with a regional management approach included loss of local control, adding additional layers of government, duplicating existing efforts, costs of funding a new agency, and political acceptability. Advantages of such an approach included more effective and efficient protection of the bay's resources, improved exchange of information, and better coordination of technical assistance and permitting.

No public consensus was reached on how best to manage Casco Bay. However, the Management Committee considered all comments when crafting the implementation section of the *Plan*.

Public Outreach Activities

In every focus group, forum, and meeting, the need to educate citizens about the health of Casco Bay has stood out as a consistent theme. Throughout the project, public education and information efforts have played a significant role, with the Citizens Advisory Committee developing methods to raise awareness about Casco Bay. Major ongoing outreach has been achieved through the following:

Newsletter. *Currents*, the quarterly newsletter of the Casco Bay Estuary Project, provides information on bay issues, scientific studies, and project initiatives to a circulation of more than 4,000. This popular newsletter has helped publicize the events and projects of other organizations involved in protecting the watershed and bay.

Fact Sheets. Because scientific reports are often difficult to understand, the Casco Bay Estuary Project develops fact sheets to communicate results of scientific study results to the general public. Fact sheets have been used to provide homeowners and boaters with tips on pollution prevention, explain nonpoint-source pollution, and summarize a study on historic sources of pollution in Portland Harbor.

Portable Information Display. A portable display with information on the project and *Casco Bay Plan* has been used to engage the public at Earth Day, trade shows, fairs, and special events.

Publication Series. The Casco Bay Estuary Project has produced more than 25 studies and reports that inform the public about technical, economic, and management issues related to the bay (see *Appendix A*). Each publication has been widely distributed through regional and local libraries and made available to the public upon request.

Speaking Engagements. Numerous presentations, using a slide show and video on bay protection, have been made to conservation and civic organizations and local governments throughout the Casco Bay area.

Public Service Announcements. A professionally produced, 30-second advertising spot was developed for the Casco Bay Estuary Project and now appears on commercial television. A longer 15-minute video prepared for the project has been aired on many local-access cable television channels throughout the watershed. A Channel 6 “Color Me Green” segment featured what homeowners can do to protect Casco Bay.

Public Lecture Series. To make scientific information accessible to the public, the Casco Bay Estuary Project has sponsored an ongoing public lecture series to share new information. In 1994, environmental historian Edward Hawes discussed his study, *Historic Sources of Pollution in Portland Harbor*; Texas A&M scientist Terry Wade presented results of a toxic pollution study of bay sediments; and University of Maine researchers presented a computer model demonstrating how water circulates in Casco Bay.

Aucocisco: A Celebration of Maine’s Casco Bay Region. *Aucocisco* (“great mud flat”) is what the Abenaki people, who inhabited Casco Bay prior to European settlement, called the area. At the request of the Portland Downtown District, the Casco Bay Estuary Project helped organize several events, including a “Bay Day” (a day-long series of lectures on marine issues) and highly popular educational boat tours. This important event offers Maine nonprofit organizations a chance to demonstrate the interrelationship of the bay’s natural resources and economy.

Posters. Two posters were produced for the general public to raise awareness about the project and to provide educational information about the Casco Bay watershed.

Boat Tours. Educational boat tours for the public were held in conjunction with Maine Audubon Society's educational programs, and as part of "Aucocisco: A Celebration of Maine's Casco Bay Region." Project staff and volunteer naturalists from Maine Audubon Society and U.S. Fish and Wildlife Service's Gulf of Maine Project talked about the bay's important resources and pollution threats.

Grants

Providing real-life examples of successful environmental protection has been a vital tool of the Casco Bay Estuary Project. The project established a grant program to make funds available for towns and nonprofit organizations to use in solving local environmental problems.

The grants, while small in financial terms, successfully capitalized on the vast creativity and enthusiasm of local groups. In each instance, local involvement increased understanding of community impacts on the natural environment. The local contribution to these "matching" grants was often exceeded by financial gain from the project (e.g., when a project identified and removed pollution sources, enabling clam flats to be reopened). A summary of grants appears in Appendix D, with highlights of some grants outlined here.

The Highland Lake Association used funds to establish a water quality monitoring program that tracks clarity and dissolved oxygen through a twice-monthly sampling program. This volunteer group purchased equipment and supplies and developed a quality assurance plan to ensure accurate monitoring. They then surveyed residents in the lake watershed about homeowner practices that affect water quality. A newsletter informs watershed residents about water quality sampling results, and informs them how to safeguard water quality. Another grant was provided to the nonprofit Presumpscot River Watch to purchase equipment and supplies and produce a training video.

Eco-Links used a Casco Bay Estuary Project grant to start a recycling program for waste oil from marine users, placing oil-collection storage tanks and recycling containers in Brunswick and Portland and educating recreational boaters about proper disposal of solid waste, waste oil, and human waste.

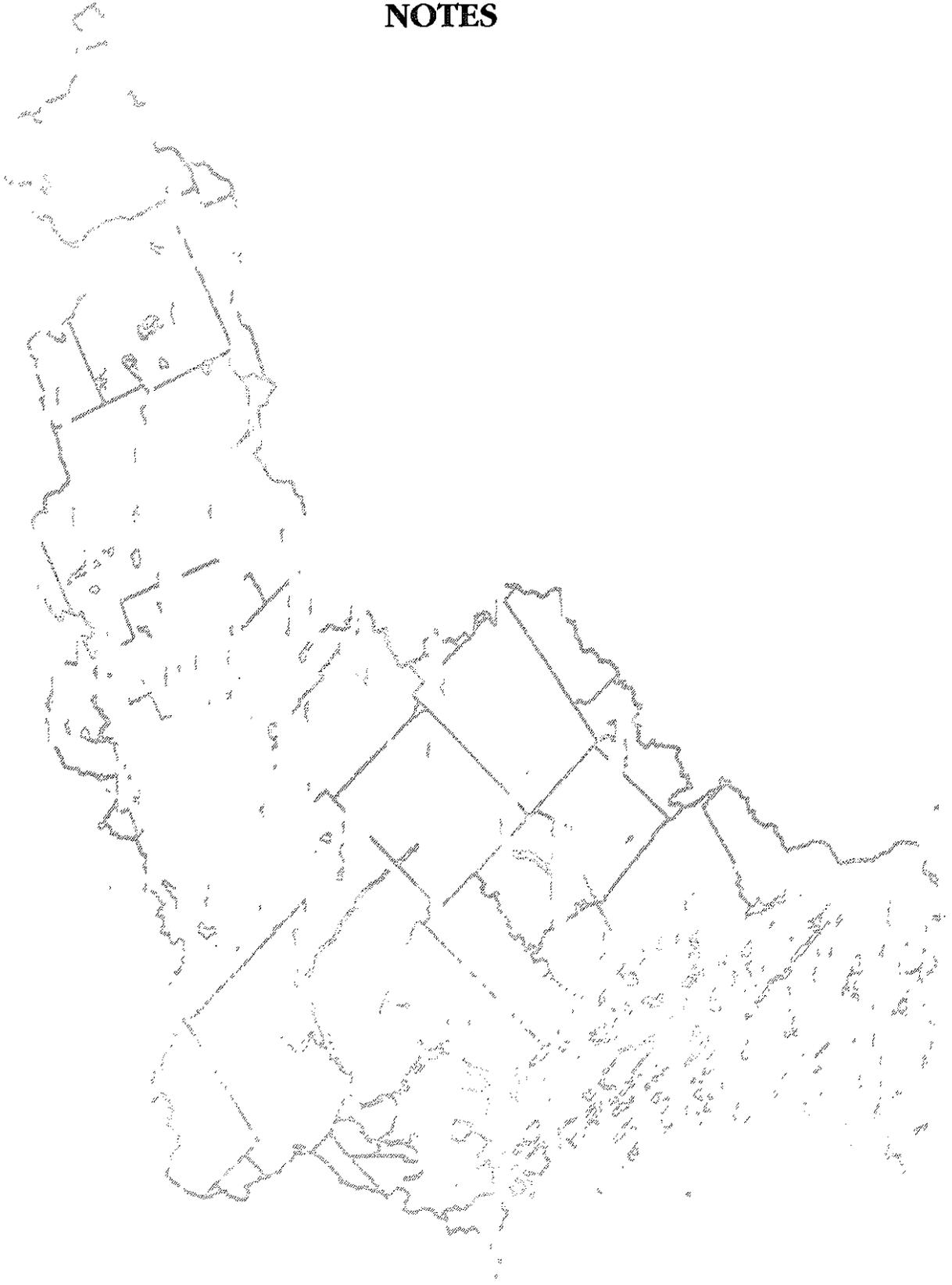
A grant awarded to the Maine Island Trail Association has helped it address the growing need to inform island visitors about the fragility of island ecosystems and the importance of low-impact use. The project grant was used to create an educational brochure and 42 signs to be placed on six Casco Bay islands to explain low-impact island use techniques for visitors.

Municipalities in Casco Bay can play a significant role in protecting the health of the bay and improving water quality. Towns play a critical role in determining land use, which can affect water quality and determine the status of clam flats.

The Town of Cumberland used a project grant to conduct local shellfish resource surveys and begin water quality monitoring, training volunteers to administer shellfish resource surveys and identify shoreline pollution sources. As a result of this work, the Maine Department of Marine Resources has reopened for harvesting two productive flats that were closed for many years. A similar success story occurred in Freeport, where more than 70 percent of the town's clam flats were either permanently or conditionally closed due to pollution. Limited water quality sampling indicated that malfunctioning septic systems could be contributing bacteria to waters feeding into the Harraseeket River and Casco Bay. A pollution source identification study sampled 41 sites for suspected pollution, and pollution sources were subsequently identified and eliminated in all but three cases.

Stormwater management is a growing concern for communities as more land area in the watershed becomes developed. A grant to the Town of Falmouth enabled production of a practical, educational guide to watershed planning for town residents, using local examples of poor watershed planning that resulted in costly damage to property owners and the town. The guide recommends improvements in watershed management that property owners can make, and provides an overview of the regulatory process. The guide's unique approach of using local examples to highlight watershed problems won the project two awards: one from the Maine Association of Planners and another from the Northern New England Chapter of the American Planning Association.

NOTES



Glossary

Bibliography

Appendices:

Appendix A: *Further Reading: Information and Study Reports Funded by the Casco Bay Estuary Project*

Appendix B: *State of Maine Water Quality Standards*

Appendix C: *About the National Estuary Program*

Appendix D: *Summary of Grant Projects Funded by the Casco Bay Estuary Project*

Appendix E: *Committee Participation in the Casco Bay Estuary Project*

Appendix F: *Summary of Public Comments on the Draft Casco Bay Plan*

Appendix G: *Commitment Letters*



CASCO BAY PLAN

GLOSSARY

A

algae bloom (or algal blooms): A growth of algae resulting from excessive nutrient levels or other physical and chemical conditions that enable algae to reproduce rapidly.

amphibians: Members of the vertebrate (with backbones) class Amphibia, including frogs, toads, newts, and salamanders, that usually begin life in the water as tadpoles with gills and later develop lungs.

amphipods: Small shrimp-like crustaceans such as sand fleas and related forms. Most live on the bottom (*i.e.*, are benthic) and feed on algae or detritus.

anadromous fish: A species, such as salmon, alewives, smelt, and shad, that is born in fresh water, spends a large part of its life in the sea, and returns to freshwater rivers and streams to mate and give birth (*i.e.*, spawn).

B

baseline study: A study that documents the existing state of an environment to serve as a measure against which future measures are compared and assessed.

benthic: Living in or on the bottom of a body of water.

benthos: Collectively, all organisms living in, on, or near the bottom substrate in aquatic habitats.

best management practices: Techniques to reduce nonpoint-source impacts from construction, agriculture, timber harvesting, marinas, and stormwater. Manuals describing these techniques (stormwater and marinas) have been developed by the State of Maine.

bioaccumulation: The process by which a contaminant accumulates in the tissues of an individual organism.

butyltin: A chemical that is the sum of tetrabutyltin (4BT), tributyltin (TBT), dibutyltin (DBT), and monobutyltin (MBT). 4BT has been detected in shipyards, probably from paint chips. TBT is used in marine paints to prevent fouling by marine invertebrates (*e.g.*, barnacles and mussels). DBT and MBT are the degradation products of TBT. Butyltins have been found to have negative impacts on marine organisms and their use has been limited to larger vessels since 1989.

C

carcinogenic: Capable of causing cancer.

channelization: The formation of a passage for stormwater runoff or the straightening of streams or waterways that can result in flooding, reduction of groundwater discharge, alteration of stream flows, changes in water temperatures and salinities, and increased erosion – all of which impact habitats.

chlordane: A chlorinated organic insecticide (pesticide) having both stomach poison and fumigant properties. Like DDT, it has a high degree of persistence in the environment and a tendency to be concentrated in the food chain. The U.S. Environmental Protection Agency banned its use in 1988.

cocktail effect: A slang term for the property of some toxic contaminants to become more toxic when combined with other toxic materials. The sum of two materials can be more toxic than each individually.

combined sewer overflow: A pipe that, during storms, may discharge untreated sewage and stormwater. The overflow occurs because the sewage treatment plant does not have the capacity to treat the increased flow caused by stormwater runoff.

contaminant: A substance that is not naturally present in the environment or is present in amounts that can, in sufficient concentrations, adversely affect the environment.

crustaceans: Invertebrates (animals without backbones) of the phylum Arthropoda, including amphipods, shrimps, crabs, copepods, barnacles, and other animals that have segmented bodies, jointed legs, and hard external shells.

cumulative effect: The combined environmental impacts that accrue over time and space from a series of similar or related individual actions, contaminants, or projects. Although each action may seem to have a negligible impact, the combined effect can be severe.

D

DDD: See DDT.

DDE: See DDT.

DDT (dichloro-diphenyl-trichloroethane): The first chlorinated hydrocarbon insecticide (pesticide). Collects in the fatty tissue of some animals and was responsible for eggshell-thinning and reproductive failure in eagles. The U.S. Environmental Protection Agency banned registration and interstate sale in 1972 because of its persistence in the environment and accumulation in the food chain. In the environment, DDT breaks down to form DDD and DDE, which are also toxic. DDT is still produced in many countries, including Mexico.

dioxin: See PCDD/PCDF.

dredged material: Sediments or other material removed from the bottom of a waterway, usually for navigation or docking purposes.

E

ecosystem: The interacting system of living organisms with one another and their physical environment.

“ecosystem management” (as used in this *Plan*): An approach to environmental management that takes into account the interrelatedness of a system’s physical, chemical, and biological components.

eelgrass (*Zostera marina*): A marine flowering plant that grows on intertidal and shallow subtidal sand or mudflats.

effluent: Waste material discharged into the environment.

erosion: Wearing away of rock or soil by the gradual detachment of soil or rock fragments by water, wind, ice, and other mechanical and chemical forces. Human activities can greatly speed this detachment.

estuary: A semi-enclosed coastal body of water having a free connection with the open sea and within which seawater is measurably diluted with fresh water.

“eutrophication” (as used in this *Plan*): The uncontrolled growth of nuisance algae that can indirectly deplete oxygen and kill marine life. This growth is caused by the excessive inputs of nutrients such as nitrogen.

F

food chain: The chain of organisms, existing in any natural community, through which energy is transferred. Each link in the chain feeds on and obtains energy from the one preceding it and, in turn, is eaten by and provides energy for the one following it (*e.g.*, a worm feeds on microscopic plants, the worm is eaten by a fish, and the fish is eaten by a seal).

furan: See PCDD/PCDF.

H

habitat: Places where plants and animals live, feed, find shelter, and reproduce.

hydrologic cycle: The continual cycling of water between the land, the sea, and the atmosphere through evaporation, condensation, precipitation, absorption into the soil, and stream or river runoff.

I

impervious surface: A surface, such as a roof or pavement, that cannot be easily penetrated by water.

indicator organism: Something that is used to assess water or habitat quality. For example, fecal coliform bacteria have been used to indicate the presence of pathogens that are harmful to humans; however, these bacteria are found in the intestinal tract of all mammals, not just humans.

intertidal: Areas between high tide and low tide that are alternately exposed to seawater and air. Extreme high and low tides occur periodically (depending on the phase of the moon and time of year) and are considered intertidal in this *Plan*.

L

leach: Washing from a solid material (*e.g.*, metals wash from rocks and minerals into the environment).

leach field: Part of a septic system. The area where the liquid (effluent) from the septic tank is dispersed into the soil.

M

marine invertebrates: Animals without backbones that live in salt water, including clams, amphipods, lobsters, sandworms, starfish, and sea urchins.

metals or heavy metals: A group of elements found in rocks and minerals that are naturally released to the environment by erosion, as well as generated by human activities. Certain metals, such as mercury, lead, zinc, and cadmium, are of environmental concern because they are released into the environment in excessive amounts by human activity and can produce toxic effects.

mollusks: An aquatic invertebrate (without a backbone) animal of the phylum Mollusca. Mollusks, such as clams, mussels, and snails, have an outside protective shell.

N

nitrogen: A nutrient required for plant growth, often present in limited supply in the ocean during the growth season. Nitrogen is present as organic nitrogen or in the inorganic forms of ammonia, nitrite, and nitrate. The inorganic forms are available to marine plants, while most other forms of organic nitrogen must be broken down by bacteria before they can be used for plant growth.

nonpoint source: An indirect discharge, not from a pipe or other specific source, usually as a result of stormwater runoff.

nutrients: Essential chemicals needed by plants and animals for growth. Enriched nutrient loads from sewage, land runoff, and atmospheric deposition can result in excessive growth of algae and lead to degradation of water quality. Nitrogen is generally the nutrient of concern in salt water.

O

organic chemicals: A bonded form of carbon, hydrogen, and other atoms. Many occur naturally and several hundred thousand have been developed by chemists for use in oils, paints, pesticides, cleaners, solvents, insulation, and fire retardants. They are generally slow to break down in the environment.

overboard discharges: Discharges into a water body from overboard discharge units (or systems). These units were designed to treat wastes from households and small commercial operations such as restaurants. Overboard discharge units have mechanical or sand filter treatment followed by chlorination.

oxygen (or dissolved oxygen): Oxygen that is present in water and therefore available for fish and other aquatic animals to use. If the amount of dissolved oxygen is too low, then aquatic animals may become stressed or die.

P

PAHs or polynuclear (or polycyclic) aromatic hydrocarbons: A class of complex organic chemicals, some of which are persistent and cancer-causing. Many of these compounds are formed from the combustion of fossil fuels such as coal and oil. They are discharged from smokestacks, chimneys, and car exhausts. Also, oil spills and other fuel discharges contain PAHs.

pathogen: An agent such as a virus, bacterium, or fungus that can cause diseases in humans.

PCBs or polychlorinated biphenyls: A group of manufactured chemicals including about 70 different but closely related compounds made up of carbon, hydrogen, and chlorine. If released to the environment, they persist for long periods and can accumulate in the tissues of organisms. PCBs are suspected of causing cancer in humans and their manufacture was banned in 1979.

PCDD/PCDF or polychlorinated dibenzo-dioxins and polychlorinated dibenzo furans (dioxins/furans): Chemicals that are by-products of many processes that include chlorination steps. Paper mills, wood treatment facilities that use the chemical pentachlorophenol, steel mills, incinerators, and other combustion processes are some of the potential sources

of PCDD/PCDF in the environment. Environmental loadings are sometimes associated with high levels of other environmental contaminants such as planar PCBs.

pesticides: Pesticides include herbicides, insecticides, fungicides, and rodenticides that are used to control unwanted plants, insects, fungi, or rodents, respectively. Most of these chemicals are manufactured and are not found naturally in the environment.

planar PCBs: Three forms (congeners) of PCBs (PCB77, PCB126, and PCB169) that have been found to be the most toxic of the many compounds (congeners) that make up total PCBs, even though they are often present in lower concentrations than the other PCB forms (congeners).

plankton: Those organisms free-floating or drifting in the open water having their movements largely determined by the motion of the water. Zooplankton refers to planktonic animals and phytoplankton refers to planktonic plants, both of which are usually microscopic. These organisms are an extremely important food source for animals.

plumbing code or the Maine Subsurface Wastewater Disposal Rules: A document developed by the Maine Department of Human Services that specifies design and construction standards for all subsurface (*i.e.*, underground) sewage disposal systems. Municipal licensed plumbing inspectors are required to enforce the rules.

point source: Any confined and discrete conveyance (usually a pipe) from which pollutants are or may be discharged into a watershed.

R

remediation: Treatment of contaminated sediments so that the sediments are no longer toxic.

runoff: That part of precipitation, snowmelt, or irrigation water that runs off the land into water bodies. It can carry pollutants from the air and land into the water body.

S

sanitary survey: A survey that includes a shoreline survey, water quality sampling, and an evaluation of physical influences used by the Maine Department of Marine Resources to determine how a shellfish area should be classified (see shellfish classification).

seeding clam flats: Moving tiny clams from a flat that has an abundance of young clams to another flat that appears to have limited numbers of clams to increase commercial clam production.

septic system: An individual sewage treatment system that typically includes a septic tank and leach field that are buried in the ground. The septic tank allows sludge to settle to the bottom and a scum of fats, greases, and other lightweight materials to rise to the top. The remaining liquid flows to the leach field where it is dispersed over soil in order to reduce the number of bacteria and viruses.

settlement: The transition from a developmental stage where animals are carried by ocean currents to a stage where the animal takes up residence on a bottom substrate (*e.g.*, a clam flat). Many benthic marine animals spend their early life stages being carried about by currents as part of the plankton.

shellfish classification: Categories for shellfish areas determined by the Maine Department of Marine Resources based on the results of a sanitary survey. The categories include approved (open), conditionally approved, restricted, conditionally restricted, and prohibited (closed to shellfish harvesting).

shellfish ordinances: Municipal ordinances (laws) that manage shellfish resources (*e.g.*, licensing and conservation closures) within a municipality. These ordinances must follow Maine Department of Marine Resources guidelines and receive its approval.

stormwater runoff: Runoff caused by rain or snow storms.

straight pipes: Pipes that carry untreated household sewage from sinks, toilets, showers, washing machines, and dishwashers from a residence to a water body.

subtidal: Areas that are always beneath salt water.

T

toxic: Poisonous, carcinogenic, or otherwise directly harmful to life.

V

vernal pools: Wetlands that hold standing water for several months in the spring and early summer and provide important breeding sites for amphibians.

W

watershed: The geographic region within which water drains into a particular river, stream, or body of water. A watershed includes hills, lowlands, and the body of water into which the land drains. Watershed boundaries are defined by the ridges of land separating watersheds.

wetlands (as used in this *Plan*): Includes all areas that are associated with water, including forested wetlands (or wooded swamps), freshwater and saltwater marshes (of any size), rivers, streams, intermittent streams, vernal pools, intertidal areas of all types, and subtidal areas.

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APPENDIX A

Further Reading: Information and Study Reports Funded by the Casco Bay Estuary Project

All titles listed here may be seen at the Casco Bay Estuary Project's office at 312 Canco Road, Portland, Maine 04103, tel. (207) 828-1043. Many titles are also in area libraries.

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APPENDIX B

State of Maine Water Quality Standards

All of the state's fresh and marine waters are classified by the Maine Legislature based on the types of uses that citizens can enjoy on or in these waters. If a discharge would violate state water quality standards by lowering the existing quality of any water body, a license may not be issued by the U.S. Environmental Protection Agency or the Maine Department of Environmental Protection.

Standards are waived only if the Maine Department of Environmental Protection finds that a discharge is necessary to achieve important economic or social benefits, and that no reasonable alternative exists. Discharges into the waters also must comply with the state's anti-degradation policy, adopted under the Clean Water Act, which requires that discharges have no significant adverse impacts on wildlife or on their habitat, and recreational and commercial water uses.

Marine Water Quality Standards

Marine waters are classified as SA, SB, or SC; SA being the highest in quality and SC being the lowest. Each class is defined by specific water quality standards that help determine whether the water is suitable for desired uses such as swimming or fishing. This assessment is made by testing water quality indicators, including levels of dissolved oxygen and bacteria.

Dissolved Oxygen

Dissolved oxygen is one of the best indicators of overall water quality. Because plants and animals require oxygen for respiration, low levels of dissolved oxygen in water bodies can severely stress or kill marine and aquatic life. When the dissolved oxygen level falls below a certain threshold (which varies for each plant and animal species), the marine or organic life must move or perish.

Bacteria

Bacteria are a natural component of marine and aquatic food webs, but human activities can add excess or pathogenic (disease-causing) bacteria and viruses. Certain types of bacteria pose a risk to public health from swimming or other water contact or consumption of shellfish. Fecal coliform, bacteria found in the intestines of humans and other warm-blooded animals, is used as an

“indicator” to assess water quality. While the bacteria themselves are not pathogenic, they indicate the presence of fecal material that may contain disease-causing bacteria or viruses.

Fecal coliform bacteria are the indicator species used to determine water quality in shellfish areas, while *Enterococci* bacteria are measured in swimming areas.

The following table outlines the uses appropriate to each marine water class and the levels of dissolved oxygen and bacteria specified for each class.

**Designated Uses and Standards within Maine’s Water Quality
Classifications of Estuarine and Marine Waters**

Class SA: Recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, navigation, and a natural and free-flowing habitat for fish and other estuarine and marine life.

Dissolved Oxygen: As naturally occurs

Bacteria (fecal coliform – shellfish areas): As naturally occurs

Bacteria (*Enterococci* – swimming areas): As naturally occurs

Class SB: Recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, navigation, and an unimpaired habitat for fish and other estuarine and marine life.

Dissolved Oxygen: 85 percent of saturation

Bacteria (fecal coliform – shellfish areas): No levels that would cause closure of shellfish areas

Bacteria (*Enterococci* – swimming areas): 8/100 milliliters
(5/15 - 9/30)

Class SC: Recreation in and on the water, fishing, aquaculture, propagation and harvesting of shellfish, navigation, and a habitat for fish and other estuarine and marine life.

Dissolved Oxygen: 70 percent of saturation

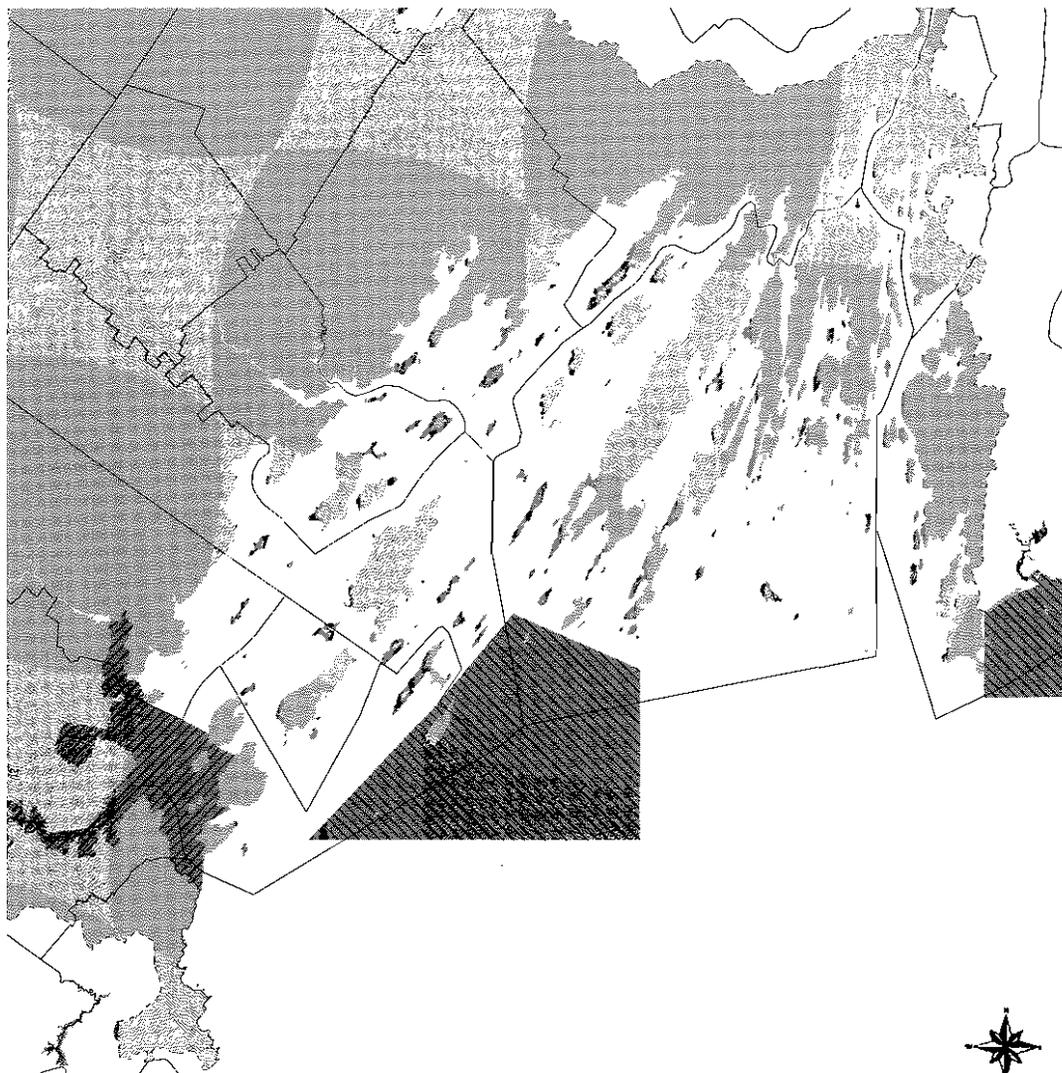
Bacteria (fecal coliform – shellfish areas): No levels that would prevent shellfish propagation

Bacteria (*Enterococci* – swimming areas): 14/100 milliliters
(5/15 - 9/30)

A map of the classification for water quality in Casco Bay follows. (A similar classification system applies to Maine’s lakes, rivers, and streams.) Additional information on the state’s marine and estuarine water classification system can be obtained from:

Bureau of Water Quality
Maine Department
of Environmental Protection
State House Station 17
Augusta, ME 04333-0017

Estuarine and Marine Waters Water Quality Classifications



SA DISTRICT
SB DISTRICT
SC DISTRICT

Maine's rivers have a separate classification from marine waters. They are classified as A, B, or C, as described below:

**Designated Uses and Standards within Maine's
Water Quality Classifications of Riverine Waters**

Class AA: Drinking water supply, recreation in and on the water, fishing, navigation, and a natural and free-flowing habitat for fish and other aquatic life.

Aquatic Life: As naturally occurs

Dissolved Oxygen: As naturally occurs

Bacteria (*Esterichia coli*): As naturally occurs

Class A: Drinking water supply, recreation in and on the water, fishing, industrial process and cooling water supply, hydroelectric power generation, navigation, and a natural habitat for fish and other aquatic life.

Aquatic Life: As naturally occurs

Dissolved Oxygen: As naturally occurs

Bacteria (*Esterichia coli*): As naturally occurs

Class B: Drinking water supply, recreation in and on the water, fishing, industrial process and cooling water supply, hydroelectric power generation, navigation, and an unimpaired habitat for fish and other aquatic life.

Aquatic Life: Habitat shall be unimpaired

Dissolved Oxygen: Not less than 7 parts per million or 75 percent of saturation, whichever is higher, except 10/1 - 5/14 when 7-day mean must be at least 9.5 parts per million and the 1-day mean must be at least 8 parts per million.

Bacteria (*Esterichia coli*): May not exceed a geometric mean of 64/100 milliliters or an instantaneous level of 427/100 milliliters (5/15 - 9/30)

Class C: Drinking water supply, recreation in and on the water, fishing, industrial process and cooling water supply, hydroelectric power generation, navigation, and habitat for fish and other aquatic life.

Aquatic Life: Habitat shall be suitable

Dissolved Oxygen: Not less than 6 parts per million or 60 percent saturation, whichever is higher

Bacteria (*Esterichia coli*): May not exceed a geometric mean of 142/100 milliliters or an instantaneous level of 949/100 milliliters (5/15 - 9/30)

APPENDIX C

About the National Estuary Program

Public alarm over deteriorating environmental conditions in estuaries nationwide prompted formation of the National Estuary Program in 1987. Part of the Clean Water Act, the program protects significant estuaries threatened by pollution, development, or overuse. Estuaries are particularly at risk because almost half the nation's population lives in coastal areas, and these communities are growing three times faster than anywhere else. While supporting economic and recreational activities, the National Estuary Program (which is administered by the U.S. Environmental Protection Agency) seeks to protect and restore the health of estuaries. To date, 28 estuaries nationwide have been admitted to the program and are demonstrating practical and innovative ways to revitalize and protect estuary ecosystems.

Estuary Programs as of July 1996:

- New York-New Jersey Harbor, New York and New Jersey
- Long Island Sound, Connecticut and New York
- Peconic Bay, New York
- Narragansett Bay, Rhode Island
- Buzzards Bay, Massachusetts
- San Juan Bay Estuary System, Puerto Rico
- Casco Bay, Maine
- Mobile Bay, Alabama
- Morro Bay, California
- Charlotte Harbor, Florida
- Maryland Coastal Bays, Maryland
- New Hampshire Estuaries, New Hampshire
- Puget Sound, Washington
- Tillamook Bay, Oregon
- San Francisco Estuary, California
- Santa Monica Bay, California
- Corpus Christi Bay, Texas
- Galveston Bay, Texas
- Barataria-Terrebonne Estuarine Complex, Louisiana
- Tampa Bay, Florida
- Sarasota Bay, Florida
- Indian River Lagoon, Florida
- Albemarle-Pamlico Sounds, North Carolina
- Delaware Inland Bays, Delaware
- Delaware Estuary, Delaware, New Jersey, and Pennsylvania
- Barnegat Bay, New Jersey
- Columbia River, Oregon and Washington
- Massachusetts Bays, Massachusetts

A major benefit of the program is that it brings communities together to decide the future of their own estuaries. Each project includes representation by citizens, town officials, business leaders, educators, researchers, and government agencies. Each program identifies its estuary's problems, recommends solutions, and makes financial commitments in a Comprehensive Conservation Management Plan (called, in this case, the *Casco Bay Plan*). The plan is a blueprint for revitalizing the estuary and ensuring its future health.

APPENDIX D

Summary of Grant Projects Funded by the Casco Bay Estuary Project

MUNICIPAL GRANTS

Town of Brunswick - Coastal Protection Zone Homeowner's Manual

In 1991, the Town of Brunswick adopted a progressive Coastal Protection Zone Ordinance to protect marine resources and reduce nitrogen loading into two of the town's embayments, Maquoit and Middle bays, which have extensive soft-shell clam resources threatened by residential and agricultural development. The Bays Committee, an active citizen's group, developed a homeowner's handbook to educate the more than 600 residents living in the Coastal Protection Zone. The handbook, *Why the Grass is Always Greener Over the Septic Tank and Other Facts of Life*, was drafted and illustrated by the Committee to explain provisions of the new ordinance and their environmental rationale. It also provides suggestions for how homeowners can reduce pollutant and nutrient-loading into the bays. The handbook was mailed to each property owner within the new Coastal Protection Zone.

Casco Bay Estuary Project Grant: \$4,500

Local Contribution: \$5,190 of Committee and staff time

Town of Cape Elizabeth - Greenbelt Interpretative Signs

The project developed another link of the town-wide greenbelt system by building a half-mile pedestrian trail around a portion of Great Pond and an associated high-value wetland, with interpretative signage explaining wetland ecology and native wildlife. The trail helps residents learn about the value of wetlands and experience the benefits of their protection firsthand.

Casco Bay Estuary Project Grant: \$1,500

Local Contribution: \$1,764 cash; \$4,911 donated expertise

Town of Cape Elizabeth - Town Center Stormwater Management Plan Project

The Cape Elizabeth Town Center Planning Committee had identified the need to develop and implement a stormwater management plan for the 200-acre Town Center. The Town Center is a compact developed area with a typical mix of urban uses: school complex, shopping center, residential development, business district, and municipal facilities. The goal of the plan is to improve the quality of the stormwater flowing from the area despite the site constraints that limit the use of natural treatment systems (*e.g.*, wet ponds and vegetative buffers).

The stormwater management plan proposes a multi-pronged approach:

(1) increased use of municipal best management practices such as regular street sweeping, catch-basin cleaning, and public education on proper use of fertilizers, pesticides, and hazardous materials; (2) infrastructure improvements to alleviate capacity limitations; (3) reduction in erosion potential; and (4) development of a mechanical treatment system to remove oils and sediments as pre-discharge treatment.

Casco Bay Estuary Project Grant: \$12,000

Local Contribution: \$4,238

Town of Cumberland - Shellfish Resource Survey and Water Quality Monitoring

Cumberland has only recreational clamming, but many clam flats that have been polluted or depleted now have healthy populations that could support a viable commercial fishery. Due to state budget cuts, the water quality monitoring program necessary to maintain or reopen commercial clam flats has fallen to the town. With this grant, the town established a shellfish management program staffed by trained volunteers who conduct shellfish resource and shoreline pollution source surveys. As a direct result of their work, the Maine Department of Marine Resources has reopened for harvesting two productive flats that were closed for many years.

Casco Bay Estuary Project Grant: \$1,372

Local Contribution: \$960 (Town staff plus uncounted hours of volunteer time to conduct sampling and survey work)

Town of Durham - Runaround Pond Study

The Conservation Commission was concerned about phosphorus-loading and algal blooms in Runaround Pond, which was created by a dam built in the 1800s to provide power to a gristmill. The dam now shows signs of failure that could drain the pond and threaten the survival of its aquatic habitats. A study was conducted to assess engineering of the dam, collect stream baseline flow and water quality data, conduct biological surveys, inventory recreational and scenic values, and recommend zoning changes to protect the resource. The study

process and results provided an excellent opportunity for public education (using a video and other means) on the value and benefits of the pond area. While zoning changes have not yet been enacted, residents did support establishment of a pond watershed "protection area."

Casco Bay Estuary Project Grant: \$3,750

Local Contribution: \$1,251 in cash and town staff time. In addition, the Conservation Commission and others contributed time and equipment to develop a videotape about Runaround Pond.

Town of Falmouth - Watershed Management Plan

The project produced a practical, educational guide to watershed planning for town residents using local examples of poor watershed planning that resulted in costly damages for property owners and the town. The guide recommends improvements in watershed management that property owners can make and provides an overview of the regulatory process. The guide's unique approach of using local examples to highlight watershed problems won the project two publication awards from the Maine Association of Planners and the Northern New England Chapter of the American Planning Association.

Casco Bay Estuary Project Grant: \$10,000

Local Contribution: \$3,334

Town of Falmouth - Stormwater Management Plan

The Stormwater Management Plan represents the next phase in the town's effort to raise public awareness about watershed issues and the impacts of development. The plan introduces residents to stormwater management planning; analyzes town watersheds (identifying major pollution threats from stormwater in each); and recommends actions to reduce or prevent impacts in each watershed.

Casco Bay Estuary Project Grant: \$6,500

Local Contribution: \$3,500

Town of Freeport - Pollution Source Identification Study

More than 70 percent of the town's clam flats were either permanently or conditionally closed because of pollution. Limited water quality sampling indicated that malfunctioning individual septic systems might be contributing bacteria to the streams and drainageways that feed into the Harraseeket River and Casco Bay. The sampling program targeted the watersheds of two closed clam-flat areas and sampled more than 41 sites for suspected pollution, including coliform bacteria, nitrogen, and, in some cases, hydrocarbons. Pollution sources were identified and eliminated in all but three cases, helping to ensure that the newly opened clam flat remains available for harvesting.

Casco Bay Estuary Project Grant: \$5,481

Local Contribution: \$1,850

Town of Harpswell - Shellfish Resource Assessment in Doughty and Stover Coves

This project presents a model two-step evaluation process that can be used by other Maine communities to maximize the economic benefits of their soft-shell clam resources. The Town of Harpswell selected Stover Cove and Doughty Cove to target for possible remedial action as both areas had been closed to harvesting because of suspected or identified bacterial contamination sources. To determine if such remediation was going to be cost-effective, the town conducted a shellfish resource survey to determine the economic value of in-flat shellfish and a pollution source survey to determine the likely cost of eliminating existing or potential sources of bacterial contamination. Stover Cove turned out to have resources of limited value and significant bacterial pollution that could not be traced to identifiable sources. Doughty Cove, however, contained abundant resources and two readily removable sources of potential pollution: an overboard discharge unit and an outhouse. After these were addressed and the area reopened in 1994, commercial harvesters were making as much as \$1,000 per day during the initial week of harvesting.

Casco Bay Estuary Project Grant: \$3,893

Local Contribution: \$1,500

Town of Harpswell - Shellfish Protection Program

The Town of Harpswell currently licenses 67 commercial clam diggers to harvest on the town's flats. To protect these economically valuable flats from pollution, the town is now developing a Shellfish Protection Plan. The plan will recommend strategies for preventing pollution, particularly from upland land use activities. Its recommendations will be incorporated into public educational materials distributed to property owners near clam flats. The plan will also determine incompatible land uses that the town may consider prohibiting from the watersheds of important flats.

Casco Bay Estuary Project Grant: \$2,912

Local Contribution: \$967

Town of Naples - Crooked River Aquifer Protection Study

The Village of Naples sits directly atop a very productive sand and gravel aquifer, a cause of concern to townspeople as they plan for future development. The project used volunteers to conduct a house-to-house survey of residents to determine current land use patterns in the aquifer area. While zoning recommendations for increased protection have not yet been enacted, the study has educated residents about the vulnerability of this resource.

Casco Bay Estuary Project Grant: \$8,337

Local Contribution: \$4,052

Cities of Portland and Westbrook - Capisic Brook Watershed Public Education/Outreach Project

As part of its combined sewer overflow abatement efforts, the City of Portland completed the Capisic Brook Watershed Study (which outlines a plan to eliminate the active combined sewer overflows and reclaim the brook as a public recreational resource). To increase public awareness about water quality problems in the brook's watershed (which includes 188 acres in two urban cities) and to instill a sense of ownership among the brook's abutting residents, the project organized three programs to acquaint citizens with volunteer water quality monitoring. The program used 20 students to collect and analyze water samples from six sites along Capisic Brook and Capisic Pond. The Capisic Brook Cleanup Day teamed public works crews with citizen volunteers to remove more than 10 tons of litter and debris from a 1-mile stretch of the brook. The Streambank Erosion/Sedimentation Survey inventoried the brook's banks for eroded sites and reported problems and recommendations to incorporate into the Capisic Brook Watershed Study.

Casco Bay Estuary Project Grant: \$10,000

Local Contribution: \$3,333

City of South Portland - Clark's Pond Stormwater Treatment Efficiency

The City of South Portland wanted to evaluate the effectiveness of Clark's Pond for stormwater treatment. The 16-acre pond receives drainage from a 4,500-acre watershed that includes the largest concentration of shopping malls in Maine. One storm event was sampled and analyzed for suspended solids, oil and grease, several metals, and fecal coliform bacteria. Results show that the pond is providing limited stormwater treatment by serving as a sediment trap for contaminated sediments flowing into the pond, which remain as the flow continues on to Casco Bay.

Casco Bay Estuary Project Grant: \$6,616

Local Contribution: \$2,055

Town of West Bath - Overboard Discharge Removal Program Project

Productive shellfish flats in West Bath have been closed to harvesting for years because of nearby overboard discharge sewage treatment systems (by law, the flats in the vicinity of overboard discharge systems must be closed to harvesting). While the West Bath Shellfish Committee wanted to seek state funds to remove overboard discharge sewage treatment systems that impact three shellfish areas, the town had no staff to administer the \$100,000 state grant. The Casco Bay Estuary Project grant enabled the town to hire an individual who had successfully administered an overboard discharge systems removal program in a neighboring town. Seventeen overboard discharge sewage treatment systems in four neighborhoods were targeted for

removal, with alternative inground systems designed for 15 homes. The town hopes that additional systems may be installed in the future once interpretation of the state's new plumbing code regulations has been clarified.

Casco Bay Estuary Project Grant: \$2,687

Local Contribution: \$900

Cumberland County Soil and Water Conservation District - Erosion and Sedimentation Control: On-site Workshop for Local Boards

Stormwater runoff is the fastest growing source of pollution in the Casco Bay watershed. The region's development boom of the past 20 years has added 37,000 new housing units along with the supporting network of roads, parking lots, and commercial facilities to the lower watershed alone. Controlling erosion during the construction phase of new development could significantly reduce the sediment load entering surface water bodies. To educate local planning boards and code enforcement officers about best management practices for erosion and sedimentation control, this workshop combined a session in which participants conducted a mock review of plans for a nearby development project, followed by a field trip to conduct an on-site inspection of the same development under construction.

Casco Bay Estuary Project Grant: \$3,444

Local Contribution: \$1,243

Town of Windham - Best Management Practices Workshop Series

The Town of Windham's Water Resources Commission identified a need for training on best management practices among municipal staff and boards (as well as for land use practitioners such as engineers, developers, and site evaluators in the private sector). The town sponsored two seminars (each offered twice): "Stormwater and Phosphorus Control" and "Erosion Control." Speakers described the manuals for best management practices developed by the Maine Department of Environmental Protection, and led a case study demonstrating appropriate steps for site evaluation and best management practice selection. Windham's workshops provided the first introduction on best management practices for private-sector participants as state-sponsored best management practice training efforts have focused on municipalities.

Casco Bay Estuary Project Grant: \$7,878

Local Contribution: \$4,014

Town of Brunswick - Ground and Surface Water Protection Project

In 1988, Maquoit Bay in eastern Casco Bay experienced a catastrophic algal bloom that killed off all the bottom-dwelling animals, including a valuable soft-shell clam population. Since then, the Town of Brunswick has adopted a Coastal Protection Zone Ordinance aimed at reducing potential pollution sources (including numerous small residential lots with on-site septic systems close to the

water). The town used this grant to inventory the status of septic systems on the 542 developed lots of the Coastal Protection Zone Ordinance; conduct on-site surveys of 21 systems; prepare septic-system management alternatives to improve inspection and maintenance of systems; and identify funding options for upgrading and replacing systems.

Casco Bay Estuary Project Grant: \$34,000

Local Contribution: \$11,333

PUBLIC OUTREACH MINI-GRANTS

Highland Lake Association - Volunteer Water Quality Monitoring Program

The Highland Lake Association established a water quality monitoring program to track clarity and dissolved oxygen in the lake through twice-monthly samplings. The association purchased equipment and supplies and developed a quality assurance plan to begin its sampling program. An effort is underway to educate residents, beginning with a survey of residents to determine what they know about the impact of typical homeowner activities on lake water quality. Following the survey, informational materials related to lake water quality protection were distributed to residents.

Casco Bay Estuary Project Grant: \$1,750

Grantee's Contribution: \$750

Forest Lake Association - Educational Workshops for Lakefront Property Owners

The Forest Lake Association sponsored three workshops for lake area residents: "Camp Road Maintenance and Improvement to Control Runoff and Erosion," "Shoreland and Waterway Buffer Planting for Erosion Control," and "Septic Basics and Maintenance."

Casco Bay Estuary Project Grant: \$600

Grantee's Contribution: \$200

Portland Harbor Marine Debris Council - Marine Debris Public Education Campaign

To educate fishermen, recreational boaters, and the public about the problem of marine debris, a sign with the message "Stow It, Don't Throw It! Stop Ocean Pollution" was designed and printed. Fifteen signs were distributed to Portland waterfront business operators and installed by the Maine Conservation Corps on each pier in the Portland Harbor area. In addition, 200 polypropylene refuse collection bags with the imprinted message: "Stop Ocean Pollution, Bring Trash Back To Port" were designed, produced, and distributed to fishermen, marinas, and recreational boaters around Casco Bay.

Casco Bay Estuary Project Grant: \$2,000

Grantee's Contribution: \$10,332

Maine Audubon Society - Estuary Interpretative Signs

The Maine Audubon Society designed and installed two interpretative signs at its Gilsland Farm facility highlighting the significance of the Presumpscot River estuary and the diversity of species inhabiting Casco Bay.

Casco Bay Estuary Project Grant: \$3,000

Grantee's Contribution: \$1,639

Eco-Links - Waste Oil Education and Recycling Project

To educate recreational boaters about proper disposal methods for solid waste, waste oil, and human waste, educational materials (*i.e.*, brochures, posters, and signs) were prepared and distributed to marinas, boatyards, yacht clubs, and other marine businesses in the Brunswick area. The project also started a recycling program for waste oil from marine users, placing oil collection storage tanks and recycling containers in Brunswick and Portland.

Casco Bay Estuary Project Grant: \$2,550

Grantee's Contribution: \$1,000

Cumberland County Soil and Water Conservation District - Best Management Practices "Slide Rule"

This project created a field tool for those using erosion and sedimentation control best management practices. Designed for contractors, local code officers, and others working at construction sites, the "BMP Slide Rule" provides dimensional and application rate guidelines for a variety of best management practices.

Casco Bay Estuary Project Grant: \$3,000

Grantee's Contribution: \$5,512

Maine Coast Heritage Trust - Open Space Conference

Grant funds were used to plan and produce a day-long statewide conference on "Trails, Greenways, and Open Space," which drew more than 200 land trust members and other citizens interested in land conservation. Sessions covered topics such as conducting an open space inventory; planning, designing, and operating multi-use trails; and overcoming landowner and land trust concerns about liability and public access. Since then, local land trusts have raised more than \$2 million toward land conservation efforts.

Casco Bay Estuary Project Grant: \$2,000

Grantee's Contribution: \$4,640

Presumpscot River Watch - Volunteer Water Quality Monitoring Program

Presumpscot River Watch, an active volunteer group that is monitoring water quality in the river and its tributaries at more than 30 locations, used this grant to purchase equipment and supplies, produce a training video (and an accompanying packet of training materials for new volunteers), and have an intern to facilitate school and summer monitoring programs.

Casco Bay Estuary Project Grant: \$3,000

Grantee's Contribution: \$1,000

Portland Trails - Educational Materials Development

To encourage public participation in creating and maintaining a 30-mile recreational trail system in the most urbanized section of Casco Bay's watershed, Portland Trails developed a promotional slide show and brochure. This effort increased the visibility of Portland Trails and attracted more than 400 new members.

Casco Bay Estuary Project Grant: \$3,000

Grantee's Contribution: \$1,515

Friends of Casco Bay - Casco Bay Bibliography

A bibliography of written materials on Casco Bay was created to lead interested readers to the wealth of available information related to Casco Bay. *The Bibliography for Casco Bay* is a comprehensive list of references on all aspects of Casco Bay, copies of which are in area libraries.

Casco Bay Estuary Project Grant: \$1,400

Grantee's Contribution: \$466

Harpwell Conservation Commission - Educational Video and Poster

The Harpswell Conservation Commission created a water quality video for presentation on cable television to increase local awareness of activities that affect water quality. The video, which featured local residents discussing local problems (to increase interest and credibility), focuses on groundwater and coastal water quality issues. To accompany the video, the Commission created a poster describing actions individuals can take to protect and improve water quality. The project won a 1995 Planning Project Award from the Maine Association of Planners and is in the running for the Best Planning Project award from the Northern New England Chapter of the American Planning Association.

Casco Bay Estuary Project Grant: \$720

Grantee's Contribution: \$360

Portland Water District - Educational Computer Program About Septic System Maintenance

A Windham high school student, with technical assistance from the Portland Water District, rewrote Purdue University's interactive septic system program using the State of Maine's subsurface wastewater disposal rules as a guide. The easy-to-use program was distributed to towns throughout the watershed.

Casco Bay Estuary Project Grant: \$675

Grantee's Contribution: \$300

Maine Island Trail Association - Educational Signs for Casco Bay Islands

The Maine Island Trail Association created 42 signs explaining low-impact use techniques for six Casco Bay islands. It also designed and printed 5,000 brochures entitled "Fragile Lands: A Guide to Low-Impact Techniques for Use of Maine Islands" for distribution to islands, schools, and members of the public.

Casco Bay Estuary Project Grant: \$1,998

Grantee's Contribution: \$750

Maine Coast Heritage Trust - Open Space Map for Casco Bay

The Casco Bay Open Space Project mapped the existing protected open space in 12 municipalities surrounding Casco Bay. The resulting map visually demonstrates the interconnectedness of these "greenways" and highlights the benefits of regional planning for open space preservation. An accompanying manual, "How to Conduct an Open Space Inventory," has been distributed to land trusts, municipal conservation commissions, and communities within the Casco Bay watershed. Workshops have been held to train citizen volunteers on how to use the map and manual in local preservation efforts.

Casco Bay Estuary Project Grant: \$2,225

Grantee's Contribution: \$935

APPENDIX E

Committee Participation in the Casco Bay Estuary Project

Numerous committees contributed countless hours to shaping and directing the Casco Bay Estuary Project: the Management Committee, the Citizens Advisory Committee, the Local Government Advisory Committee, the Technical Advisory Committee, and the Implementation Subcommittee. The following lists of committee participants reflect the wide degree of involvement during the five years of the project. We regret if any names have been omitted.

MANAGEMENT COMMITTEE

Chairperson: Jeffrey Jordan, City Manager, South Portland

Robin Alden, Commissioner, Department of Marine Resources
Represented by Brian Swan and Harold Winters

Jacqueline Cohen, Town Planner, Town of Freeport

Jean Dyer, Casco Bay Island Development Association

George Flaherty, Director of Environmental Services and Intergovernmental Relations, City of Portland

Kevin Gildart, Assistant to the President, Bath Iron Works

Victoria Powers, Esq., Portland

Peter Rice, Esq., Yarmouth

Evan Richert, A.I.C.P., Director, Maine State Planning Office
Represented by John Delvecchio and William Ferdinand, Jr., Esq.

Edward O. Sullivan, Commissioner, Maine Department of Environmental Protection
Represented by Martha Kirkpatrick, Esq., Bureau Director, Land and Water Quality

Les Watling, Ph.D., Ira C. Darling Center, University of Maine

Stephen Silva, Manager, Maine State Office, U.S. Environmental Protection Agency

CITIZENS ADVISORY COMMITTEE

Chairpersons:	Jean Dyer	Kevin Gildart
	Victoria Powers	Peter Rice
Darlene Auten	Alan Graves	Ruth Mistark
Ed Benedict	David Gulick	Rupert Neily
Erno Bonebakker	Bill Harmon	Andy Nichols
Elizabeth Butler	Ned Hatfield	Artie Odlin
Don Chase	Daniel Hildreth	Joe Payne
Pat Chase	Harriet Hutchison	Don Perkins
David Chiapetta	John Jemison	Gary Roberts
Jeff Clements	Paul Jensen	Lissa Robinson
Sam Cousins	J.B. Kavaliauskas	Marvin Rosenblum
Anthony DiMillo	Edward Kitchell	Lynne Seeley
Arthur Dodge	Jill Knight	Ralph Stevens
John Ferland	Greg Lord	Lisa Taylor
Bud Fisher	Judith Marsh	Douglas Vollmer
Virginia Fisher	Kevin McQuinn	Dana Wallace
Ed Gomes	Paul D. Merrill	Tim Zorach
Melissa Gormley	Wayne Milliken	

LOCAL GOVERNMENT ADVISORY COMMITTEE

Chairpersons: Jacqueline Cohen, Freeport Town Planner
George Flaherty, Director of Environmental Services and
Intergovernmental Relations, Portland
Jeffrey Jordan, City Manager, South Portland

John Ackerman, Durham Conservation Commission
George Barnes, Harpswell
John Bubier, Director, Greater Portland Council of Governments
Dick Cahill, Gray Town Planner
Damaris Diffin, Durham Administrative Assistant
Mathew Eddy, Greater Portland Council of Governments
Jim Fisk, Westbrook City Planner
Phil Guiles, New Gloucester Representative
Bob Hamblen, Windham Town Planner
Sherry Hanson, Capital Coastal Council of Governments
David Klenk, Yarmouth Town Planner
Donna Larson, Cumberland Town Planner
Paul Lawrence, Windham Water Resource Commission
Steve Linnell, Greater Portland Council of Governments
Don Mannett, Engineer, City of Westbrook
Janet McLaughlin, Cape Elizabeth Town Council
Amy Naylor, former Brunswick Town Planner

Maureen O'Meara, Cape Elizabeth Town Planner
 Cynthia Percy, Phippsburg Conservation Commission
 Josie Quintrell, Harpswell Conservation Commission
 Lynn Raymond-Empey, Naples Administrative Assistant
 Marvin Rosenblum, Maine Department of Economic and
 Community Development
 Fran Rudoff, Maine State Planning Office
 Rick Seeley, Greater Portland Council of Governments
 Andrew Singelakis, Brunswick Town Planner
 Dick Strout, Harpswell Shore and Harbor Committee
 George Theborge, Falmouth Town Planner
 Brad Thompson, South Portland Waterfront Advisory Committee
 Anna Marie Thorn, South Portland Conservation Commission
 Ted Tiedemann, Selectman, North Yarmouth
 Steve Westra, Yarmouth Town Planner

TECHNICAL ADVISORY COMMITTEE

Chairperson: Dr. Les Watling, University of Maine

State Agencies:

Phil Bozenhard, Maine Department of Inland Fisheries and Wildlife
 Don Card, Maine Department of Marine Resources
 Dr. Richard Dressler, Maine Department of Inland Fisheries and Wildlife
 Bill Ferdinand, Maine State Planning Office
 Dr. LaBelle Hicks, Maine Pesticides Control Board
 Dr. Joseph Kelley, Maine Geological Survey
 Christopher Kroot, Maine Department of Environmental Protection
 Dr. Brian Marcotte, Maine Department of Marine Resources
 Ken Meyer, Maine Department of Human Services
 Christine Olson, Maine Department of Transportation
 John Sowles, Maine Department of Environmental Protection
 Brad Sterl, Maine Department of Marine Resources
 Brian Swan, Maine Department of Marine Resources
 Dr. Gail Wipplehauser, Maine Natural Areas Program

Academic/Research Institutions:

Dr. Betsy Brown, Colby College
 Dr. Christine Brown, University of New England
 Dr. Louis Gainey, University of Southern Maine
 Dr. Henri Gaudette, University of New Hampshire
 Dr. Robert Goode, Southern Maine Technical Institute
 Becky Koulouris, Bowdoin College
 Dr. Dennis Taylor, Bigelow Laboratory for Ocean Sciences
 Clarice Yentsch, Bigelow Laboratory for Ocean Sciences

Local Agencies/Governments/Industries:

Kevin Braley, S.D. Warren Co.
Ross Cudlitz, Cumberland County Soil and Water Conservation District
George Flaherty, City of Portland
Kirk Laffin, New England Regional Wastewater Institute
Chester Matthews, Bath Iron Works
Dana Perkins, Portland Water District
Bruce Ringrose, City of Portland
Joseph Taylor, Portland Water District

Others:

Irving Fisher, Portland Planning Board
Joe Payne, Friends of Casco Bay
Don Perkins, Citizen's Advisory Committee
Phineas Sprague, Geologist
Dana Wallace (formerly with Maine Department of Marine Resources)

Federal Agencies:

Dr. Arnold Banner, U.S. Fish and Wildlife Service
Bill Bartlett, U.S. Geological Survey
David Chiapetta, U.S. Soil Conservation Service (now Natural Resources
Conservation Services)
Derrill Cowling, U.S. Geological Survey
Dr. Michele Dionne, Wells Estuarine Reserve
Stewart Fefer, U.S. Fish and Wildlife Service
John Kurland, National Marine Fisheries Service
Jim Lake, U.S. Environmental Protection Agency, Narragansett Laboratory
Mike Marchetti, U.S. Department of Agriculture
Jay McKay, U.S. Army Corps of Engineers
Dr. Rosemary Monahan, U.S. Environmental Protection Agency, Region I
Wayne Munroe, U.S. Soil Conservation Service (now Natural Resources
Conservation Services)
Wende Rosier, U.S. Fish and Wildlife Service
Diane Switzer, U.S. Environmental Protection Agency, Lexington Laboratory
Jeffrey Waugh, U.S. Army Corps of Engineers

Consultants:

Tom Adams, Vortechncs
Kurt Buchholz, Battelle Ocean Sciences
Dave Cowan, Normandeau Associates
David Ezzio, Yankee Software
Dr. Edward Hawes, Environmental Historian
Bradley Hay, Geologist
Anne Hayden, Resource Services

Chris Heinig, MER Assessment
Jayne Michaud, Chem Risk
Richard Wenning, Chem Risk

Students:

Tabitha Byrnes, Portland High School
Robert Fernald, Portland High School
Lynda Maxwell, Portland High School

IMPLEMENTATION SUBCOMMITTEE

John Bubier, Executive Director, Greater Portland Council of Governments
Jacqueline Cohen, Town Planner, Town of Freeport
Betty Farley, District Manager, Cumberland County Soil and Water
Conservation District
Stewart Fefer, Project Leader, Gulf of Maine Project, U.S. Fish and
Wildlife Service
John Ferland, General Manager, Clean Casco Bay
George Flaherty, Director of Environmental Services and Intergovernmental
Relations, City of Portland
Tim Hendrix, Director of Operations, Portland Pipeline Corporation
Dan Jellis, General Manager, Portland Water District
Jeffrey Jordan, City Manager, City of South Portland
Jack Kartez, Chairperson and Director, Environmental Science and Policy
Program, University of Southern Maine
Martha Kirkpatrick, Esq., Bureau Director, Land and Water Quality,
Maine Department of Environmental Protection
P.D. Merrill, President, Merrill Industries
Joe Payne, Casco BayKeeper
Don Perkins, Perkins & Co.
Peter Rice, Esq., Yarmouth
Fran Rudoff, Coastal Program Coordinator, Maine State Planning Office
Steve Silva, Manager, Maine State Office, U.S. Environmental
Protection Agency
Facilitator: Pamela Plumb, Pamela Plumb & Associates

APPENDIX F

Summary of Public Comments on the Draft *Casco Bay Plan*

The *Casco Bay Plan* was not developed to be a paper document sitting on a shelf. Rather, this written document is a reflection of the experience and ideas of numerous individuals and organizations at the local, state, and federal levels who collectively worked to define priorities, set goals, and create sensible actions to protect the integrity of Casco Bay into the future. In a continuing process to incorporate the views of all interested in protecting the bay, the draft *Casco Bay Plan* was published in November 1995. To share the draft *Plan* contents and to obtain comments, several presentations were made to local officials, business and industry groups, non-profit organizations, and the public. Written and oral comments on the draft *Plan* were received from November 1995 through February 1996.

The following table lists all letters and oral comments received on the draft *Plan* in chronological order. Three types of comments were received: those that required no change, those that requested content or editorial changes, which were incorporated into this final document, and those that reflected differing views on policy issues, which were forwarded to either the Management Committee or the Implementation Subcommittee for discussion and direction. The attached table documents the response to each comment. Copies of all letters and minutes of public hearings are available from the Casco Bay Estuary Project.

Comment from...	Dated	Organization	Topic(s)	CBEP Response
Bridge, Jennie	10/29/95	New England Interstate Water Pollution Control Commission (NEIWPCC)	Explanation of NEIWPCC direct/indirect costs	Forwarded to Implementation Committee
Unknown	10/30/95	N/A	Implementation Committee	Forwarded to Implementation Committee
Turkel, Tux	10/30/95	Portland Press Herald	Editorial	Changes to be made
Carter, Renee	11/13/95	N/A	Chemical disposal	Included in Public Ed Action #4
McFarland, Bill	11/15/95	N/A	Regulatory initiatives	Forwarded to Management Committee
Martz, Elsa	11/15/95	Student at Bowdoin College	Editorial	Acknowledge in newsletter, fact sheets
Sargent, Greg	11/16/95	Resident of Brunswick	Resident particip., editorial	No changes recommended
Cenci, Mark	11/21/95	Richard Sweet Associates	CSOs/Horsley & Witten	No changes recommended
Fifield, Warren	11/21/95	Resident of Portland	Pollution of Sebago Lake	No changes recommended
Galey, William	11/27/95	Resident of Chebeague Island	Overboard discharge	No changes recommended
Hayes, Anthony	11/28/95	Town of Falmouth Public Works Department	Septic systems, economic impacts	1-make editorial change; 2-no response
Winter, Lois	11/28/95	Gulf of Maine Project, U.S. Fish and Wildlife Service (USFWS)	Habitat	Waiting for her rewrite
Hewett, Charles	11/29/95	Office of the Governor	Implementation, measuring progress	Expanding Chapter 8, forwarded to Implementation Committee
Courtemanch, Dave	11/30/95	Maine Department of Environmental Protection (ME DEP)	Numerous	1-address through Public Ed Action #5; 2-research; 3-OBDS-forwarded to Management Committee; 4-(marine classification)-forwarded to Management Committee; 5-(stewardship)-no change
Patterson, George	12/2/95	Resident of Harpswell	Editorial	Changes to be made
Chaplin, David	12/2/95	Resident of Brunswick	Mission of program	Included in Public Ed Action #4

Comment from...	Dated	Organization	Topic(s)	CBEP Response
Hayden, Anne	12/2/95	Consultant	Numerous	Forwarded to Management Committee
Hawes, Ed	12/2/95	Consultant	Industrial development, public education	1-no change; 2-add to Public Ed Actions #2 and #10
Chaplin, David	12/2/95	Resident of Brunswick	Marina concern	Forwarded to Management Committee
Sondheim, Sandy	12/2/95	U.S. Coast Guard	Coast Guard Program	No response necessary
White, Carol	12/2/95	Resident of Chebeague Island	Septic systems, technical assistance	Forwarded to Management Committee
Phillips, Walter	12/2/95	Resident of Harpswell	Public education	No changes recommended
Giggey, Michael	12/2/95	Wright-Pierce	Nitrogen loading	1-no change; 2-respond with letter
Cruthers, Joan	12/2/95	N/A	Landscaping solutions	Addressed in Public Ed Action #4
Desmarais, Barbara	12/2/95	Resident of Brunswick	Public education	Addressed in Public Ed Action #4
Fefer, Stewart	12/2/95	Gulf of Maine Project, USFWS	Support for local programs	Issues added
Bird, Henry	12/2/95	N/A	Public education	Addressed in Public Ed Action #1
Murphy, Sean	12/2/95	Student at the University of Maine	Agriculture, streams, habitat protection	1-edit title; 2-forwarded to Management Committee; 3-look for ways to include this
Hawes, Ed	12/2/95	Consultant	Toxics	No changes recommended
Benedikt, Ed	12/2/95	State Legislator	Plumbing code	Fold into Planning Action #9
Winter, Steve	12/3/95	N/A	Water pollution	Forwarded to Management Committee
Payne, Joe	12/4/95	Friends of Casco Bay	Numerous	Forwarded to Management Committee
Hawes, Ed	12/4/95	Consultant	Economic effects, planning and assess. recs, etc.	p24,26-ok; p77-research; p77,84,90,86-ok
Hatch, Walter	12/5/95	Conservation Commission member in Bethel	Implementation	Will include him in sub-watershed planning

Comment from...	Dated	Organization	Topic(s)	CBEP Response
Ferland, John	12/6/95	Clean Casco Bay, Inc.	Editorial	1-ok; 2-ok
Lawrence, Paul	12/6/95	Paul W. Lawrence Consulting, Inc.	Numerous	Some changes, letter of response
Perkins, Don	12/6/95	Perkins & Co.	Numerous	Forwarded to Management Committee
Bethune, Desiree	12/7/95	N/A	Editorial	p11,22-ok; p83-no change; p101,146,183-ok; p47-no change; p63-edit title; p24,107-no change; p108-forwarded to Management Committee; p109-no change; p112-forwarded to Management Committee; p116-no change
Knoll, Henry	12/7/95	N/A	Numerous	1-3-letter of explanation; 4-forwarded to Management Committee
Cohen, William S.	12/7/95	U.S. Senate	Acknowledgement	No changes recommended
Stevens, Ralph	12/7/95	N/A	MTBE (Methyl tertiary butyl ether, or reformulated gas)	No changes recommended
Kontos, Carol	12/7/95	Sebago Lake Association	Numerous	p107,109,111-ok; p112-forwarded to Management Committee; p116-no change; p120,121-ok; p130-research, septic issue; forwarded to Management Committee
Franklin, Gary	12/7/95	Resident of Scarborough	MTBE	No changes recommended
Ansheles, Carol	12/7/95	Resident of Portland	Financing	No changes recommended
Sondheim, Arthur	12/7/95	U.S. Coast Guard	Coast Guard Program	No changes recommended
McDermott, Arthur	12/7/95	N/A	Funding	No changes recommended
Fisher, Virginia	12/7/95	Casco Bay Island Development Association	Implementation	Forwarded to Implementation Committee

Comment from...	Dated	Organization	Topic(s)	CBEP Response
Hampton, Mark	12/7/95	Maine Association of Site Evaluators	Numerous	Changes to some/forwarded to Management Committee
Perkins, Don	12/7/95	Perkins & Co.	Implementation Committee	Forwarded to Implementation Committee
Payne, Joe	12/7/95	Friends of Casco Bay	Numerous	Some changes/forwarded to Implementation Committee
Crowley, Bob	12/7/95	Resident of South Portland and Stave Island	Brown tail moth	Include under Public Ed Action #4
Mitchell, Ed	12/7/95	Resident of New Gloucester	MTBE	No changes recommended
Greene, Mark	12/10/95	Town of Long Island Planning Board	Town boundaries	Research/will correct as necessary
Donald, Darcy	12/11/95	N/A	Oil spills	No changes recommended
Hamilton, Chris	12/11/95	Maine Coast Heritage Trust	Format	No changes recommended
Hyde, George	12/12/95	Town of Falmouth	Local concern re: stormwater runoff, public education, etc.	No changes recommended
Mitchell, Betsy	12/13/95	Resident of Gray	Pollution of Royal River	No changes recommended
Longnecker, Krista	12/13/95	Friends of Casco Bay, resident of Portland	Editorial, public education	p3,10,37,40-ok; p205-rewrite; PEA #1-forwarded to Implementation Committee; #6-being revised; #9-no change
Salmansohn, Pete	12/14/95	National Audubon Society	Editorial	Changes to be made
Bubier, John	12/14/95	Greater Portland Council of Governments	Implementation	Forwarded to Implementation Committee
Melrose, John	12/15/95	Department of Transportation	Numerous	1-forwarded to Management Committee; 2-no change; 3-will add; 4-changes; 5-ok; 6-no change; 7-will edit; 8&9-already being done; 10&11-forwarded to Management Committee

Comment from...	Dated	Organization	Topic(s)	CBEP Response
Snow, Olympia	12/18/95	U.S. Senate	Mark Cenci	No changes recommended
Stevens, Ralph	12/20/95	Resident of South Berwick	MTBE	No changes recommended
Ansheles, Carol	12/21/95	Resident of Portland	Editorial, etc.	1-4-no change; 5-PE Action #4; 6-no change; 7- forwarded to Implementation Committee; 8-forwarded to Implementation Committee; p8-ok; p9-research; p12-ok; p15-no change; p19,24,31,41-ok; p75-no change.
Neily, Jr., Rupert	12/21/95	Maine Coast Heritage Trust	Implementation	TA Action #5-ok; #7-ok; P/Assess #4, #5-no change; #8-forwarded to Management Committee; last page-forwarded to Implementation Committee
Franklin, Gary	12/22/95	Resident of Scarborough	MTBE	No changes recommended
Richert, Evan	12/22/95	Maine State Planning Office	Local watershed planning, implementation, etc.	Forwarded to Management Committee
Hatch, Walter	12/22/95	Resident of Bethel	Concern re: world population	No changes recommended
Birkett, Lucy and Stimpson, Karen	12/27/95	Maine Island Trail Association	Stewardship, new solutions, implementation	p94-ok; p101-refer to Planning Action #8; p111,116,124-ok; p140-no change; pp155-158-forwarded to Implementation Committee
Elowe, Ken	12/28/95	Maine Department of Inland Fisheries and Wildlife	Numerous	Many changes made
Cenci, Mark	12/29/95	Richard Sweet Associates	Horsley & Whitten report, etc.	Follow-up re: Horsley & Whitten; septic issue forwarded to Management Committee
Zimmerman, Joel	12/29/95	NEIWPC	Numerous	Many changes made; agricultural and transportation issues forwarded to Management Committee

Comment from...	Dated	Organization	Topic(s)	CBEP Response
Various	1/2/96	DEP	Numerous	Many changes made; p48-forwarded to Management Committee; p106-forwarded to Implementation Committee; p129-forwarded to Management Committee
MacKaling, Steve	1/3/96	N/A	Air deposition/incineration	No changes recommended
Winter, Lois	1/4/96	Gulf of Maine Project, USFWS	Government regulations, habitat, numerous editorial	Numerous changes
Fefer, Stewart	1/4/96	Gulf of Maine Project, USFWS	Implementation	No changes recommended
Bass, Betsy	1/5/96	Maine Congress of Lakes Association	Numerous	Some changes made
Bowen, Marcia	1/9/96	Normandeau Associates	Implementation	Forwarded to Implementation Committee
Payne, Joe	1/9/96	Friends of Casco Bay	Numerous	Many changes made; p50, 118, p146, p155,158-161, p170, fiscal goals-forwarded to Implementation and Management Committees
Wall, Robert	1/9/96	University of Maine	Marine research	1st paragraph-no change; 2nd paragraph-ok
Chaplin, David	1/10/96	Resident of Brunswick	Various	1-forwarded to Management Committee; 2-no change; 3-forwarded to Management Committee; smaller edits: 1&2-ok; 3-no change; 4-ok
Shaver, Sally	12/16/95 (rec'd 1/10/96)	U.S. Environmental Protection Agency (USEPA)	Numerous	p14-ok; p19,21,30,32,55,77-no change; p83-85-ok; p88-will research; p142 & 153-no change
Desmarais, Barbara	1/10/96	Resident of Brunswick	Stewardship	No change recommended — included under Public Education Actions #4 and #10

Comment from...	Dated	Organization	Topic(s)	CBEP Response
Gray, Jr., Joseph	12/22/95 (rec'd 1/12/96)	City of Portland Planning and Urban Development Department	General support, plumbing codes	Forwarded to Management Committee
Winter, Lois	1/12/96	Gulf of Maine Project, USFWS	Habitat	Many changes made
Schauffler, Marina	1/12/96	Resident of Falmouth	Implementation	Forwarded to Implementation Committee
Chaplin, David	1/14/96	Resident of Brunswick	Water quality	No changes recommended
Maier, William	1/22/96	Land use consultant and licensed site evaluator	Horsley & Witten, Inc., report	p14,21,25-no changes recommended; p141-forwarded to Management Committee; p158-forwarded to Implementation Committee; p202-no change recommended
Chemerys, Ruth	1/22/96	U.S. EPA	Numerous	Consolidated with comments from U.S. EPA
Rocque, David P.	1/25/96	State Dept of Agriculture, Food and Rural Resources	Numerous	Many changes made
Hagstrom, Anne and Washburn, Peter	1/30/96	Natural Resources Council of Maine	Toxic pollution	Some changes made; many issues forwarded to Management Committee
Smith, Mark	1/30/96	U.S. EPA	Numerous	Many changes made
McElwain, Stephen	2/14/96	Resident of Scarborough	Air emissions and ash disposal	No changes recommended
McElwain, Stephen	2/21/96	Resident of Scarborough	Air deposition	No changes recommended
Munroe, Wayne	2/26/96	Natural Resources Conservation Service	Numerous	Many changes made
Toppan, Clough	3/1/96	Division of Health Engineering, Department of Human Services	Numerous	Many changes made

APPENDIX G

Commitment Letters

It is through the cooperation and collaboration of numerous federal and state government agencies, interested groups, and local communities that the actions outlined in this plan will be implemented. Among those supporting and committing to implement this plan are the following:

U.S. Environmental Protection Agency
U.S. Department of the Interior/Fish and Wildlife Service
U.S. Department of Commerce/National Oceanic and
Atmospheric Administration
U.S. Department of Defense/Department of the Army/Corps of Engineers
U.S. Department of Transportation/United States Coast Guard
U.S. Department of Agriculture/Natural Resource Conservation Service
State of Maine/Land and Water Resources Council
Cumberland County Soil and Water Conservation District
Greater Portland Council of Governments
Friends of Casco Bay
Casco Bay Island Development Association
Maine Audubon Society
Maine Island Trail Association
Town of Brunswick
Town of Cape Elizabeth
Town of Cumberland
Town of Durham
Town of Falmouth
Town of Freeport
Town of Harpswell
Town of Long Island
Town of Phippsburg
City of Portland
City of South Portland
Town of West Bath
Town of Yarmouth



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
JOHN F. KENNEDY FEDERAL BUILDING
BOSTON, MASSACHUSETTS 02203-0001

June 28, 1996

Jeff Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04032

Dear Mr. Jordan:

The United States Environmental Protection Agency (EPA) has actively participated in the development of the Casco Bay Plan and we look forward to implementing the Plan along with our partners in the Casco Bay watershed. Since the inception of the Casco Bay Estuary Project in 1990, the EPA has contributed substantial funding and staff time to the Project and this investment in the Bay's future will continue. Contingent upon sufficient annual appropriations from Congress, over the next four years the EPA intends to provide the Project with an EPA Project Coordinator and base funding to assist with implementation of the Plan. Significantly, the EPA also commits to taking the following actions recommended in the Plan:

Monitor Enforcement of Combined Sewer Overflow Reduction Plans in Portland, South Portland, and Westbrook: The cities of Portland, South Portland, Westbrook and the State of Maine all have combined sewer overflows (CSOs) that reduce water quality in Casco Bay. Each community is currently under a consent agreement with the EPA and/or the Maine Department of Environmental Protection (ME DEP) to reduce the impacts of these wet weather discharges consisting of stormwater, sewage, and industrial wastes. The EPA will work closely with the ME DEP to ensure that Combined Sewer Overflow Reduction Plans developed by these communities are carried out on schedule.

Develop a Comprehensive Management Strategy for Dredged Material: Dredging rivers and harbors in Casco Bay is needed to sustain the economic and recreational value of harbors, but the disposal of dredged material has become expensive and difficult in cases where sediments contain toxic material. The EPA will assist the State of Maine in developing a statewide dredging strategy and will

continue to work closely with the U.S. Army Corps of Engineers, Portland Dredging Committee, Friends of Casco Bay, and a host of other state and federal natural resource agencies to help resolve Portland Harbor dredge disposal issues.

Develop Biological/Environmental Indicators: Water quality influences the types of plants and animals that will live in a stream, river or estuary. Alterations of the biological community can indicate chronic water quality impacts, while chemical water quality measures provide only a snapshot of current conditions. The State of Maine water quality regulations provide for use of biological criteria, and the State has developed freshwater criteria. Criteria for marine and estuarine water, however, still need to be established. EPA-New England will seek special EPA Office of Research and Development funding in 1997 to assist the State of Maine with the development of marine and estuarine criteria. When appropriate, the EPA, through its New England Regional Laboratory in Lexington, Massachusetts, will assist the State with field work.

Develop Sediment Quality Criteria and Sediment Quality Discharge Limits that apply to Casco Bay: There is a need to establish statewide sediment quality standards that apply to Casco Bay and reflect the published levels that the ME DEP and EPA follow when making regulatory decisions. Using sediment quality criteria developed by the EPA, the ME DEP and the Casco Bay Project can potentially create sediment quality standards applicable to Casco Bay. To date, the EPA has established sediment quality criteria for five organic chemicals and will continue to develop more in the future.

Research the Contribution of Deposition of Pollutants from the Air: The deposition of pollutants from the air may be a significant source of toxicants to the Casco Bay watershed. As a result, the EPA Office of Air Quality Planning and Standards recommended in their review of the Draft Casco Bay Plan that a deposition study be conducted in the Casco Bay area. In February 1996, the ME DEP requested special funding from EPA to carry out a study that would estimate the portion of contaminants in the sediments of Casco Bay, specifically cadmium and polycyclic aromatic hydrocarbons, that have accumulated as a result of air deposition. EPA-New England will aggressively seek funding for this study and if funding is awarded, EPA will provide appropriate technical advice and support to the project.

EPA-New England, Maine State Office Commitments:

The EPA Maine State Office also has targeted the Casco Bay watershed as the primary focus of its work in fiscal year 1996 and will carry out or assist with the following activities:

Stormwater and Combined Sewer Overflows

- Allocate a high percentage of the 1996 Clean Water Act, Nonpoint Source Control (Section 319) funds for projects in the Casco Bay watershed.
- Support development of the Capisic Brook Management Plan, an integrated stormwater management plan that addresses CSO abatement, stormwater control, wetland enhancement, and green way development.
- Evaluate the results of an EPA funded 104(b)3 stormwater, inflow and infiltration project in Westbrook and determine appropriate follow up.
- Provide stormwater and wetland education to municipalities when requested as part of the Casco Bay Estuary Project technical assistance project.

Wetlands

- Work with the U.S. Army Corps of Engineers, U.S. Fish & Wildlife Service and the State to help the Town of Westbrook establish New England's first wetland mitigation bank.
- Provide wetlands (404) guidance to the Capisic Brook Stormwater/CSO project in Portland.

Drinking Water

- Plot location of drinking water system intakes in Geographic Information Systems in the Westbrook area and evaluate the risks of contamination from Resource Conservation & Recovery Act (RCRA) facilities, Underground Storage Tanks, Leaking Underground Storage Tanks and other potential sources. Where risks are identified, target cooperative EPA and State inspections, technical assistance and enforcement.

- Work with the State to encourage communities in the Casco Bay watershed with surface drinking water sources to establish or maintain appropriate water supply watershed management programs. Review plans to determine whether nonpoint source controls can be added to the plans or expanded to help protect aquatic life and non-consumptive human uses as well as drinking water quality.
- Coordinate with ME DEP in targeting of Underground Inspection Control (UIC) inspections.
- Assist ME Department of Human Services in reviewing Wellhead self-evaluations submitted by public water suppliers.
- Assist the Town of Windham and the United States Geological Survey with the ongoing study of the Windham Aquifer and adjacent areas in the Presumpscot basin.

Water Quality and Wastewater Discharge Permitting

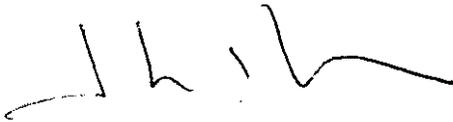
- Draft new discharge permits for the City of Portland (CSO discharges), the City of South Portland wastewater treatment facility, Yarmouth wastewater treatment facility, Central Maine Power-Wyman Station, and Control Devices-GTE.
- Coordinate resolution of the S.D. Warren-Westbrook NPDES permit appeal with ME DEP's re-licensing of the S.D. Warren-Westbrook wastewater discharge.
- Assist the ME DEP and other organizations with their efforts to improve water quality in the Presumpscot River, particularly the stretch of river between the S. D. Warren-Westbrook pulp and paper mill and the Smelt Hill Dam.
- Assist the ME DEP and the Town of Falmouth with resolution of water quality issues related to ME DEP re-licensing of the town's wastewater treatment plant discharge.

Air Quality

- Coordinate with the ME DEP, Maine Department of Transportation, Maine Department of Energy, Greater Portland Council of Governments and the City of Portland, as well as other stakeholders on the designation of Portland as a Clean City. This project will work with the appropriate stakeholders to provide a unified strategy for transportation planning with an emphasis on bringing clean vehicles to the Portland area.

The EPA is pleased to be part of the continuing collaborative effort to protect Casco Bay and we appreciate the opportunity to formally present these commitments to you. Also, I would like to congratulate you, the Casco Bay Estuary Project staff, and all the Project's partners for preparing an excellent plan for the Bay and laying the groundwork for its successful implementation.

Sincerely,



John P. DeVillars
Regional Administrator



United States Department of the Interior
U.S. Fish and Wildlife Service



GULF OF MAINE PROJECT
4R Fundy Rd., Falmouth, Maine 04105
Phone: (207) 781-8364 FAX: (207) 781-8369
E-mail: R5ES_GOMP@mail.fws.gov
<http://www.fws.gov/~cep/maine.html>

Mr. Jeff Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Rd.
Portland ME 04032

May 7, 1996

Dear Mr. Jordan:

The USF&WS Gulf of Maine Project has taken an active role in the development of the Casco Bay Plan and, through this letter, confirms its commitment to help carry out specific components of the Plan. In particular, the Gulf of Maine Project commits to the following actions:

Technical Assistance for Habitat Protection - The Gulf of Maine Project will offer support to municipalities, land trusts, conservation commissions, and individuals to promote voluntary habitat conservation measures at the local level. These services will include 1) providing and interpreting scientific information on the relative habitat values of areas for important fish and wildlife species; 2) providing advice on types of conservation activities and potential financial support for conservation or restoration of such areas.

Restore Degraded Habitat - Act as member of a Task Force on restoration of degraded habitats. A consultant will identify and characterize such habitats, funding sources, and methods. The Gulf of Maine Project and other members will oversee project design, consultant selection, and project implementation.

Grants for Local Habitat Protection - To encourage activities of local conservation interests the Gulf of Maine Project will act in coordination with the MDIF&W and Maine Office of State Planning to provide small grants. Proposed work will be consistent with the Habitat analysis performed by Gulf of Maine Project for CBEP, identifying important Casco Bay habitats.

In addition, the USFWS Gulf of Maine Project will be available to serve on Implementation Committees and will continue to provide technical assistance as requested. We look forward to continuing partnership efforts in the Casco Bay Watershed to protect important living resource habitats. If I can provide clarification or further information, please contact me.

Sincerely,

Stewart Fefer
Project Leader



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
One Blackburn Drive
Gloucester, MA 01930

Mr. Jeff Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04032

MAY - 6 1996

Dear Mr. Jordan:

This is in reference to the Casco Bay Plan (CBP) for the Casco Bay Estuary Project. The National Marine Fisheries Service (NMFS) has reviewed the Casco Bay Draft Plan and we are familiar with the goals, objectives, and action plans outlined in the document. Cooperation between federal, state, and local agencies, as well as concerned interest groups, will be the key to accomplishing the ambitious steps described in the CBP.

NMFS offers our strong support for the CBP. In particular, we are committed to assisting Maine with implementing the following Action Plans:

- In the Public Education Action, "Develop an Environmental Habitat Kit and Guide Maps to Casco Bay for the General Public", NMFS will participate on a task force that will develop and distribute a habitat field guide that will encourage interested citizens to become more familiar with the bay and understand the adverse impacts of certain activities.
- In the Technical Assistance Action, "Provide Technical Assistance Necessary for Habitat Protection", NMFS will continue to provide information on habitat locations, values, and uses to the local governments and groups in order to promote the protection of important habitats in the Casco Bay Watershed.
- In the Planning and Assessment Action, "Develop a Comprehensive Management Strategy for Dredged Material", NMFS will work together with the Office of Casco Bay, Portland Harbor Waterfront Alliance and other groups and agencies to develop a statewide dredging strategy. This strategy proposes to 1) reduce input of toxic materials to harbor sediments, 2) assess, categorize, and quantify material that requires dredging, 3) develop practical alternatives for dredged material disposal, 4) develop treatment and decontamination techniques for dredged material, 5) develop plans for closure of the Portland Harbor disposal sites when needed, 6) research selection of new sites, and 7) improve dredging and disposal techniques.

NMFS is looking forward to working together with you and the other agencies involved to make the Casco Bay Estuary Project a success.



Sincerely,

Chris Mantzaris
Chief, Habitat and Protected Resources Division



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254-9149

June 12, 1996



Planning Directorate
Evaluation Division

Mr. Jeff Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04032

Dear Mr. Jordan:

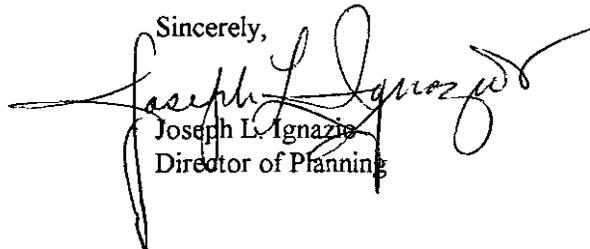
The New England Division of the U.S. Army Corps of Engineers through its various programs and authorizations has the ability to assist in the implementation of certain actions recommended by the Casco Bay Plan. In particular, the New England Division has the ability to provide water resources planning, development and assessment services. This includes planning assistance relative to dredged material management and restoration of degraded habitat as recommended in the Casco Bay Plan.

The New England Division has two planning assistance programs which provide opportunities for states to obtain assistance in addressing water resource issues. These programs are the Section 22, Planning Assistance to the States Program and the Section 206, Flood Plain Management Services (FPMS) Program. The Planning Assistance to States Program is designed to assist states in developing comprehensive plans in all facets of water resources planning, including dredged material management. Under the FPMS Program we can provide technical assistance to improve management of flood plains.

Additionally, the Corps has the authority under the Water Resources Development Acts of 1986 and 1990 to modify Corps of Engineers projects to restore fish and wildlife resources.

The New England Division is pleased to be a part of the effort to protect Casco Bay and will continue to work with the other organizations that are striving to make the Casco Bay Estuary Project a success. If you should have any questions please contact Mr. Jay Mackay at (617) 647-8142.

Sincerely,



Joseph L. Ignazio
Director of Planning

U.S. Department
of Transportation

United States
Coast Guard



Commanding Officer
U.S. Coast Guard
Marine Safety Office

P.O. Box 108
Portland, ME 04112-0108
Staff Symbol:
Phone: (207) 780-3251

16452
APR 8 1996

Casco Bay Estuary Project
Attn: Ms. Anne M. Payson
312 Canco Road
Portland, ME 04103

Dear Ms. Payson:

This is in response to your letter of April 4, 1996 requesting Coast Guard involvement in the task force implementing certain public education activities identified in the Casco Bay Plan.

I am glad to be able to take part in your task force, and have assigned LT Andrew Tucci to assist you as necessary. As you pointed out in your letter, the Sea Partners Program, the Coast Guard's primary public education program for marine pollution, may not be fully funded in the future. Regardless of its funding, either LT Tucci or a member of the Sea Partners program will be available to your task force.

Please contact LT Tucci at 780-3251, x-173 if you have any questions, or when you have any specific requests concerning the task force.

Sincerely,

A handwritten signature in black ink, appearing to read "B. S. Russell".

BURTON S. RUSSELL
Commander, U. S. Coast Guard
Officer in Charge, Marine Inspection



United States
Department of
Agriculture

Soil
Conservation
Service

Natural Resources
Conservation Service
381 Main Street, Suite 3
Gorham, ME 04038

May 06, 1996

Mr. Jeff Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Re. Casco Bay Plan

Dear Mr. Jordan,

On behalf of the USDA Natural Resources Conservation Service (NRCS), I would like to pledge a commitment for the NRCS to provide technical leadership of soil and water resource conservation programs that coincide with many goals of the Casco Bay Plan.

The specific Casco Bay Estuary Project priority issues closest to the mission of the NRCS include Habitat Protection, Stewardship and Stormwater Management. The Casco Bay Plan target actions that overlap with the mission of NRCS include Public Education and Technical Assistance. The following Casco Bay Plan actions represent potential assistance aligned with Soil and Water Conservation Program Services provided by the Natural Resources Conservation Service:

*** Public Education**

- **Conduct a Comprehensive Campaign to Promote Sound Homeowner Practices:** The NRCS provides technical assistance to approved requests for homeowners needing recommendations for soil and water conservation treatment practices. NRCS also provides public information and education fact sheets and bulletins for some conservation practices.
- **Create an Educational Site Demonstrating How Vegetation Reduces Stormwater Runoff:** The NRCS provides technical leadership in the evaluation of plant materials applications for agricultural and conservation management, erosion control and water quality resource protection benefits.



The Soil Conservation Service
is an agency of the
Department of Agriculture

AN EQUAL OPPORTUNITY EMPLOYER

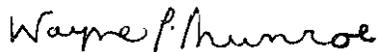
*** Technical Assistance**

- **Provide Technical Assistance to Help Reopen and Manage Clam Flats:** The NRCS provides watershed inventory and evaluation, conservation planning and application treatment recommendations according to resource concerns and customer needs. The NRCS can provide detailed conservation planning and resource management system treatment recommendations to agricultural land operators requesting assistance. NRCS may also provide agricultural cost share conservation plans subject to priority area designation and availability of Environmental Quality Incentive Program (EQIP) funds.

- **Provide Technical Assistance Necessary for Habitat Protection:** The NRCS may assist in restoring degraded habitats in Casco Bay, eligible conservation programs may include the Wetlands Reserve Program and Wildlife Habitat Incentive Program.

The Natural Resources Conservation Service is committed to providing technical assistance and financial assistance as available in advancing conservation treatment efforts in the Casco Bay Watershed. We look forward to Partnering with other organizations involved in implementation of the Casco Bay Plan.

Sincerely,



Wayne P. Munroe
District Conservationist



STATE OF MAINE
EXECUTIVE DEPARTMENT
STATE PLANNING OFFICE

ANGUS S. KING, JR.
GOVERNOR

EVAN D. RICHERT, AICP
DIRECTOR

June 19, 1996

Mr. Jeffrey K. Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Re: Land and Water Resources Council Commitment to the *Casco Bay Plan*

Dear Mr. Jordan:

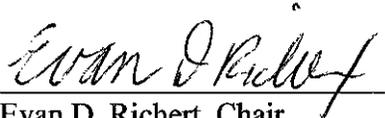
The Land and Water Resources Council is pleased to support the *Casco Bay Plan* and to commit resources to its implementation. The Land and Water Resources Council of the State of Maine is an opportunity for the natural resource commissioners to advise Governor King and the Maine Legislature in the formation of policies for management of the State's land and water resources and to coordinate and implement state programs and policies which affect the natural environment. As such, the Land and Water Resources Council is in a pivotal position to coordinate State agencies in the implementation of the *Casco Bay Plan* and is squarely behind the efforts of the Casco Bay Estuary Project and the work of many of our members and staffs who provided guidance and assistance in the development of the *Plan*. As we collectively prepare to implement actions outlined in the *Plan*, the Land and Water Resources Council and the State agencies represented reiterate our support for the goals of the project and look forward to continuing the active role we have played thus far.

The Department of Environmental Protection will be the lead State agency coordinating the involvement and support needed to turn this plan into real environmental protection. Specifically, Paul Van Cott, the Southern Maine Regional Office Manger of the Department of Environmental Protection, will act as the lead staff representative for the State.



Beyond our broad commitment to help implement the goals outlined in the *Plan*, attached are specific commitments relating to each action. By working in concert with federal, municipal, non-profit and citizen actions to protect Casco Bay we proudly share the responsibility for stewardship of this precious resource.

Very truly yours,



Evan D. Richert, Chair
State Planning Office



Robin Alden, Commissioner
Department of Marine Resources



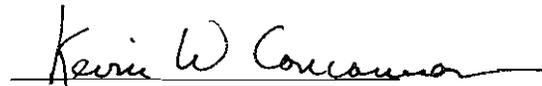
Edward McLaughlin, Commissioner
Department of Agriculture, Food &
Rural Resources



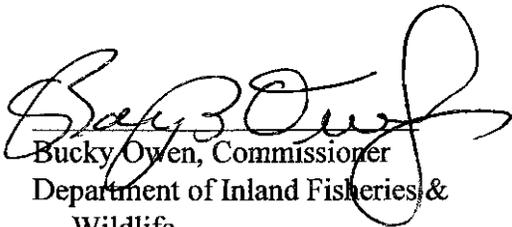
Ronald Lovaglio, Commissioner
Department of Conservation



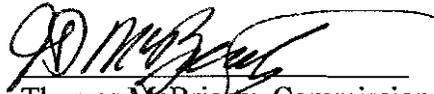
Edward O. Sullivan, Commissioner
Department of Environmental Protection



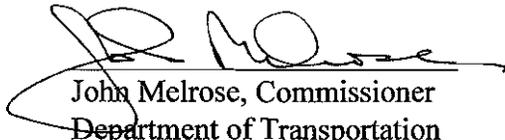
Kevin Concannon, Commissioner
Department of Human Services



Bucky Owen, Commissioner
Department of Inland Fisheries &
Wildlife



Thomas McBrierty, Commissioner
Department of Economic &
Community Development



John Melrose, Commissioner
Department of Transportation

CASCO BAY PLAN

LAND AND WATER RESOURCES COUNCIL COMMITMENTS

May 1, 1996

Based upon the actions outlined in *Casco Bay Plan*, the agencies within the State of Maine collectively look forward to working together and with others to complete the following actions:

PUBLIC EDUCATION ACTIONS

Action #1--Fund High School Students Research

The Maine Coastal Program (located at the State Planning Office) has an ongoing Shore Stewards/Partners in Monitoring Program that offers a competitive mini-grant program to support local water quality monitoring (including schools) and outreach/educational programs. Technical assistance will be provided to Casco Bay groups and schools to encourage greater involvement in this program and to help develop proposals.

Action #3--Conduct a Comprehensive Campaign to Promote Sound Householders Practices

The Department of Environmental Protection, through the nonpoint source program and local technical assistance center will participate along with appropriate Maine Coastal Program outreach and education efforts.

Action #4--Educate Boaters About Low-Impact Practices, Non-Toxic Boat Products, and the Need to Protect Sensitive Habitats

The State Planning Office and the Department of Environmental Protection look forward to providing guidance and assistance to a coalition of local groups in the Casco Bay watershed to continue education efforts for boaters. Brochures, posters, and training are among the types of assistance we look forward to sharing. The State Planning Office has received funds from the U.S. Fish and Wildlife Service to establish a boat pump-out program. Funds have been directed, in conjunction with Friends of Casco Bay, to Casco Bay for this effort. Marina best management practices have been developed with training conducted for area marina operators.

Action #6--Create an Educational Site Demonstrating How Vegetation Reduces Stormwater Runoff

In conjunction with the City of Portland and the Cumberland County Soil and Water Conservation District, the Maine Department of Environmental Protection expects to be able to provide funds through 319 of the Clean Water Act to support the construction of a highly visible demonstration project to illustrate the use of both a vegetative buffer and compost filtration technology to treat runoff from parking facilities. Funding is anticipated for FY 1997 for \$35,000.

Action #7--Hold "State of the Bay" Conferences

All appropriate State agencies look forward to the opportunity to assist in planning and organizing the conference as well as supporting efforts that encourage ongoing dialogue and problem solving.

Action #8--Extend the State Planning Office's New "Marine Volunteer Program" to Casco Bay

The State Planning Office is committed to researching the need for a volunteer program in the Casco Bay watershed and is pleased to work with the Casco Bay Estuary Project and the area non-profit agencies over the coming months to determine the level of interest. If the need for a program is confirmed, the Maine Coastal Program will plan to initiate the program in 1997 or 1998 and devote approximately \$30,000 toward the effort.

TECHNICAL ASSISTANCE ACTIONS

Action #1 -- Provide Technical Assistance to Help Reopen Clam Flats

The Maine Department of Marine Resources plays the pivotal role in opening and closing clam flats. The Department is committed to providing training to conduct shoreline surveys and water quality monitoring necessary to assess the condition of the clam flats. Additionally, the Maine Department of Marine Resources provides assistance to over 43 coastal communities engaged in shellfish conservation and management. In 1963, the legislature authorized municipalities to enact shellfish ordinances, subject to the approval of the Commissioner of Marine Resources. Those towns that manage their shellfish are granted certain privileges for assuming that responsibility. The Department's three regional biologists provide the necessary oversight for program implementation. Assisting municipalities in the development of their management plans, determining the

number of licenses to be sold and conservation measures to be employed, opening and closing of flats for conservation purposes, and reviewing ordinances for consistency with State laws and regulations are only a few of their responsibilities.

The Department of Environmental Protection contributes an important support role relating to clam flats by funding the removal of pollution sources through the overboard discharge and small community grant programs, regulating both point and non-point source discharges, preventing pollution through technical assistance to municipalities, dischargers and consultants, and through its monitoring of toxic pollutants.

The State Planning Office will assist the Department of Marine Resources to improve municipal clam management activities and funding from the Maine Coastal Program will be dedicated to clam management and volunteer coordination efforts.

Action #2 -- Provide Technical Assistance to Monitor and Open Public Swimming Areas

The Department of Environmental Protection will monitor selected swimming beaches located along Casco Bay beginning in the summer of 1996. The program will include a sampling schedule and procedures, will meet required quality assurance/quality control requirements and will establish a mechanism to notify municipalities of the result of water quality testing. The Department of Human Services will provide assistance in responding to requests from the public or the media for information regarding public health aspects of bacteria levels at swimming beaches based upon the monitoring information.

Action #3 -- Train Installers and Pumpers of Septic Systems

Recognizing the important role septic system pumpers and installers play in reaching septic system owners, the Maine Department of Human Services staff is committed to working as part of a team to provide technical assistance.

Action #4 -- Provide Training in Best Management Practices for Contractors, Farmers, Public Works Crews, Road Commissioners, and Municipal Boards and Staff

The Department of Environmental Protection recently established the Nonpoint Source Training Center to provide training on erosion/sedimentation BMPs, stormwater BMPs and marina BMPs. In cooperation with the Maine Department of Transportation Local Roads Program, targeted assistance will be provided in the

Casco Bay watershed to audiences including contractors, engineers, planners and marina operators.

Action #5 -- Establish a Disposal Program for Toxic Pollutants in Casco Bay Communities and Small Businesses

The need is evident for a toxic disposal program. Both the Maine Department of Environmental Protection and the State Planning Office commit to participating on a task force to more fully formulate the issues and prepare for an appropriate solution.

Action #6 -- Develop and Implement Action Plans for Sub-watershed Areas

The State Planning Office and the Maine Department of Environmental Protection work closely on coastal watershed surveys and planning activities. The Maine Department of Environmental Protection has established a Watershed Division which will actively work with local groups in sub-watershed areas of the Casco Bay watershed.

Action #7 -- Conduct Pollution-Prevention Audits for Business/Industry that Affect Casco Bay

The Maine Department of Environmental Protection, through its Pollution Prevention Program, will identify the business/industry sector with the higher risks of generating pollution and will contact these businesses and offer voluntary pollution prevention audits. Additionally, a Pollution Prevention Resource Library will be established at the Southern Maine Office of the Department of Environmental Protection.

REGULATORY/ENFORCEMENT ACTIONS

Action #1 -- Clarify the Use of the Natural Resource Protection Act for Habitat Protection

The Maine Department of Inland Fisheries and Wildlife, with support from the Maine Department of Environmental Protection, will develop a policy that defines when the agency will and will not map areas for the Natural Resource Protection Act as well as outlining what alternative methods will be used by the Department for habitat protection. This policy clarification will outline when the regulatory approach will be triggered and when alternative habitat protection methods will be used.

Action #2 -- Monitor Compliance with Combined-Sewer Overflow Reduction Plans in Portland, South Portland, and Westbrook

The Maine Department of Environmental Protection will monitor and enforce the approved plans from these three municipalities.

Action #3 -- Adopt Minimum Standards for Stormwater Quality in State and Municipal Regulatory Programs

The Maine Department of Environmental Protection, as the agency responsible for regulating stormwater in the state, will be developing new stormwater regulations that establish quantity and quality standards in 1996. The State Planning Office will incorporate these new standards into model subdivision and site plan ordinances. These steps will become the basis for technical assistance and outreach to municipalities.

Action #4 -- Comply with the Pumpout Law

The Maine Department of Environmental Protection is responsible for enforcement of this law, requiring some marinas to provide pumpouts for boaters.

Action #5 -- Improve Local Enforcement of the Subsurface Wastewater Disposal Rules

Failing septic systems pollute clam flats and affect water quality. The Maine Department of Human Services will enforce laws and will encourage greater enforcement. The State Planning Office will work with the Department of Human Services and the Department of Environmental Protection to enhance quality control for plumbing inspectors and contractors and to encourage enforcement activities as needed.

Action #6 -- Require Proof of Legal Waste Disposal Upon Transfer of Property

The Land and Water Resources Council recognizes that this issue is both supported by many and opposed by many and is an issue which requires thoughtful consideration. State agencies, particularly the State Planning Office, Department of Environmental Protection and Department of Human Services are committed to working with other task force members to more fully research the issues and address regulations appropriately.

PLANNING AND ASSESSMENT ACTIONS

Action #1 -- Develop Municipal Programs to Protect Water Resources and Clam Flats from Septic System Discharges

Based upon the results of subwatershed surveys and municipal needs related to septic system management, both the State Planning Office and the Department of Human Services anticipate the future need to guide future policies and activities.

Action #2 -- Develop a Comprehensive Management Strategy for Dredged Material

State agencies, including State Planning Office, Department of Marine Resources, Department of Environmental Protection, and the Department of Transportation are actively involved with resolving issues surrounding dredged material. The State is committed to working to reduce input of toxic materials into harbor sediments and to develop practicable alternatives for contaminated dredged material disposal. Additionally, the State will work with the U.S. Army Corps of Engineers to develop a closure plan for the Portland Harbor disposal site while simultaneously researching locations for new sites.

Action #3 -- Review Implementation of the National Shellfish Sanitation Program

The Department of Marine Resources has convened public workshops to begin to review, explain, and discuss the National Shellfish Sanitation Program and its implementation and will consider possible areas of improvement which could result in both increased acreage of flats open and increased public health.

Action #5 -- Develop a Plan to Restore Degraded Habitat in Casco Bay

The Department of Inland Fisheries and Wildlife looks forward to working with others to develop a plan for restoring degraded habitat in Casco Bay. The collaborative process established to research, select and prioritize restoration will be beneficial to all.

Action #6 -- Develop Biological/Environmental Indicators

In concert with the research on biological indicators being conducted by the U.S. Environmental Protection Agency, the Maine Department of Environmental Protection will develop indicators for Maine marine waters.

Action #7 -- Develop Sediment Quality Criteria and Sediment Quality Discharge Limits that Apply to Casco Bay

The U.S. Environmental Protection Agency is developing sediment criteria. When these are final, the Maine Department of Environmental Protection will work to adapt these specifically to Maine.

Action #8 -- Develop a Grant Program to Support Local Habitat Protection Activities

Funding for a grant program will come from others. However, many state agencies are actively involved in identifying and protecting habitat in Casco Bay. To assist this effort, the Maine Coastal Program will fund an effort with the Department of Marine Resources at a cost of \$50,000 to document significant subtidal coastal fisheries habitat in Casco Bay. The tasks will include: conducting an inventory of existing information on fisheries habitat; using existing sediment maps compiled by the Maine Geological Survey at the State Department of Conservation to determine species assemblages-habitat relationships at selected sites, mapping of species assemblages of marine fishes in relation to specific sediment types and initiating work on management recommendation for "critical" marine habitat areas. This work will contribute greatly to our understanding of the fisheries resource in Casco Bay.

Action #9 -- Research Whether State Subsurface Wastewater Disposal Rules Adequately Prevent Coastal Pollution

Based upon new water quality information developed through work of the Casco Bay Estuary Project, the Department of Human Services will review the samples and determine if further research and/or regulatory change is needed. The State Planning Office and the Department of Environmental Protection stand available to assist.

ENVIRONMENTAL MONITORING PLAN

Committing to undertake the above actions is not sufficient to ensure that needed environmental improvements occur. Recognizing the importance of judging progress and ensuring that our activities are accountable, we are highly supportive of the monitoring efforts that will occur. As with the actions listed above, State agencies already contribute greatly in developing baseline information to assess trends over time. Specifically, the Department of Environmental Protection oversees the Surface Water Ambient Toxics Monitoring Program, which is a

comprehensive state-wide program to assess the toxic contamination of state waters.

Further, the Department of Marine Resources, as the responsible party for the opening and closing of clam flats, will continue its surveillance program for fecal coliform pollution in the Marine waters of the State of Maine. This program will continue to be expanded, within the confines of practicality of department resources, to involve volunteer water sampling efforts and to target areas as prioritized by municipal and industry interest. As these monitoring efforts continue, the Department of Marine Resources will build upon its' efforts to share this information with the Department of Environmental Protection and other related groups to ensure that areas are targeted for clean-up in a logical manner. This type of interaction has proven successful in some parts of the state and an extension to the Casco Bay area is imminent.

Finally, the Department of Inland Fisheries and Wildlife conducts a periodic survey of sea birds and wading birds and has prepared an eel grass base map which will be critical in assessing change over time.

IMPLEMENTATION

Beyond undertaking actions for the protection of Casco Bay as outlined in the *Casco Bay Plan*, State agencies also look forward to participating in the leadership necessary in implementing the *Plan* through active membership on the Implementation Committee. As outlined in the *Plan*, the Commissioner of the Department of Environmental Protection, Director of the State Planning Office, Commissioner of the Department of Marine Resources and Commissioner of the Department of Inland Fisheries and Wildlife will individually and collectively bring guidance and expertise necessary for the long term protection of Casco Bay. The opportunity to coordinate and communicate with others on the Implementation Committee is a critical component to the long term protection of Casco Bay and one that State agencies look forward to participating in.



Cumberland County Soil and Water Conservation District
381 Main St., Suite 3 - Gorham, ME 04038 - (207) 839-7839 - Fax: (207) 839-7834

May 13, 1996

Mr. Jeffrey Jordan
Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04103

Re: Casco Bay Plan

Dear Mr. Jordan,

The purpose of this letter is to indicate the District's support of the Casco Bay Plan. The plan clearly defines the priority issues facing Casco Bay, and proposes actions to address those issues. The Plan recognizes that education, technical assistance, planning, and enforcement are key to a balanced approach to neutralize the threats to Casco Bay.

The Conservation District has long been an advocate of a voluntary, total watershed approach to addressing soil and water issues. It is to this end that the District has shaped the delivery of its programs and services. Technical assistance has long been the District's priority strategy to conserve soil and water resources in the Casco Bay Watershed. Technical assistance, education and outreach are major components of the District's 1995-2000 Strategic Plan, which have been mirrored in the Casco Bay Plan.

With emphasis on a coordinated approach, the District is able to capitalize on its many partnerships in the watershed to achieve the goals and objectives of its soil and water conservation programs. Since 1946, direct technical assistance to private citizens, municipalities, agencies, organizations, and others for the conservation of soil and water resources has been the primary focus of District programs. The District pledges its programs and efforts in continued support of the soil and water resources of the Casco Bay Watershed and the actions identified in the Casco Bay Plan.

Sincerely,

John T. Flaherty, Jr.
Chair
Board of Supervisors

JTF/bf

CONSERVATION - DEVELOPMENT - SELF-GOVERNMENT



Greater Portland Council of Governments

233 Oxford Street • Portland, Maine • 04101 • 774-9891 (phone) • 774-7149 (fax)

September 4, 1996

Patricia Harrington
Executive Director
Casco Bay Estuary Project
312 Canco Road
Portland ME 04103

Dear Pat,

I am writing to express the Greater Portland Council of Governments' support for and continuing commitment to helping to implement the Casco Bay Plan.

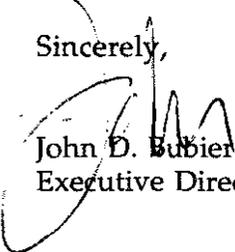
Besides continuing to serve on the Implementation Committee, we will work to promote implementation of policies and strategies contained in the Plan wherever possible through our various programs as we work with community leaders and citizens on issues and projects related to the priority issues of the Casco Bay Plan. When we work with communities updating local comprehensive plans and ordinances, we will encourage discussion and consideration of the Casco Bay Plan strategies for incorporation into plans, ordinances and voluntary programs.

When we assist with development review applications, as we are sometimes asked to do, we will cite local ordinances' authority such as it is, to justify measures that will help minimize impacts on the Bay.

We also look forward to continuing to cooperate to our mutual benefit with respect to continuing to develop our shared GIS database resources.

And wherever possible under other programs not yet established we will look for ways to encourage implementation of the Casco Bay Plan as part of the process.

Sincerely,


John D. Bubier
Executive Director

August 7, 1996

Mr. Jeffrey K. Jordan, Chairman
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04032

Dear Jeff:

The Friends of Casco Bay and the Casco Bay Estuary Project work as partners in our shared goal of protecting Casco Bay and preventing pollution and activities which negatively impact the bay's ecosystem. We stand in support of the *Casco Bay Plan* and are committed to carrying out many of the specific activities outlined in the *Plan*. We have actively participated in the development of the *Plan* and believe implementation is critical.

The work of Friends of Casco Bay broadly supports all the actions outlined in the *Plan*. More specifically however, there are some actions which we look forward to playing a major role in, as follows:

Public Education Action #4--Educate Boaters About Low-Impact Practices, Non-Toxic Boat Products, and the Need to Protect Sensitive Habitats

The Friends of Casco Bay looks forward to playing a major role in educating boaters about a number of different issues. We have actively been researching successful boater education projects throughout the nation and are in the process of publishing an *Environmental Boater's Guide*.

Public Education Action #9--Continue Friends of Casco Bay's Successful Volunteer Water Quality Monitoring Program

Of great importance to the bay and to both our organizations is the continuation of the Citizen Stewards volunteer water quality monitoring program which was initiated with Estuary Project support in 1992. This important stewardship activity has expanded each year. In the last year, we and over 150 volunteers monitored 108 sites in the bay for five water quality parameters. These monitoring efforts established a baseline of information which is now being used to determine change over time. With high quality control and EPA approval the data have been used by researchers, academics, and state and federal agencies. To analyze and communicate the data, we have developed a comprehensive data management program. Beyond its usefulness to Friends of Casco Bay, the

Board of Directors 1996

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Sherry F. Huber, *West Falmouth*

P. Andrews Nixon, *Brunswick*

Casco BayKeeper:

Joseph E. Payne, *Westbrook*

Marine Debris Council

Project Director:

Joan Saxo, *Freeport*

long term goal is to share this with all water quality monitoring groups in Maine to promote uniformity of data, data sharing and ease of data access.

Technical Assistance Action #1--Provide Technical Assistance to Help Reopen Clam Flats

The Friends of Casco Bay launched a five to eight year effort to work toward reopening many of the clam flats in Casco Bay which are closed due to pollution and has been working on numerous projects toward that end. Our Clam Flat Coordinator is a specialist in providing technical assistance to communities on how to open their clam flats.

Technical Assistance Action #2--Provide Technical Assistance to Monitor and Open Public Swimming Areas

With few public swimming areas monitored at this time for bacterial pollution, the need to better monitor and communicate the results is evident. The Friends of Casco Bay has been lobbying for the monitoring of swimming beaches, as needed, as well as helping municipalities understand their role in swimming area management.

Regulatory/Enforcement Action #4--Comply with the Pumpout Law

The Friends of Casco Bay is in its second year of a major education program for boaters, as well as providing a pumpout boat to make the pumping of marine sewage-holding tanks and compliance with the Pumpout Law easy.

Planning and Assessment Action #2--Develop a Comprehensive Management Strategy for Dredged Material

The Friends of Casco Bay, both as an organization and as a member of the Waterfront Alliance, is committed to working toward developing practical alternatives to the disposal of dredged material as well as reducing the input of toxic materials into harbor sediments, which complicates dredge disposal issues. This is a serious and complex issue which requires the cooperation and coordination of many interested parties. We have already taken a lead by chairing the Technical Subcommittee researching dredging issues in Portland Harbor. Moreover, we have committed, as a partner in the Sustainable Development Challenge Grant recently submitted by the Casco Bay Estuary Project, to contribute at least \$20,000 in services to insure success of the Portland Harbor Economic Viability Project.

Planning and Assessment Action #3--Review Implementation of the National Shellfish Sanitation Program

In concert with our efforts to reopen clam flats in Casco Bay and to train municipalities in the management of this important resource is the need to insure that the National Shellfish Sanitation Program is administered for the protection of public health while providing for the economic use of the resource. The Friends of Casco Bay has been working with the State of Maine Department of Marine Resources to insure that this is accomplished.

Monitoring Plan

The Friends of Casco Bay is a constant supporter of the need to monitor change over time. As an organization which contributed to the creation of the Monitoring Plan, we look forward to actively participating in Monitoring Plan implementation and in trying to insure that credible data are developed. Additionally, for Monitoring Action #11-

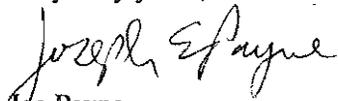
temperature, salinity, dissolved oxygen and clarity monitoring, we will monitor these on a monthly basis at several stations in Casco Bay. This activity will build on three years' worth of data previously collected by Friends of Casco Bay.

Board of Directors

Beyond all the specific actions outlined in the plan is the need to manage the project well and be on the cutting edge of new issues which will arise in the future. The Friends of Casco BayKeeper will serve on the Board of Directors of the Casco Bay Estuary Project and looks forward to helping steer the course ahead.

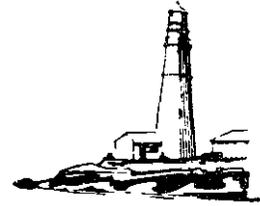
The entire relationship between the Friends of Casco Bay and the Casco Bay Estuary Project cannot be captured in on letter such as this. However, this should serve to illustrate our level of commitment to the work ahead.

Very truly yours,

A handwritten signature in cursive script that reads "Joe Payne".

Joe Payne
Casco BayKeeper

Casco Bay Island Development Association, Inc.
P.O.Box 3373, Portland, Maine 04104.



April 8, 1996

Dear Pat,

I am writing at the request of CBIDA's Steering Committee to confirm what Jean Dyer has already told you; CBIDA would like to be a part of the new Estuary Board which will soon replace the present Management Committee. We understand that we would appoint an island representative to the new board and that there would be no financial liability to CBIDA as a result of actions of the board.

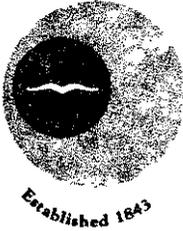
CBIDA assumes it's primary function would be to keep islanders informed of the Estuary's programs, etc. and to communicate islander's concerns to the program.

We will also continue to produce and distribute a pamphlet to boaters. This pamphlet will provide boaters with practical information, such as where to find gas, but will also contain suggestions for responsible boating.

CBIDA has had experience in lobbying both local and state governments. We feel this is something we can do for the Estuary program if the occasion arises.

Sincerely,

Virginia Fisher, president



MAINE AUDUBON SOCIETY

Gilsland Farm • 118 U.S. Route One • Falmouth, Maine 04105 • 781-2330

The responsible voice for Maine's environment and natural resources.

Thomas A. Urquhart
Executive Director

June 30, 1996

Ms. Patricia Harrington
Director
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04032

Dear Patricia,

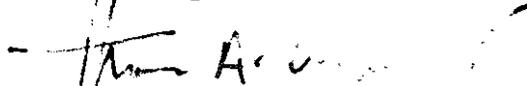
On behalf of Maine Audubon Society, it is my pleasure to endorse the Casco Bay Plan. We support the goals and objectives of the plan, and we applaud the overarching focus on cooperative initiatives.

We hope that the Casco Bay Estuary Project will provide strong leadership in harnessing the resources and expertise to be found in the many efforts, public and private, aimed at enhancing the environmental quality of Casco Bay. The Plan is an important blue print for such an effort.

As stated in our mission, "Maine Audubon Society is dedicated to the protection, conservation and enhancement of Maine's ecosystems through the promotion of individual understanding and actions." We have a particular interest in the Plan's priorities aimed at **protecting habitat and promoting stewardship**. In implementing the goals associated with these two priorities, Maine Audubon can provide considerable expertise in the category of **public education**. Programs for school children, teachers and the general public at the new Environmental Center at Gilsland Farm are aimed especially at promoting awareness and action by Maine's citizens on environmental issues affecting the Casco Bay watershed.

We look forward to participating in partnerships with the Casco Bay Estuary Project and other organizations to make the Casco Bay Plan a success.

Sincerely yours,


Thomas A. Urquhart
Executive Director





April 11, 1996

Patricia Harrington
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04103

Dear Patricia,

Thanks again for giving us the opportunity to comment on the Casco Bay Plan. We are very encouraged by the work you (and all parties involved) have done, and look forward to working with you on the action measures that relate to our mission.

There are three public education task forces that we are committed to participating in on some level: the task force to educate boaters about low-impact practices, non-toxic boat products, and the need to protect sensitive habitats; the task force to develop and provide environmental habitat kit and guide to Casco Bay; the task force to extend the State Planning Office's New "Marine Volunteer Program" to Casco Bay.

As you know, MITA Board member Erno Bonebakker has been very involved with various projects and volunteer efforts in Casco Bay. He has volunteered to serve on the above mentioned task forces, representing MITA, when the time comes. We are also open to participating in some of the other task forces—please let us know if you think of any that would benefit from our presence. Thanks again for all of your hard work!

Best regards,


Lucy Birkett
Program Coordinator

cc Erno Bonebakker

MAILING ADDRESS: P.O. BOX C, ROCKLAND, MAINE 04841-0735

OFFICE LOCATIONS: 117A TILLSON AVENUE, ROCKLAND, MAINE 04841-3416 • PHONE/FAX (207) 596-6456
41 A UNION WHARF, BOX 8 • PORTLAND, MAINE 04101-4607 • PHONE (207) 761-8225/FAX (207) 761-0657



Town of Brunswick, Maine

INCORPORATED 1739

OFFICE OF THE TOWN MANAGER

DONALD H. GERRISH, MANAGER

28 FEDERAL STREET
BRUNSWICK, MAINE 04011
TELEPHONE 725-6659
FAX # 725-6663

May 14, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04103

Dear Jeff,

The Town of Brunswick would like to express its support for the *Casco Bay Plan*. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

During the development of the *Casco Bay Plan* we have participated in projects which have given us a better understanding of our municipality's relationship to Casco Bay. We now have the capacity to utilize GIS data such as parcels, soils, contours, and zoning via Arcview in our planning office. We also took advantage of the Project's minigrant program to develop a homeowners' handbook for residents in our Coastal Protection Zone and to further examine the potential impacts of septic systems on Middle and Maquoit Bays.

We look forward to working with other municipalities, state agencies and environmental groups to implement the *Casco Bay Plan* to protect Casco Bay for the future.

Sincerely,

Donald H. Gerrish
Town Manager



TOWN OF CAPE ELIZABETH

P.O. BOX 6260
320 OCEAN HOUSE ROAD
CAPE ELIZABETH, MAINE 04107-0060

MICHAEL K. McGOVERN
Town Manager

799-5251
AREA CODE 207
FAX 799-7141

June 27, 1996

Jeffrey Jordan, Chairman
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04103

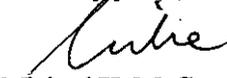
Dear Jeff:

The Town of Cape Elizabeth would like to express its support for the Casco Bay Plan. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

During the development of the Casco Bay Plan we have participated in projects which have given us a better understanding of our municipality's relationship to Casco Bay. We have been introduced to GIS and soon hope to utilize Arcview to access data layers such as parcels, soils, contours, and zoning in our town office. We also took advantage of the Project's minigrant program to develop a stormwater management plan for the Town Center and to develop interpretive signs for our expanding greenbelt pathway system.

We look forward to working with other municipalities, state agencies, and environmental groups to implement the Casco Bay Plan to protect Casco Bay for the future.

Sincerely yours,


Michael K. McGovern
Town Manager

TOWN OF CUMBERLAND

Town Office Building
P.O. Box 128
12 Drowne Road
Cumberland, Maine 04021
(207) 829-5559

May 7, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Dear Jeff :

The Town of Cumberland would like to express its support for the *Casco Bay Plan*. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

During the development of the *Casco Bay Plan* we have participated in projects which have given us a better understanding of our municipality's relationship to Casco Bay. We now have the capacity to utilize GIS data such as soils and contours via Arcview in our planning office. We also took advantage of the Project's minigrant program to train citizen volunteers to conduct shellfish resource and shoreline pollution source surveys to maximize the benefits of the soft-shell clam fishery.

We look forward to working with other municipalities, state agencies and environmental groups to implement the *Casco Bay Plan* to protect Casco Bay for the future.

Sincerely,


Robert Benson
Town Manager

Town of Durham
630 Hallowell Road
Durham, Maine 04222

Tel. 353-2561
353-2350

May 15, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Dear Jeff,

The Board of Selectmen of Durham have asked me to write you to express their support for the Casco Bay Plan. As municipal officials and residents of the Casco Bay watershed, they understand the importance of protecting Casco Bay and its resources.

During the development of the Casco Bay Plan we have participated in projects which have given us a better understanding of Durham's relationship to Casco Bay. We took advantage of the Project's mini-grant program to study a local water resource of concern, Runaround Pond. The study of the Pond's water quality and inventories of surrounding wildlife habit, recreational and scenic values has been used for public education to heighten local awareness of the Pond's value and its sensitivity to impact from watershed development.

We look forward to working with other municipalities, state agencies and environmental groups to implement the Casco Bay Plan to protect Casco Bay for the future.

Sincerely,



Joe Tarazewich
Adm. Asst.

Town of Falmouth, Maine

John D. Harris, Town Manager

271 Falmouth Road
Falmouth, Maine 04105
(207) 781-5253



July 25, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04103

Dear Jeff:

The Town of Falmouth would like to express its support for the *Casco Bay Plan*. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

During the development of the *Casco Bay Plan* we have participated in projects which have given us a better understanding of our municipality's relationship to Casco Bay. We have begun to utilize ArcView to access GIS data layers such as parcels, soils, contours, and zoning in our town office. We also took advantage of the Project's minigrant program to develop an award-winning watershed management plan and follow-up stormwater management plan to raise public awareness about watershed issues and the potential impacts of development.

We look forward to working with other municipalities, state agencies, and environmental groups to implement the *Casco Bay Plan* to protect Casco Bay for the future.

Sincerely,

A handwritten signature in black ink that reads "John D. Harris". The signature is written in a cursive style with a large initial "J".

John D. Harris
Town Manager

TOWN OF FREEPORT

Municipal Offices
(207) 865-4743
FAX (207) 865-0929



Dale C. Olmstead, Jr.
Town Manager

May 9, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Dear Jeff:

The Town of Freeport would like to express its support for the *Casco Bay Plan*. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

During the development of the *Casco Bay Plan* we have participated in projects which have given us a better understanding of our municipality's relationship to Casco Bay. We took advantage of the Project's minigrant program to sample water quality at over 41 sites for suspected pollution that might be contributing to the closure of clam flats. In all but three cases, identified pollution sources were eliminated, helping to ensure that opened clam flats will remain available for harvesting.

We look forward to working with other municipalities, state agencies and environmental groups to implement the *Casco Bay Plan* to protect Casco Bay for the future.

Sincerely,

A handwritten signature in black ink, appearing to read 'Dale C. Olmstead, Jr.', is written over a faint, larger version of the same signature.

Dale C. Olmstead, Jr.
Town Manager

Town of Harpswell, Maine

OFFICE OF

SELECTMEN, ASSESSORS, & OVERSEERS OF THE POOR

P.O. BOX 139 • SOUTH HARPSWELL, ME 04079

(207) 833-5771

July 2, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04103

Dear Jeff:

The Town of Harpswell would like to express its support for the Casco Bay Plan. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

During the development of the Casco Bay Plan, we have participated in projects which have given us a better understanding of our municipality's relationship to Casco Bay. We were the first municipality in the watershed to utilize GIS and now use Arcview to access data layers such as parcels, soils, contours, and zoning in our town office. We also took advantage of the Project's minigrant program to determine the pollution sources responsible for closure of a very productive clam flat. Currently, the Harpswell Conservation Commission is completing another minigrant project which will identify prime nursery habitat areas for juvenile lobsters.

We look forward to working with other municipalities, state agencies, and environmental groups to implement the Casco Bay Plan to protect Casco Bay for the future.

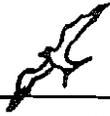
Sincerely,



Robert E. Webber, Chairman
Harpswell Board of Selectmen

REW/am

Town of Long Island



P. O. Box 263 Long Island, Maine 04050 207-766-5820



May 7, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Dear Jeff,

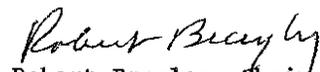
The Town of Long Island would like to express its support for the *Casco Bay Plan*. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

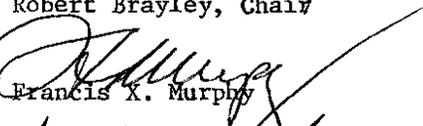
As an island community we have a unique understanding of our municipality's relationship to Casco Bay, and the impact that others can have upon us. We have taken advantage of the Project's technical assistance program to get water quality sampling training from the Maine Department of Marine Resources. Citizen volunteers are now sampling regularly in hopes of getting many of the island's clam flats reopened for harvesting.

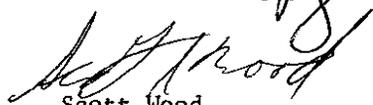
We look forward to working with other municipalities, state agencies and environmental groups to implement the *Casco Bay Plan* to protect Casco Bay for the future.

Sincerely,

Selectmen


Robert Brayley, Chair


Francis X. Murphy


Scott Wood



TOWN OF PHIPPSBURG
HC 32, Box 22A
Phippsburg, Maine 04562-9602
Phone: (207) 389-2653 / Fax: (207) 389-1522

May 7, 1966

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

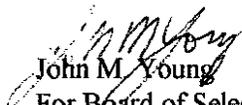
Dear Jeff,

The Town of Phippsburg would like to express its support for the Casco Bay Plan. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

During the development of the Casco Bay Plan we have participated in projects which have given us a better understanding of our municipality's relationship to Casco Bay. Recently, we have taken advantage of the Project's technical assistance program to get some engineering design assistance for a chronic road erosion problem which is impacting an adjacent wetland.

We look forward to working with other municipalities, state agencies and environmental groups to implement the Casco Bay Plan to protect Casco Bay for the future.

Sincerely,


John M. Young
For Board of Selectmen
Town of Phippsburg



CITY OF PORTLAND

June 11, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, ME 04103

Dear Jeff:

The City of Portland would like to express its support for the *Casco Bay Plan*. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. The City is actively pursuing actions to protect water quality because we understand that the diverse pollution sources that threaten water quality are more effectively addressed locally.

During the development of the *Casco Bay Plan*, we have completed numerous projects which have directly benefited the water quality of Casco Bay. The City is committed to implementing its \$54 million CSO abatement program over 15 years. Through the use of innovative storage techniques such as hydrobreaks, 72% of all storm water is already being treated. Other significant projects include:

- Construction of a waste water treatment plant on Peaks Island to eliminate two municipal outfalls;
- Initiation of Marine Combined Sewer Abatement Program to improve water quality in areas closed to shellfish harvesting;
- Completion of master plan for acceptable waste water management which resulted in a sewer extension to the southwest quadrant of Peaks Island to remove five overboard discharge systems.
- Adoption of shoreland zoning buffer standards to protect island wetlands;

Mr. Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
June 11, 1996
Page 2

- Adoption of technical standards in the City's site plan review regulations to model stormwater contributions from new development in order to reduce impacts o the City's sewer system;
- Active pollution prevention projects include the industrial pretreatment program, street sweeping, and catch basin cleaning programs; and
- Innovative Capisic Brook Stormwater Abatement Project, going to the Council for approval in September, will construct a natural water pollution abatement system with a greenbelt parkway and a comprehensive water quality monitoring and habitat management plan.

We look forward to working with other municipalities, state agencies and environmental groups to implement the *Casco Bay Plan* to protect Casco Bay for the future.

Sincerely,


Robert B. Ganley
City Manager

RBG/s

ref:jordan/rbg.ltr



CITY OF SOUTH PORTLAND

LINDA R. BOUDREAU
Mayor

LINDA C. COHEN
City Clerk

MARY KAHL
Corporation Counsel

May 29, 1996

District One

LINDA R. BOUDREAU

District Two

SUSAN B. AVERY

District Three

RALPH C. BAXTER, SR.

District Four

ROBERT W. FICKETT

District Five

BRIAN S. DEARBORN

At Large

KEVIN J. GLYNN

At Large

NANCY L. LARSEN

Patricia Harrington, Executive Director
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Dear Patricia,

The City of South Portland would like to express its support for the work of the Casco Bay Estuary Management Committee and staff in the development of the Casco Bay Plan. As you are aware, the City of South Portland has actively participated in the development of this plan for Casco Bay through the efforts of Jeffrey K. Jordan who has participated as a member of the Management Committee since the start of the project five years ago, and has served Chair of the Management Committee since May of 1994.

As one of the communities fronting directly on Casco Bay, the City of South Portland has become significantly more aware of the importance of protecting Casco Bay both as an ecological and an economic resource for not only this area but much of the State of Maine. Residents, taxpayers and sewer rate payers in South Portland since 1989 have made a significant contribution towards improving water quality in Casco Bay. The City of South Portland has spent in excess of \$14 million thus far in addressing the abatement and control of combined sewer overflows. In April of 1995, the City completed the upgrade of the sewerage treatment facility to increase the capacity of secondary treatment from an average of 5.5 million gallons per day to 9.3 with an instantaneous peak flow of 22.9 million gallons per day. In addition, the City was able to convert three secondary clarifiers into primary settling tanks to provide an additional 33 million gallons of primary equivalent treatment and disinfection for what would have been CSO discharges. The City has also undertaken the upgrade of its five largest pump stations to increase the carrying and load capacity of our collection system to deliver the maximum amount of flow possible to this significantly expanded treatment plant, thereby reducing discharges for combined sewer overflows in Casco Bay. The City has been able to reduce the total number of CSO discharge points from thirty-five to eleven.

Patricia Harrington
May 29, 1996
Page Two

I am also pleased to announce, through the efforts of Jeff and City staff, we will begin this summer an ongoing water monitoring program on Willard Beach to inform the public on water quality at Willard Beach.

During the development of the Casco Bay Plan, a number of City Councilors and staff participated in projects and public hearings which have given us a better understanding of our municipality's relationship to the Bay and the necessity to provide for the protection of the watershed for Casco Bay. The City has made a long term commitment through our investments in the last seven years to improve the quality of Casco Bay, as well as having recently updated our Pre-Treatment Ordinance for industrial discharges and with the adoption of our Comprehensive Plan in 1992 which calls for protection efforts through zoning and land use planning techniques to protect water quality and habitat areas for wildlife.

We look forward to working with other municipalities, state and federal agencies and environmental groups to implement the Casco Bay Plan to protect this most valuable resource in our backyard!

Sincerely,



Linda Boudreau
Mayor

cc: Members of the South Portland City Council
Jeffrey K. Jordan, Acting City Manager

TOWN OF WEST BATH
RR 1, BOX 420
WEST BATH, MAINE 04530

May 7, 1996

Jeffrey Jordan, Chair
Management Committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Dear Jeff,

The Town of West Bath would like to express its support for the *Casco Bay Plan*. As residents and municipal officials of the Casco Bay watershed, we understand the importance of protecting Casco Bay and its valuable resources. Municipalities are already assuming more responsibility for water quality protection due to the changing nature of federal and state governments and because we now understand that the diverse pollution sources that threaten water quality are most effectively addressed locally.

During the development of the *Casco Bay Plan* we have participated in projects which have given us a better understanding of our municipality's relationship to Casco Bay. We took advantage of the Project's minigrant program to evaluate the potential for alternative septic system designs to replace existing overboard discharge systems which were adjacent to productive soft-shell clam flats.

We look forward to working with other municipalities, state agencies and environmental groups to implement the *Casco Bay Plan* to protect Casco Bay for the future.

Sincerely,

Richard Totten, Chairman
Selectmen



TOWN OF YARMOUTH

P.O. BOX 907
YARMOUTH, MAINE 04096

STEVEN D. WESTRA
Director of Planning and Development
207-846-2401
Fax: 207-846-2403

May 10, 1996

Jeffrey Jordan, Chair
Management committee
Casco Bay Estuary Project
312 Canco Road
Portland, Maine 04103

Dear Jeff:

As the Director of Planning and Development for the Town of Yarmouth, I am writing to express my support for the *Casco Bay Plan*. Although Yarmouth is not faced with the degree of development pressures faced by some surrounding towns, it is still very difficult to monitor and address the many needs of Casco Bay.

As you may know, our public works department has worked very hard to make significant improvements to our sewerage treatment plant, with impressive results seen in the local calm flats. But, this has been a full time effort which only addressed one specific aspect of the health of Casco Bay. We simply do not have the time, staff, or expertise needed to care for Casco Bay as well as we would like.

Working with the Casco Bay Estuary Project, we have developed some tools such as GIS mapping to assist us. However, we have just scratched the surface of that technology and will also need further training from Casco Estuary Project staff.

The *Casco Bay Plan* is a critical tool to ensure for the future viability of the Bay. I am sure the Governor and EPA will recognize the economic and environmental importance of implementing the plan. If there is any other way I can express Yarmouth's support of the *Casco Bay Plan*, please let me know.

Sincerely,

Steven D. Westra
Planning Director

SDW:jh

sw\cascobay.ltr