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Community Strategies to Improve the Bay

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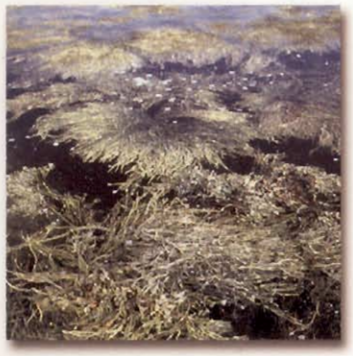
Community Strategies to Improve the Bay

Steps that can be taken locally to improve and protect Casco Bay



The Friends of Casco Bay
BAYKEEPER
April 2002

Casco Bay Estuary Project

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A project affiliated with the
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Community Strategies to Improve the Bay

Steps that can be taken locally to improve and protect Casco Bay

Shaded area = Lower Casco Bay Watershed

Casco Bay – A Plan for Protection

Nonpoint source pollution in Maine comprises 78% of the total water body impairment

The goal of this report is to provide an overview of water quality in Casco Bay today and to identify steps that can be taken at the local level to protect the Bay. Over the last thirty years, efforts to improve and protect water quality in our nation's coastal waters have addressed the largest sources of pollution: industrial discharges, municipal sewage treatment plants and threats from catastrophic spills. More recently, the focus on water quality improvement has shifted to the more diffuse – and more widespread - sources of contamination known as nonpoint source pollution. According to the National Wildlife Federation, nonpoint source pollution in Maine composes 78% of the total water body impairment. While federal and state action was required to address point sources of pollution, local action – often with help from state and federal agencies – is required to effectively address nonpoint source pollution. This report identifies specific actions that the towns bordering Casco Bay can take to ensure the continued improvement of water quality in the Bay.

Casco Bay is a spectacular resource that serves many purposes – it supports commercial fisheries, provides recreational opportunities, is home to wildlife and offers open space. The shores of the Bay are the most densely populated in the state of Maine: 12% of the state's population lives in the twelve communities bordering the Bay. These communities comprise only 0.8% of the state's land area and their populations continue to grow (Table 1). While the health of the Bay was once taken for granted, we now know that a broad range of human activities affect the quality of the Bay's environment. Toxic contaminants in the sediments of the Bay attest to the use of the bay as a dumpsite for discharges of all kinds for decades before such practices were regulated. On the Bay itself, waste discharges from boats, use of anti-fouling compounds, and spills of petroleum products are threats to the Bay's water quality. Today, runoff associated with land use within the Bay's watershed is the biggest threat to its water quality. Residential and commercial development, agriculture, forestry, and discharges from cars, furnaces, incinerators and power plants all affect the naturally occurring water, sediments, and nutrients that flow from the land into Casco Bay.

Runoff associated with land use within the bay's watershed is the biggest threat to its water quality

Stormwater runoff is most likely the single largest source of pollution to the bay, carrying with it nutrients, herbicides, pesticides, pathogens, and other toxic contaminants, as well as sediments. Stormwater runoff from impervious surfaces such as roads and parking lots carries petroleum byproducts from vehicles, salt and deicing compounds, and sand. Runoff from agricultural areas and lawns can carry fertilizers, pesticides, and fecal coliform bacteria. Stormwater runoff picks up and transports these and

Table 1. Population change by town: 1990-2000

Town	1990	2000	% Change
Phippsburg	1,815	2,106	+16.0%
West Bath	1,716	1,798	+4.8%
Brunswick	20,906	21,172	+1.3%
Harpswell	5,012	5,239	+4.5%
Freeport	6,905	7,800	+13.0%
Yarmouth	7,862	8,360	+6.3%
Cumberland	5,836	7,159	+22.7%
Long Island	201	202	+0.5%
Falmouth	7,610	10,310	+35.5%
Portland	64,157	64,249	+0.1%
South Portland	23,162	23,324	+0.7%
Cape Elizabeth	8,854	9,086	+2.6%
Totals	**154,036**	**160,805**	**+4.4%**

12% of the state's population lives in the twelve communities bordering Casco Bay

Recompence Bay in Freeport

other harmful pollutants and discharges them, untreated, to waterways. When left uncontrolled, these discharges can result in reduced dissolved oxygen, contamination of wildlife, destruction of fish and shellfish habitat, loss in aesthetic value, contamination of drinking water, and impaired water quality.

Casco Bay is an estuary: a water body where fresh water meets salt water. The Stroudwater/Fore, Royal, Cousins and Presumpscot Rivers flow into the bay along with myriad smaller streams. Compared to other estuaries, however, Casco Bay receives relatively little fresh water. Complex circulation patterns in the bay, driven by tides, winds, and currents in the neighboring Gulf of Maine, link the bay to the Gulf and affect the functioning of the bay's underlying ecosystem at least as much as freshwater inputs.

Although we refer to one "bay," Casco Bay is in fact a series of smaller water bodies. The bay's geography, broken up by long peninsulas, large expanses of intertidal area, and hundreds of islands makes it difficult to generalize about the bay in any meaningful way. Middle Bay is different from Lowell's Cove, Quahog Bay from Portland Harbor, Hussey Sound from the Harraseeket; these differences can be measured in terms of freshwater inflow, exchange with the Gulf of Maine, and, ultimately, water quality.

Threats to the Bay:

Nutrient loading

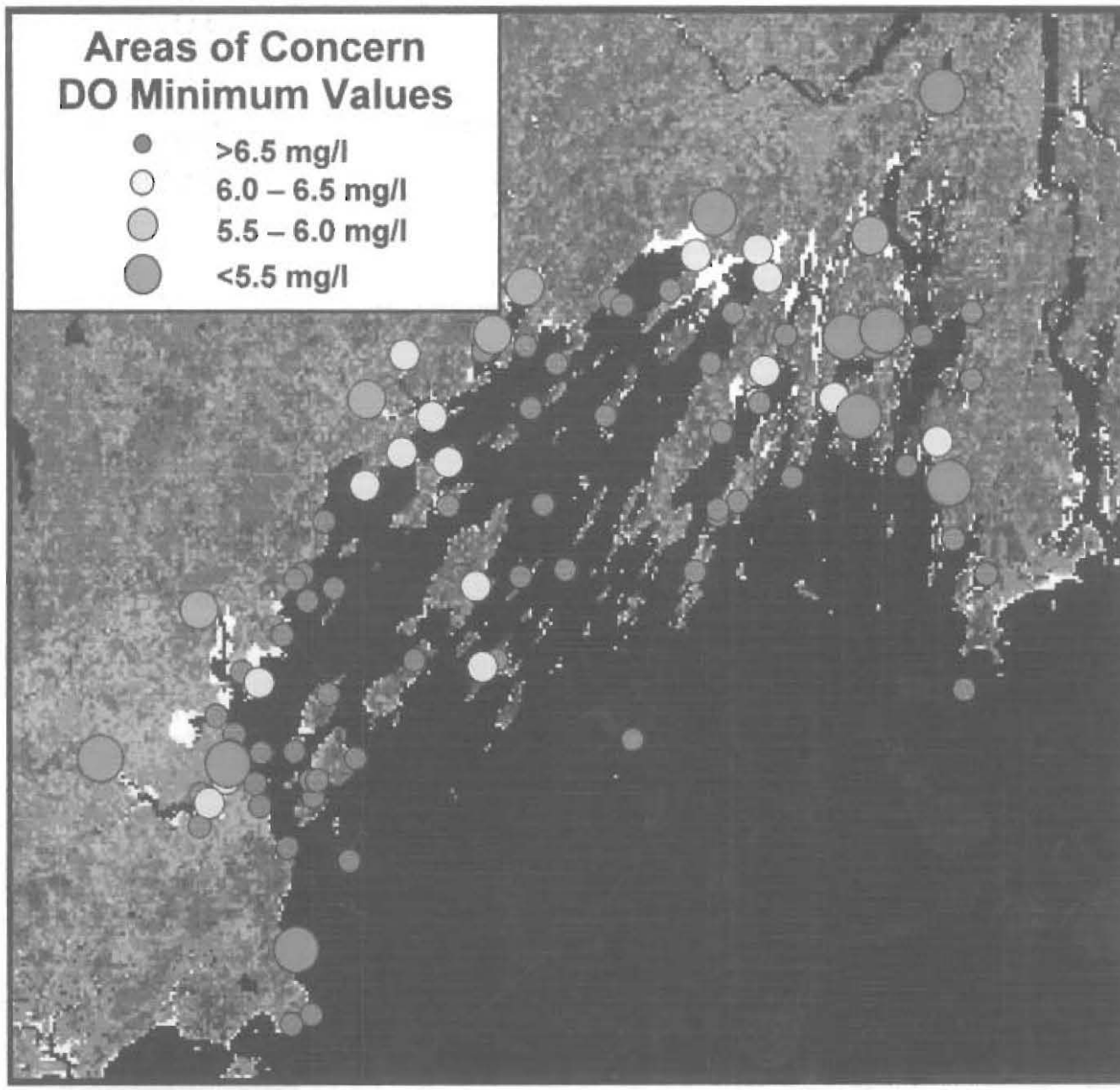
Excessive organic matter and nutrients enter the bay in runoff and can support an explosion of oxygen demanding bacteria. Resulting declines in dissolved oxygen can be lethal to marine life. Dissolved oxygen levels are therefore an important indicator of ecosystem health.

Casco Bay is generally in good health with regard to dissolved oxygen but there are areas of concern

The Friends of Casco Bay have conducted water quality monitoring in the bay since 1993. Eighty stations are sampled from April to October from shore; an additional ten stations are sampled by boat year round. Dissolved oxygen is measured along with several other oceanographic parameters. Data from the first six years of the monitoring program have recently been analyzed. The results indicate that while Casco Bay is generally in good shape with regard to dissolved oxygen, there are areas of concern (see map on facing page). Portland Harbor, the Presumpscot River, Royal River, Cousins River, Maquoit Bay, Quahog Bay and New Meadows River all exhibited relatively low levels of dissolved oxygen. In Portland Harbor, with seven sites sampled, low levels were primarily associated with Custom House Wharf and the Stroudwater Bridge sampling sites. By contrast, Quahog Bay, with five sites sampled, exhibited more uniformly depressed levels of dissolved oxygen. Point source discharges may be the cause of lower dissolved oxygen at Customs House Wharf, while nutrient-laden stormwater may be the source of the problem at the Stroudwater Bridge. The most recent dissolved oxygen data from the Presumpscot showed improved dissolved oxygen, indicating that elimination of the Sappi pulping operation upstream at Westbrook may have reduced levels of oxygen-demanding bacteria at the mouth of the river.

Sources of nutrients include septic systems, wastewater treatment plants, agricultural land and lawns. Conversion of meadows and woodlands into lots with buildings and pavement, and the loss of wetlands, increase the flow of nutrients into Casco Bay. That is because soils filter stormwater and plants absorb nutrients, while impervious surfaces increase runoff. Naturally occurring sources of organic matter can also cause problems: the Friends of Casco Bay monitoring program determined that the natural accumulation of seaweed in Peabbles Cove in Cape Elizabeth is the cause of low dissolved oxygen in that area.

Massive 1979 fish kill in the New Meadows River of menhaden (pogies) deprived of an adequate supply of oxygen



Large red circles indicate areas of concern based on minimum dissolved oxygen concentrations observed between 1993-1998.

A naturally occurring bloom of toxic algae may have contributed to the lethal decline in dissolved oxygen that resulted in a massive shellfish die-off in Maquoit Bay in 1988. The geography of the bay's inlets must be taken into account in evaluating the threat of nutrient loading. Maquoit Bay is relatively poorly flushed; nutrients are more likely to cause a problem in Maquoit Bay than in other areas of the bay more closely connected to the currents of the Gulf of Maine. The 1988 shellfish kill in Maquoit Bay demonstrates the risk from nutrient loading, whatever its source: thirteen years later Maquoit Bay has not regained its former status as one of the most productive shellfish harvesting areas in the state.

Pathogens

Pathogens, bacteria and viruses that affect human health, are a pervasive problem in Casco Bay. Although not by themselves a threat to the environment, they are a public health risk and result in the closure of shellfish harvesting areas. One source of pathogens introduced to Casco Bay are the waste water treatment plants in Freeport, Yarmouth, Falmouth, Westbrook, Portland, South Portland and Cape Elizabeth. There is little that can be done at this time to reduce or eliminate resulting shellfish closures. As population in the region grows, the volume discharged from waste water treatment plants will increase, and areas closed to shellfishing near the outfalls may be expanded, especially for those plants, such as in Falmouth and Freeport, which discharge to enclosed areas.

Population growth will increase the discharge of waste water to Casco Bay

Some towns in Casco Bay have been very aggressive in locating and removing sources of bacterial contamination including boat discharges, failing septic systems, overboard discharges, waste water treatment plant overflows, manure storage, and pet wastes. For example, Freeport has successfully removed all but one of its overboard discharges, encouraged an upstream farm to use best management practices for manure storage, and has initiated a pet waste cleanup program at Winslow Park.

Historically, many Casco Bay shorefront home and business owners found it easier to discharge their domestic waste into the bay via overboard discharges than to build in-ground septic systems on a rocky shore. Overboard discharge systems, which partially treat wastewater, represent one source of bacterial contamination that keeps approximately 25% of Maine's mussel and softshell clam flats closed to harvest (due to the risk of system malfunction). Installation of these systems has been prohibited in Maine since 1987. When it enacted the ban, the Legislature also created a program to help pay for replacement of existing overboard discharges with in-ground systems, where possible. Many communities in Casco Bay have taken advantage of this program to remove overboard discharges within their borders.

Pathogens result in the closure of shellfish beds

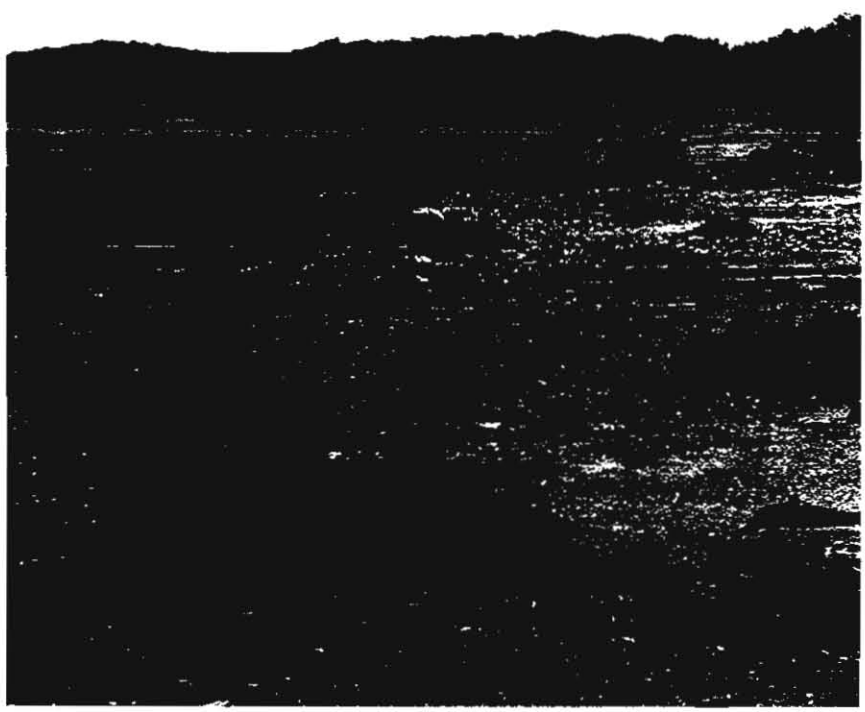


Table 2. Number of licensed overboard discharges (OBD) as of 2001.

Municipality	OBDs	OBDs in Casco Bay Estuary Project removal program
Cape Elizabeth	5	
South Portland	1	
Portland*	60	
Falmouth	2	
Cumberland	1	
Yarmouth	14	
Freeport	1	
Harpswell	116	10
Brunswick	5	3
West Bath	19	8
Phippsburg	11	1
Long Island	4	
Total	**239**	

* All are located on Portland's Islands

In recent years hundreds of acres of Casco Bay clam flats have been re-opened to harvesting after pollution sources were cleaned up

In 1999, the Casco Bay Estuary Project, in collaboration with local stakeholders, assessed closed shellfish areas within the bay in order to help municipalities restore their shellfish growing areas. Intertidal areas were ranked according to their shellfish productivity, sources of pollution and degree of difficulty of remediation. Clam flats in Brunswick, West Bath, Harpswell, and Phippsburg were targeted for remediation. By the end of 2001, 35 overboard discharges will have been removed and 300 acres of shellfish habitat opened to harvest in the four towns.

Bacterial contamination from homes often goes undetected or ignored. Local code enforcement officers focus on licensing new systems rather than remediating inadequate existing systems. However, grant programs and low interest loans can facilitate water quality improvement by funding replacement of untreated discharges, malfunctioning septic systems, and installation of community-based disposal systems.

Combined sewer overflows (CSOs) occur when major rainstorms cause waste water conveyance pipes and treatment plants to become overloaded, resulting in direct discharge of untreated wastewater to Casco Bay. Portland and South Portland have programs in place to separate stormwater from the waste stream in order to reduce pathogen contamination. The next challenge is to reduce the volume of stormwater altogether and to ensure

that all stormwater is properly treated, removing contaminants as well as suspended solids and pathogens, before being discharged into the bay.

Discharge of human waste from boats is another source of pathogens in Casco Bay. Some marinas in the bay operate facilities for pumping out wastewater holding tanks. In addition, the Friends of Casco Bay operate a pumpout boat. Although discharge of sewage from boats is prohibited within state waters, enforcement is nonexistent and the practice is common.

Although sewage discharge from boats is prohibited within state waters enforcement is nonexistent and the practice is common

Shellfish harvesting areas in the vicinity of anchorages are subject to closure if fecal coliform levels are high, or the threat is high, based on the number and type of boats, particularly live-aboard boats, moored in the area. Pathogens may represent a threat to swimmers at popular anchorages such as the Goslings and Cocktail Cove as well as along the shore of the mainland. To help maintain shellfishing within the Harraseeket, Freeport has relocated moorings and is educating boaters regarding discharge laws and the availability of pumpout facilities.

Toxic Contaminants

The bay has likely been a sink for toxic contamination since the dawn of the industrial revolution. Toxics enter the bay today from industrial discharges and wastewater treatment plants, atmospheric deposition, stormwater, boatyards and marinas. Toxic chemicals have the potential to harm living organisms. The degree of toxicity depends on the chemical, its concentration, and the affected organism. Types of toxic contaminants include metals, organic compounds, and chlorine.

Combined sewer overflow (CSO) that discharges into Portland Harbor

Sediment analysis conducted by the Casco Bay Estuary Project indicates that toxic materials have accumulated in several areas of the bay, particularly in more heavily populated areas. Inner bay and shallow water sites near the City of Portland have elevated levels of weathered petroleum, probably resulting from chronic inputs from runoff and point sources. Nearby sites in the west bay showed a relative enrichment from an unweathered petroleum product suggesting a localized source of contamination, perhaps fresh diesel fuel. The contaminant composition of sediments from Cape Small, far from urbanized sources, was similar to that of the inner bay; perhaps these contaminants come from the Kennebec River.

Some results of sample analysis were considered high by national standards. The widespread distribution of contaminants at elevated concentrations in the bay, including in areas that are not located near any historical sources, known discharges, or intense urban development, suggests that atmospheric deposition of combustion-related contaminants may play a significant role in the accumulation

of such contaminants in the sediments. The Casco Bay Estuary Project will repeat sediment analysis in late 2001 to assess trends in toxic contamination over time.

Stormwater runoff carries pesticides and herbicides applied to agricultural fields, recreational areas, and homeowners' yards into the bay. Homeowners are the largest group of pesticide users and yet they are the least regulated. The amount of pesticides sold for home use by Maine residents has doubled in the past five years to 1,600,000 lbs; many are common weed killers, weed and feed products, and insect and rodent controls that are all readily available at hardware and garden supply stores. State law requires that anyone who applies pesticides in a public place, such as schools, municipal grounds, golf courses and parks, be licensed by the Maine Board of Pesticide Control. Enforcement is poor, however; for example, many schools use unlicensed staff to apply pesticides.

Homeowners are the largest group of pesticide users and yet they are the least regulated

The Friends of Casco Bay are currently sampling stormwater runoff for the presence of three herbicides and two insecticides (all common components of weed and feed products), as well as nutrients (nitrogen and phosphorus), to test the widely held theory that such chemicals are washing into the bay.

Toxic contaminants at elevated levels are widely distributed in the bay's sediments, suggesting that one source is the atmosphere. Vehicle exhaust and smoke stacks are sources of contaminants.

What can be done to protect water quality?

Stormwater Management

Since 1990, stormwater runoff has been regulated by the federal government in municipalities with populations greater than 100,000 and construction sites larger than five acres through a permitting process that pertains mostly to new construction. More recent regulations (EPA's "Phase II" regulations) enlarge the sphere of oversight to urbanized areas larger than 50,000 people and construction sites between one and five acres. These rules are principally applicable to the Casco Bay municipalities of Cape Elizabeth, Falmouth, Portland, and South Portland. Each municipality is obligated to improve water quality and reduce pollutant discharge to the "maximum extent practical" and to report results using measurable goals. Activities designed to comply with Phase II regulations will complement existing efforts to limit CSOs.

Runoff from the parking lot at the YMCA in Freeport is collected in a detention pond to reduce pollutant discharge into the bay

Stormwater can also be addressed by smaller and more rural communities. Runoff to coastal and upstream waters can be reduced by buffers required by state-mandated shoreland zoning regulations. Nutrient loading and sedimentation are minimized by vegetation, which slows runoff and absorbs nutrients. Towns, with support from the Maine Department of Environmental Protection, should resist granting variances that compromise the effectiveness of setbacks.

Stormwater is most likely the single largest source of pollution to the bay

Nonpoint Education for Municipal Officials (known as NEMO) is an education program housed at the Southern Maine Technical College. It is an excellent means of informing municipal staff and volunteers regarding prevention of nonpoint sources of pollution; Freeport has already benefited from participation in NEMO. The program will soon offer training so that representatives from local communities can conduct their own educational sessions.

Build-out analyses of residential areas, conducted to plan for development within a town, can also be used to assess nutrient loading on a watershed basis. By calculating the number of homes in a subwatershed and applying average rates of nutrient runoff from septic systems and impervious surfaces,

Best management practices recreate as much as 50% of the filtering capacity of natural features disrupted by development

estimated total nutrient loading can be compared to that which the receiving water can absorb without suffering degradation (which is related to size, flushing and other parameters). A build-out analysis for Casco Bay's coastal towns performed by the Casco Bay Estuary Project is a useful starting place for such an exercise.

In order to protect Middle and Maquoit Bays, the Town of Brunswick has established a coastal protection zone in part of the area draining to the bays (a pending proposal would extend the zone to nearly the full extent of their watersheds). Housing density and impervious surface are regulated to reduce nutrient loading to the bay from septic systems and stormwater.

For more developed areas, the amount of impervious surface becomes the limiting factor in maintaining water quality; it is estimated that impervious surface of as little as 10% will result in degradation of surface waters within a watershed. As an example, Concord Brook watershed which drains about half of downtown Freeport, is calculated to have 14-20% impervious surface already.

Municipalities can require that best management practices (BMPs), described by the Maine Department of Environmental Protection, be applied to development and other land use activities within their borders. BMPs can recreate as much as 50% of the filtering capacity of natural features disrupted by development through creation of vegetated buffer strips and swales, ditch stabilization, and stormwater detention ponds. These features help to reduce erosion and improve water quality by allowing infiltration of stormwater.

Installation of such features is not the end of the story. They must be maintained on an ongoing basis to ensure that they continue to function properly. A recent analysis of stormwater features in Scarborough indicated that many were not achieving the level of treatment for which they had been designed. In another example, Freeport undertook a major retrofit of stormwater structures in Concord Brook to improve their capacity to capture and treat stormwater. Towns should work with the Maine Department of Environmental Protection to ensure that design, installation and maintenance of BMPs are sufficient to ensure effective treatment of stormwater.

The pond next to Cole-Haan headquarters in Yarmouth features innovative stormwater management, collecting rainwater off buildings for use in irrigation

Working together, municipalities, government agencies, non-governmental organizations and

stakeholders can create watershed management plans to comprehensively address water quality issues. Currently, such groups are at work on the Presumpscot, New Meadows and Royal Rivers.

Individual homeowners, and other land owners, can do their part for the bay by participating in the BayScaper program, an effort of the Friends of Casco Bay in partnership with the Maine Board of Pesticides Control, to promote environmentally sound landscaping practices. Participants receive guidance on how they can limit the flow of nutrients and pesticides from their lands and ultimately into Casco Bay.

Habitat Protection

Preservation and restoration of wetlands and other natural habitats is another way to maintain and improve water quality. Grants are available from the National Oceanic and Atmospheric Administration's Community-based Restoration Program, the U.S. Army Corps of Engineers' Coastal America Program, the Maine Outdoor Heritage Fund, the Casco Bay Estuary Project, the Gulf of Maine Council on the Marine Environment, the US Fish and Wildlife Service (related to the North American Waterfowl Management Plan and National Coastal Wetlands Conservation Program), and the National Fish and Wildlife Foundation to help protect and restore habitat. Preservation of riparian and coastal habitats ensures that these areas continue to be pollution filters, not pollution sources.

Also important are efforts to restore coastal habitat, such as the Conservation Law Foundation's "Return the Tides" program, which trains volunteers to identify opportunities to restore salt water flow where it is constrained by roads, bridges, and other structures. Naturally functioning salt marshes and intertidal flats are important to maintaining Casco Bay's nutrient cycle.

Salt marsh preservation assures protection of valuable habitat and filtering functions

Protection of open space in many cases preserves natural vegetation that filters water eventually draining to the bay. Similarly, many of the techniques designed to limit sprawl, such as steering growth toward areas that are sewered (assuming that the wastewater treatment is effective) and limiting the expansion of roads, will also help to protect water quality in Casco Bay.

Pollution Prevention

Pollution prevention activities are also important. Industrial pretreatment programs can reduce the amount of toxic contaminants introduced into the municipal waste stream. Integrated pest management and BayScaping are ecologically sound alternatives to many current pesticide practices and can reduce the pesticide load in stormwater.

The Friends of Casco Bay's pumpout boat will meet boaters on the bay, making it convenient to empty a boat's holding tank

South Portland is a model for managing municipal lands to limit water quality impacts: integrated pest management is used to reduce chemical use. Soil testing, selection of hardy vegetation and calculation of lightest possible applications limits need for use of fertilizers and pesticides.

In-ground septic systems generate nutrients, even when properly functioning. When malfunctioning they are a source of pathogens as well. Limiting housing density in unsewered areas, ensuring the proper functioning of septic systems, and maintaining vegetated setbacks from water courses are important to protecting water quality. The Town of Yarmouth allocates tax revenue to pump septic systems in the town every three years at no extra charge to the homeowner. This proactive approach will prevent the failure of many septic systems, and reduce the need for costly replacement systems.

Availability of functioning pumpout facilities is important for limiting discharge of sewage from boats. Towns working together with the Maine Department of Environmental Protection can ensure that marinas provide and maintain pumpout services. In addition, boaters need to be educated regarding the location of pumpout facilities and the importance of not discharging directly to Casco Bay.

Education

Availability of functioning pumpout facilities is important for limiting discharge of sewage from boats

Education is a crucial tool in achieving compliance with water quality regulations, recommendations, goals and policies. Mailings to home owners, information in boat registrations, town web sites, local access television programming, and school programs are among the many opportunities for increasing awareness in our communities of the need for effective stewardship of the bay – by individuals, businesses, nonprofits, schools and others. Organizations like the "Stream Teams", coordinated by Maine Department of Environmental Protection, create an avenue for citizens to collaborate on protecting streams that are important to their community and provide a clearinghouse for information on water quality protection.

The following section of the report details specific recommendations which each of the municipalities bordering the bay can implement to protect and improve water quality in Casco Bay.

Phippsburg

Setting

- Rural setting on coastal peninsula adjacent to the Kennebec River, Casco Bay, and the New Meadows River
- Population has increased by 16% since 1990
- Historical and current industries include fishing, boat building, lumber mills, shellfish harvesting, and tourism
- Primarily residential community
- Over 12 miles of coastline bordering Casco Bay and 28 square miles of land area

Water quality issues

- Wastes from boats in the Basin during the summer months
- Overboard discharges at Sebasco, West Point and Carrying Place
- Non-point source pollution in Round Cove
- Dissolved oxygen levels in the upper New Meadows River among lowest in Casco Bay

Model activities

- Active shellfish committee collects water samples to assure that clam flats are "Open to Harvest"
- Participation in multi-town effort to protect water quality in the New Meadows River
- Land trust has purchased over 700 acres for conservation in past 15 years

Popham Beach State Park is the most visited open space in Phippsburg. The local land trust has been protecting hundreds of additional acres in recent years.

Opportunities

Restore and protect shellfish growing areas

- Continue water quality monitoring and efforts to remove overboard discharges
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility

- Require timely pumping of septic systems
- Inspect septic systems upon sale or transfer of property and require replacement of overboard discharges where appropriate
- Install sign at entrance to the Basin regarding ban on discharges and availability of pumpout facilities
- Develop harbor management ordinance to limit moorings in the vicinity of shellfish growing areas
- Work with West Bath, Harpswell and Brunswick to provide additional pumpout facilities, including for deep draft, recreational vessels
- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection
- Encourage compliance with state law requiring installation and maintenance of pumpout facility at Sebasco

Reduce impacts of pesticides and other toxics

- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Require use by the town and private landowners of best management practices for road/stream crossings, available from the Maine Department of Environmental Protection
- Develop regulations, best management practices and/or integrated pest

Sebasco Estates

Phippsburg

management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect

- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Amend the shoreland zone to require 250 foot setback from streams, wetlands and other riparian areas
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Participate fully in development of a watershed management plan for the New Meadows River
- Support public and private efforts to protect open space through acquisition and easements
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College

Raise public awareness of water quality issues in Casco Bay

- Develop K-6 curriculum materials, and service learning opportunities related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners. The goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Provide information about discharge laws and availability of pumpouts to residents registering boats

West Bath

Setting

- Rural community on the New Meadows River
- Mostly residential, with commercial development along Bath Road
- Population rose from 1,716 to 1,798 between 1990 and 2000, an increase of 4.8 %
- Over 8 miles of shoreline on Casco Bay with almost 12 square miles of land area
- Coastline contains valuable soft-shell clam harvest areas

Water quality issues

- Overboard discharges are keeping over 65 acres of clam flats closed to harvesting
- Stormwater is not addressed
- Dissolved oxygen levels in the upper New Meadows River and New Meadows Lake among lowest in Casco Bay

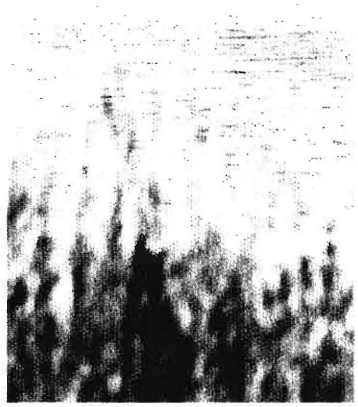
New Meadows River

Model activities

- Participation in multi-town effort to protect water quality in the New Meadows River
- Banned new overboard discharges in 1987 - first community to do so
- Collaborating with Casco Bay Estuary Project to remove overboard discharges in important soft-shell clam habitats

Opportunities

Restore and protect shellfish growing areas



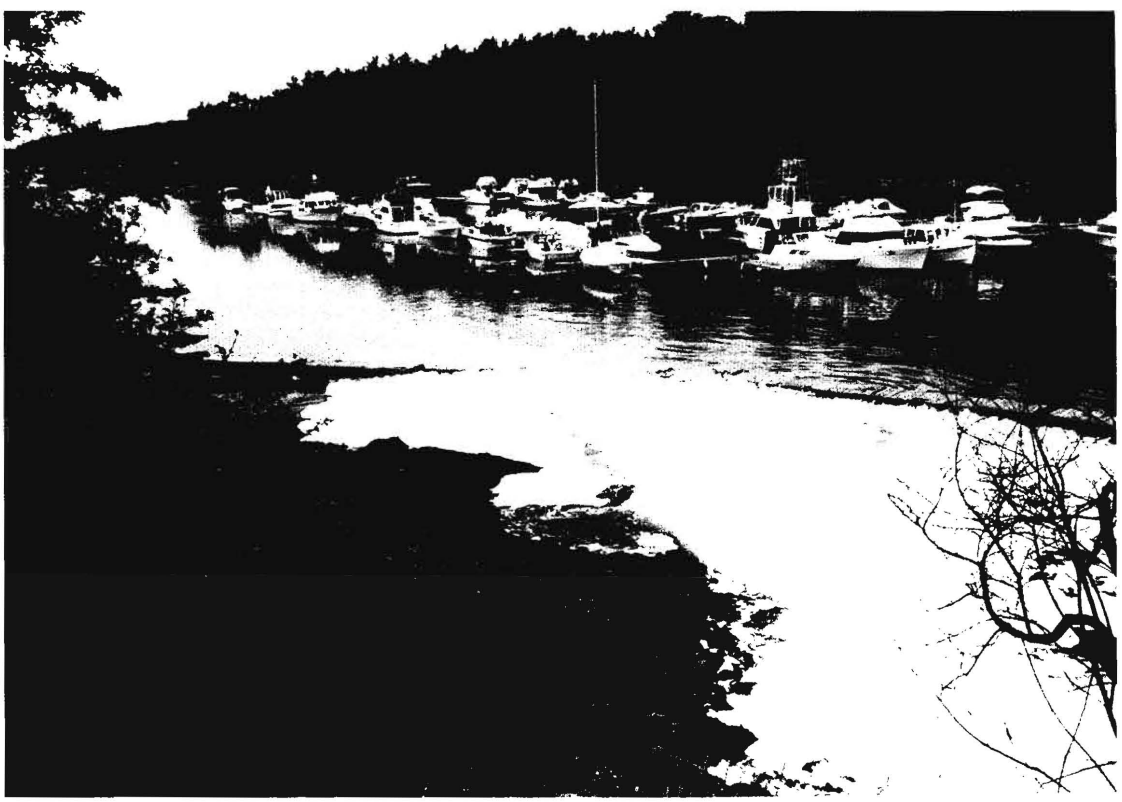
- Continue water quality monitoring and efforts to remove overboard discharges
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Work with Phippsburg, Harpswell and Brunswick to provide additional pumpout facilities, including for deep draft, recreational vessels
- Develop harbor management ordinance to limit moorings in the vicinity of shellfish growing areas

- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection

Reduce impacts of pesticides and other toxics

- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Develop stormwater management plan especially in developed area along Bath Road
- Require use of best management practices for road/stream crossings, available from the Maine Department of Environmental Protection, by the town and private landowners
- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas

West Bath is part of a multi-town effort to protect water quality in the New Meadows River



Removal of OBDs has opened acres of shellfish harvesting area in the New Meadows River

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Work with Brunswick to remove barrier at mouth of New Meadows Lake to increase tidal action and flows in the lake and thereby reduce risk of low dissolved oxygen
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Participate fully in development of a watershed management plan for the New Meadows River
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Form conservation commission and/or land trust to work towards land acquisition and resource conservation, and to monitor enforcement of environmental regulations

Raise public awareness of water quality issues in Casco Bay

- Develop K-6 curriculum materials and service learning opportunities related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Harpswell

Setting

- Three peninsulas give town longest shoreline in Casco Bay (230 miles); land area equals 24 square miles
- Largely rural community of 5,239; population up 5% since 1990
- Economy dependent on fisheries, summer cottages, and commuters
- Coastline contains valuable soft-shell clam harvest areas
- Many islands provide wildlife habitat and recreational opportunities

Water quality issues

- Many overboard discharges remain
- Dissolved oxygen levels in the upper New Meadows River and Quahog Bay among lowest in Casco Bay
- Discharges from boats may contribute to shellfish closures
- Continued development a likely source of pathogens and nutrients
- Harpswell Cove and Middle Bay must be managed jointly with Brunswick

Model activities

- Volunteer monitoring of shellfish flats
- Overboard discharge removal program in important shellfish harvest areas

Harpswell is actively protecting shellfish harvesting areas from pollution

- Participation in multi-town effort to protect water quality in the New Meadows River

Opportunities

Restore and protect shellfish growing areas

- Investigate joint management with Brunswick of pollution threats in the watersheds of Harpswell Cove and Middle Bay
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Continue to remove overboard discharges
- Assign municipal staff to sample collection
- Work with West Bath, Phippsburg and Brunswick to provide additional pumpout facilities, including for deep draft, recreational vessels
- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection
- Develop harbor management ordinance to limit moorings in the vicinity of shellfish growing areas

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Monitor Brunswick Naval Air Station for activities that may threaten water quality

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality

- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Support efforts of the Land Use Committee to implement a resource protection ordinance
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Eliminate exemption for agriculture within the shoreland zone
- Participate fully in development of a watershed management plan for the New Meadows River
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Study circulation of Quahog Bay to determine flushing rates
- Support public and private efforts to protect open space through acquisition and easements

Raise public awareness of water quality issues in Casco Bay

- Develop K-6 curriculum materials, service learning opportunities and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Brunswick

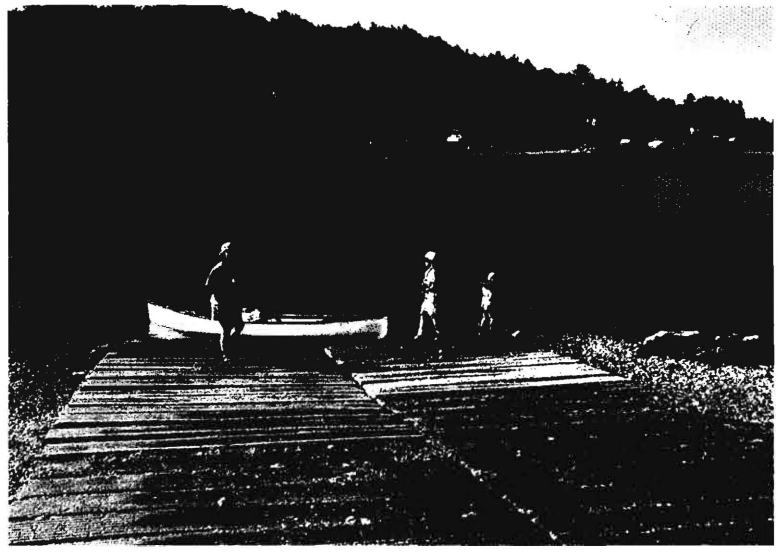
Setting

- Community of over 20,000; situated between the Androscoggin River and the head of Casco Bay
- Population growth of 1.3% over last decade but 2.6 houses built for each new resident
- Forty-nine miles of coastline and 47 square miles of land area
- Growth focussed on town center and surrounding neighborhoods
- Rural part of town includes farmland, wooded areas, and other large undeveloped parcels
- Economy dominated by Brunswick Naval Air Station, light manufacturing, service industries and Bowdoin College
- Coastline contains valuable soft-shell clam harvest areas

Water Quality Issues

- Threats to status of shellfish harvesting areas
- Dissolved oxygen levels in Maquoit Bay, New Meadows Lake and the New Meadows River among lowest in Casco Bay
- Illegal boat discharge
- Toxic contamination from marinas and boatyards
- Harpswell Cove and Middle Bay must be managed jointly with Harpswell

Boat ramp at Sawyer Park on the New Meadows River in Brunswick



Model activities

- Coastal Protection Zone limits nutrient run off
- Leader in multi-town effort to protect water quality in the New Meadows River
- Collaborating with Casco Bay Estuary Project to remove overboard discharges in important soft-shell clam habitats
- Active land trust has preserved several large tracts of land
- Open space plan being developed that includes outreach to neighboring towns

Opportunities

Restore and protect shellfish growing areas

- Investigate joint management with Harpswell of pollution threats in the watersheds of Harpswell Cove and Middle Bay
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Amend ordinance regulating marine activities, structures, and ways to limit moorings in the vicinity of shellfish growing areas
- Exert leadership within the Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection
- Work with West Bath, Phippsburg and Harpswell to provide additional pumpout facilities, including for deep draft recreational vessels

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Monitor Brunswick Naval Air Station for activities that may threaten water quality

Brunswick's coastal protection zone regulates housing density and impervious surface to reduce nutrients flowing into Maquoit and Middle Bays

Manage land use to minimize pollution impacts

- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Work with West Bath to remove barrier at mouth of New Meadows Lake to increase tidal action and flows in the lake and thereby reduce risk of low dissolved oxygen
- Continue to participate fully in development of a watershed management plan for the New Meadows River
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Support public and private efforts to protect open space through acquisition and easements
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"

- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Freeport

Setting

- Population has grown 13% in ten years; now at 7,800
- 27 miles of coastline and 35 square miles of land area
- 18 islands, including Bustins, which has 111 seasonal homes
- Harraseeket is a large semi-enclosed harbor with over 350 moorings and 211 slips
- Coastline contains valuable soft-shell clam harvest areas: "Harraseeket is one of the most important softshell clam producing areas in Casco Bay – if not the entire state" (DMR Sanitary Survey, 1995)
- 800 acres of inter-tidal habitat:
  70% closed in 1993
  90% open in 1995
- Varied development of immediate shoreline
- Wastewater treatment plant discharges into Harraseeket

Water quality issues

- Threat of bacterial contamination of shellfish harvesting areas from illegal boat discharge and sewage treatment outfall
- Dissolved oxygen levels in the Cousins River among lowest in Casco Bay
- Increased impervious surface in Concord Brook (which is estimated to be 14-20% impervious) and Frost Gully Brook watersheds threatens stream water quality
- Pressure on stream corridors and wetlands from development
- Presence of dioxin in Cousins River

Harraseeket River

Model activities

- Efforts to manage stormwater through development review, retrofits, municipal facilities, and participation in NEMO and Stream Teams

- Deliberate effort to cleanup pollution sources causing shellfish closures including removal of all but one overboard discharge and application of best management practices for manure storage at an upstream farm
- Reorganization of harbor to accommodate both moorings for boats with heads and shellfishing, and an education campaign including sign at harbor entrance

- Pet waste bags available at Winslow Park
- Adoption of open space plan
- Annual street sweeping and catch basin cleaning
- Bond issue passed by voters to provide funds for acquiring open space
- Local government addressing residential growth issues

Opportunities

Restore and protect shellfish growing areas and swimming areas

- Continue to educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Assure waste water treatment plant functions optimally
- Implement pet waste education campaign for downtown, especially parking lots
- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection
- Monitor water quality at swimming areas using Enterococcus method and develop rapid response protocol to initiate closures, if necessary, in a timely fashion (following US EPA BEACH protocol)

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Maintain prohibition on pesticide use in Resource Protection District
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Support public and private efforts to protect open space through acquisition and easements
- Support recommendations of the Freeport Residential Growth Committee
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Use natural landscape to treat municipal stormwater and provide complementary uses such as recreation and open space
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Upper reaches of the Harraseeket River

Yarmouth

Setting

- Popluation is just over 8,300, an increase of 6.3% since 1990
- Mostly residential, with a service industry-based economy
- Over 7 miles of shoreline, with two islands connected to the mainland and inhabited year-round, and several other islands; 13 square miles of land area
- Coastline contains valuable soft-shell clam harvesting areas
- Comprises significant portion of Royal River watershed
- Shares Broad Cove with Cumberland, and the Cousins River with Freeport

Water quality issues

- Community-based treatment plant on Cousins Island
- Remaining overboard discharges on Littlejohn Island, sanitary survey required
- Three marinas, only one has pumpout facilities
- Dissolved oxygen levels in the Cousins and Royal Rivers among lowest in Casco Bay
- Stormwater runoff from I-95 and US Route 1 adjacent to Royal River
- Presence of dioxin in Cousins and Royal Rivers

Model activities

- Septic systems regulated by plumbing inspector and codes enforcement officer, cost of tri-annual pumpouts is covered by the Town as a municipal service to home owner (visit must be scheduled by the homeowner)
- Wastewater treatment plant upgraded eight years ago, has capacity to hold excess (up to 1 million gallons) storm water until the plant can properly treat it
- Street sweeping done with water to reduce dust and material is hauled to demolition landfill and re-used if possible
- Has toxics reduction program to reduce the amount of metals and other contaminants entering the waste water stream

Cousins Island in Yarmouth where several OBDs were replaced with a community septic system

- Friends of the Royal River active in monitoring and promoting conservation of the river and its watershed

Opportunities

Restore and protect shellfish growing areas

- Remove remaining overboard discharges, and remove or upgrade the community-based system on Cousins Island
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Develop harbor management ordinance to limit moorings in the vicinity of shellfish growing areas
- Use Regional Shellfish Council to promote restoration and protection of shellfish harvesting areas and to leverage funding from state and federal programs such as EPA's nonpoint source pollution program (319) and the overboard discharge removal program of the Maine Department of Environmental Protection

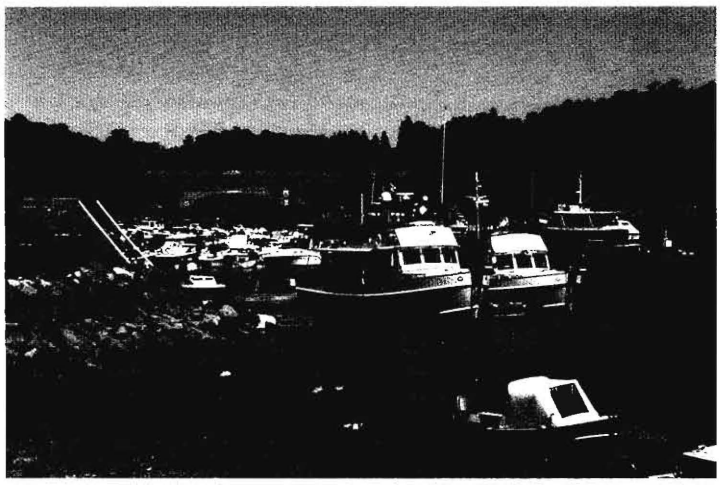
Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property – ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- With other communities in the Royal River watershed, develop specific recommendations for implementation of the *Royal River Watershed: A Water Quality Management Plan* and investigate opportunity to develop a regional management authority for the river

Royal River marinas



- Develop a stormwater management plan for the downtown area and Route 1 corridor that includes complementary uses such as recreation and open space
- Work with Falmouth and Cumberland to develop a watershed management plan for the East and West Branches of the Piscataqua River to address nonpoint source pollution and stormwater loading
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Investigate role of sediment oxygen demand in depletion of dissolved oxygen in Royal River
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Support Friends of the Royal River and other volunteer efforts to improve the health of the Royal River
- Support public and private efforts to protect open space through acquisition and easements
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College

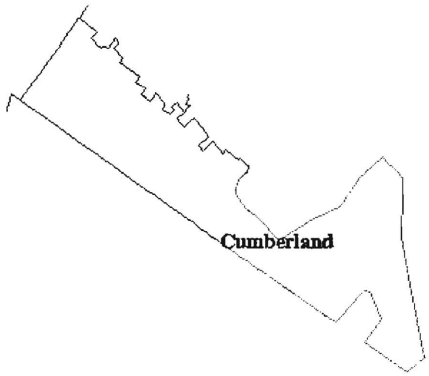
Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"

Sandy Point Beach on Cousins Island

- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Cumberland



Setting

- Rural town becoming suburban, several working farms remain
- Mainland shorefront built up with residential development
- Population grew 23% in last 10 years to just over 7,000
- Home construction has outpaced population growth: a decrease in household size (from 3.44 to 2.89) between 1970 and 1990 accounts for an additional 325 houses
- 2.5 miles of mainland frontage on Casco Bay with no deep water access; 26 square miles of land area
- Town encompasses several islands including 1600 acre Great Chebeague Island, with a year-round population of 330, swelling to 1800 in the summer
- All of mainland intertidal area open to recreational shellfishing only; most of Chebeague open to shellfishing; ten commercial licenses issued for digging on the islands
- Sewage system owned/managed by Portland Water District, effluent piped to Falmouth Sewage Treatment Plant

Water Quality Issues

- Runoff of both nutrients and pesticides from ever-increasing residential development threatens the quality of wetlands and streams
- Three areas on Chebeague closed to shellfishing due to two overboard discharges and an area that fails water quality tests

Chandler Cove ferry dock at Chebeague Island

Model activities

- Effort to minimize sprawl through land use ordinance, especially with clustering
- Work to help farms survive and assure they use best management practices
- Town owned Val Halla golf course uses "green" turf maintenance practices such as organic fertilizer and pesticide application only when needed to solve discrete problems

- Monitoring and sanitary surveys conducted to keep shellfish harvesting areas open

Opportunities

Restore and protect shellfish growing areas

- Open closed areas on Chebeague by completing shoreline survey of eastern shore and facilitate removal of overboard discharge on Chandler Cove
- Educate boaters to hold their sewage and have it pumped out at a disposal facility

Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

Manage land use to minimize pollution impacts

- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Work with Yarmouth and Falmouth to develop a watershed management plan for the East and West Branches of the Piscataqua River to address nonpoint source pollution and stormwater loading
- Use natural landscape to treat municipal stormwater and provide complementary uses such as recreation and open space.
- Support public and private efforts to protect open space through acquisition and easements

Broad Cove in Cumberland

- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Falmouth

Setting

- One of the fastest growing towns on Casco Bay
- Population increased from 7,610 in 1990 to 10,310 in 2000, an increase of over 35%
- Mostly residential, with a service industry-based economy
- Over 6 miles of shoreline and 30 square miles of land area
- Three contiguous anchorages with a total of 1,000 moorings
- Town issues 73 recreational shellfish licenses, no commercial licenses

Water quality issues

- Storm water runoff, especially from concentrated high pavement areas on Route 1
- Dissolved oxygen levels in the Presumpscot River among lowest in Casco Bay
- Waste water treatment plant scheduled for upgrade in 2002-2003
- Limited areas open to clam harvesting due to anchorage, waste water treatment plant, and nonpoint source pollution
- Extensive anchorages, limited pumpout facilities, and lack of enforcement of "No Discharge" zone
- High phosphorus levels in Highland Lake (drains to the Presumpscot)

Model activities

- Town adopted a Highland Lake Watershed Management Plan to reduce phosphorus loading
- Conservation Committee and other groups working to acquire lands for preservation
- Fiber matting used to stabilize soil after ditch "clean-out"
- Street sweepings are tested and re-used, if appropriate, for fill, construction or for sanding
- Friends of the Presumpscot River and Presumpscot Riverwatch active in monitoring and promoting conservation of the river and its watershed through participation in a Stream Team and other activities
- Smelt Hill Dam removal will improve water quality in the Presumpscot River by restoring natural flows

- Golf course at Portland Country Club, located in Falmouth, is the only golf course in Maine certified by Audubon International, which requires steps to be taken to protect and create wildlife habitat, conserve water and protect water quality, and reduce chemical use

Opportunities

Restore and protect shellfish growing areas

- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility

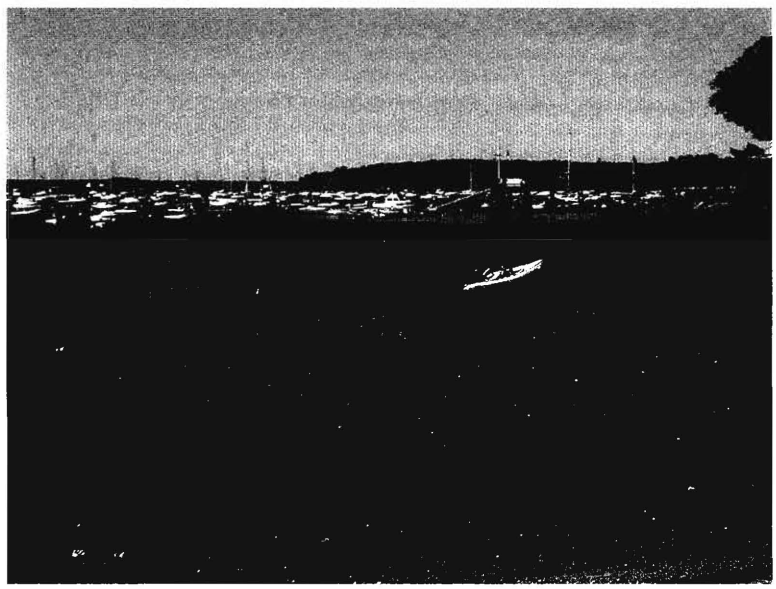
Reduce impacts of pesticides and other toxics

- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

Manage land use to minimize pollution impacts

- Enforce wetland protection setbacks and buffer requirements; consider stronger wetlands protection plan
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas

Falmouth anchorage



- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Develop a stormwater management plan for the Route 1 commercial district that includes complementary uses such as recreation and open space

- Work with Yarmouth and Cumberland to develop a watershed management plan for the East and West Branches of the Piscataqua River to address nonpoint source pollution and stormwater loading
- Support public and private efforts to protect open space through acquisition and easements
- Support the efforts of Presumpscot RiverWatch and Friends of the Presumpscot River to improve the health of the Presumpscot River

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners–the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Falmouth Town Landing

- Support the Presumpscot River Watershed Plan produced by the Casco Bay Estuary Project sponsored Presumpscot River Team.

Long Island

Setting

- 900 acre Long Island plus six offshore islands; 3.2 square miles of land area in all
- Ten miles of coastline
- Separated from Portland in 1993 and incorporated as Town of Long Island
- Population currently steady at about 200; 146 lived on Long Island in 1830 and 252 in 1880
- Population grows to 900 in summer
- In 1995, 26% of adults were fishermen
- At the beginning of the 20th century Long Island was a booming tourist destination
- Subdivision of land at that time created many small lots, all non-conforming by present standards, and an exacerbating factor in today's ground and coastal water quality problems
- One third of island taken for Navy Refueling Depot in 1940's; remediation of the Navy facilities completed in the 1990's
- About 150 moorings, but few boats with heads

Ferry, fire boat and lobster boat at Mariner's Wharf on Long Island

Water quality issues

- Water quality testing shows elevated bacteria levels - an uncommon occurrence away from the mainland - most areas closed to shellfishing
- Coastal and ground water quality problems due to inadequate sewage treatment, especially in areas where houses are clustered together on small lots

Model activities

- Self determination: a model for what a community can do to control its own destiny
- Fuel depot remediation successfully completed
- Recently adopted a shellfish ordinance and appointed and trained a shellfish warden
- Ordinance language requires sewage system inspection upon transfer of title
- Dissemination of water quality and shellfish information in island newsletter

Opportunities

Restore and protect shellfish growing areas

- Identify and upgrade malfuntioning and inadequate wastewater disposal systems; further tighten regulation
- Educate boaters to hold their sewage and have it pumped out at a disposal facility
- Facilitate removal of overboard discharges in Wreck Cove and Harbor Grace

South Beach

Long Island

- Investigate and eliminate gray water discharges on the northern end of the island
- Conduct shoreline surveys and continue water quality monitoring
- Consider seeding prospective clamflats

Reduce impacts of pesticides and other toxics

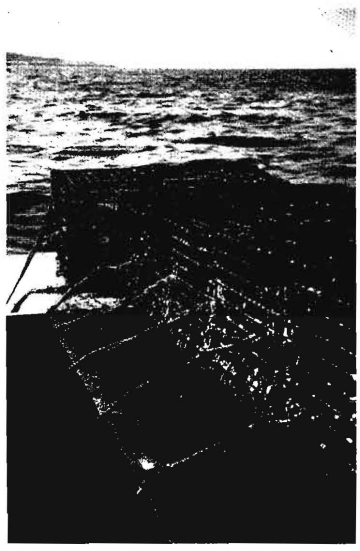
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)

Manage land use to limit pollution impacts

- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Support public and private efforts to protect open space through acquisition and easements
- Conduct build out analysis to assess potential impact of inground septic systems and impervious surface on water quality

Raise public awareness of water quality issues in Casco Bay

- Develop K-5 curriculum materials related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Continue newsletter articles and other methods of educating residents regarding water quality



- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use town web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

Portland

Setting

- Urban setting, the largest city in the state (64,249); densely populated except for island communities
- City comprises 19 square miles of land area; coastline is 16 miles for mainland and 21 miles for islands
- Population relatively constant over the past 10 years
- Industries include food processing, light manufacturing, metal works
- Port of Portland (including South Portland) is largest oil terminal port on East Coast
- East End Beach provides recreational opportunities, boat launch and moorings

Water quality issues

- Toxics from combined sewer overflows include those from industrial sources
- Dissolved oxygen levels at Custom House Wharf, Stroudwater Bridge and in the Presumpscot River among lowest in Casco Bay
- In Year 4 of a 15-year combined sewer overflow improvement program, but waterfront combined sewer overflows are generally not included
- Private maintenance dredging cost prohibitive because of contaminants in sediments
- Possible presence of illegal pipes/drains along the waterfront
- Historic industrial use, such as the old Portland Gas Works, contributes to contaminant load

- Poorly functioning septic systems and overboard discharges on islands, discharges from boats and cruise ships, lack of pumpout facilities

Model activities

- Street sweeping and cleaning of the City's 5,000 catch basins occurs annually. Pilot project underway using a Vactor truck to remove polycyclic aromatic hydrocarbons (toxic compounds found in exhaust and other combustion products) in catch basin sediments.
- Greenway Master Plan calls for use of natural features and created wetlands to filter stormwater in the Capisic Brook and Fall Brook areas while providing public recreational areas
- Hall Stream Team, including Capisic Brook, is part of Maine Department of Environmental Protection's Stream Team program
- The City and Portland Water District helped residents eliminate mercury in the waste stream with a residential mercury collection day
- An industrial pretreatment program reduces toxic input to the waste water treatment plant
- Creation of a TIF (Tax Increment Financing) district and other measures to provide low interest loans for dredging and dredge spoil disposal
- Expansion of Peaks Island waste water treatment plant, with additional sewer connections
- Use of the preferred Enterococcus method for monitoring water quality at East End Beach, along with rapid response protocol to initiate closures in a timely fashion
- Effort to control pet waste on the Eastern Promenade walkway: increased awareness through signage, increased enforcement by rangers, and availability of bags for cleanup
- Smelt Hill Dam removal will improve water quality in the Presumpscot River by restoring natural flows

Entrance to Back Cove, B&M plant to the north, Portland Water District's East End Wastewater Treatment Facility to the south

Opportunities

Restore and protect shellfish growing areas

- Facilitate removal of island overboard discharges and replacement of malfunctioning septic systems
- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Develop waste disposal protocol for cruise ships to avoid discharges, including gray water
- Investigate waterfront discharges, identify and resolve disposal issues related to tenant turnover
- Prioritize combined sewer overflow program to address Casco Bay water quality
- Expand pet waste program to other areas draining to the bay

Reduce threat from toxic contaminants and nutrient loading

- Require remediation of sediments contaminated with polycyclic aromatic hydrocarbons (PAHs) at Gas Works/Northern Utilities and polychlorinated biphenols (PCBs) at Portland Water District
- Comply with Phase II stormwater regulations
- Develop upland disposal option to facilitate disposal of contaminated dredge spoils
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Develop regulations, best management practices and/or integrated pest management program to manage use of pesticides on municipal property - ordinances must be registered with the Maine Bureau of Pesticide Control in order to go into effect

- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas

Manage land use to minimize pollution impacts

- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Support public and private efforts to protect open space through acquisition and easements
- Implement Greenway Master Plan for Capisic Brook and Fall Brook, and extend to other watersheds use of the natural landscape to treat stormwater while providing for recreation and open space
- Conduct buildout analysis for islands to assess potential impact of septic systems and impervious surface on water quality
- Support the efforts of Presumpscot RiverWatch to improve the health of the Presumpscot River

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use city web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

South Portland

Setting

- Densely populated, population stable over past 10 years (23,324)
- Bounded on two sides by water, Fore River and Casco Bay
- Land area is 12 square miles; coastline is ten miles
- Industry, Portland International Jetport, a series of shopping malls, portions of the Maine Turnpike and Route 295 contribute to large amount of impervious surface
- Oil transport dominates commercial activity in the harbor: tankers offload oil which is stored in large tanks adjacent to the Fore River
- Marinas provide water access and recreational opportunities
- Draft shellfish ordinance is first step towards shellfish harvest, beginning with possible depuration digging

Water quality issues

- Toxics from combined sewer overflows include those from industrial sources
- Dissolved oxygen levels in the Stroudwater River among lowest in Casco Bay
- Historical activity at the South Portland shipyard contributed contaminants to Casco Bay

City staff regularly test water quality at Willard Beach in South Portland

- Contaminants in sediments complicate maintenance dredging due to difficulty of dredge spoil disposal

Model activities

- Integrated pest management applied to municipal facilities: minimized use of fertilizers/ pesticides through soil testing, species selection, and limited application of chemicals as last resort

- Stormwater addressed by annual street sweeping and catch basin cleaning; drains stenciled with "Don't dump: Drains to Casco Bay"; prepared to comply with Phase II stormwater regulations
- Aggressive program underway to remove combined sewer overflows
- Maine Department of Environmental Protection study underway in Long Creek to assess the effects of airport runoff on water quality in Long Creek
- An industrial pretreatment program reduces toxic input to the waste water treatment plant
- Use of the preferred Entercoccus method for monitoring water quality at Willard Beach
- Pet waste bags available at Bug Light Park and Willard Beach
- Infiltration strip to catch stormwater at Bug Light Park parking lot

Opportunities

Restore and protect shellfish growing and swimming areas

- Educate boaters, especially "live-aboards," to hold their sewage and have it pumped out at a disposal facility
- Expand pet waste policy, especially in areas that drain to the bay
- Develop rapid response protocol to implement beach closure

Reduce impacts of pesticides and other toxics

- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Participate in negotiation of consent decree between Maine Department of Environmental Protection and South Portland Shipyard regarding remediation of contaminated sediments
- Develop upland disposal option to facilitate disposal of contaminated dredge spoils
- Review reports on tank farm oil/water separators

Manage land use to minimize pollution impacts

- Support public and private efforts to protect open space through acquisition and easements

- Use natural landscape to treat municipal stormwater and provide complementary uses such as recreation and open space
- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
- Use city web site to make information available (e.g., guidance regarding threshold for permit review; educational materials regarding best management practices; information for empowering citizen monitors; links to www.cascobay.org, www.mywatershed.com, and other internet-based educational material, etc.)
- Provide information about discharge laws and availability of pumpouts to residents registering boats

South Portland provides bags as incentives for dog owners to clean up after their pets at Willard Beach

Cape Elizabeth

Setting

- Suburban setting with two state parks along the coast and Fort Williams municipal park
- Town comprises 15 square miles of land area; coastline in Casco Bay is 5.1 miles
- Population grew by 2.42% during last 10 years (now 9,086)
- Casco Bay provides recreational opportunities and scenic vistas

Water Quality Issues

- Few water quality issues due to municipal sewer system and lack of industry
- Accumulation of seaweed in Peabbles Cove is the source of low dissolved oxygen in that area
- Potential for elevated heavy metals, sediments, phosphorus, and bacteria from stormwater runoff as described in the Town Center Stormwater Management Plan
- Stormwater affects Trout Brook

Model activities

- Developed a stormwater management plan; implemented half of recommended infrastructure improvements.

Fort Williams Park and Portland Head Light receive 1/2 million visitors a year, who come to enjoy fine views of Casco Bay

- Good street sweeping practices
- Careful use of fertilizers/pesticides, use restricted to athletic fields
- Effective carry in, carry out trash policy at Fort Williams
- Active land trust makes Cape Elizabeth a leader in permanently dedicated open space
- Effective wetland protection

An active land trust makes Cape Elizabeth a leader in permanently dedicated open space

Opportunities

Reduce impacts of pesticides and other toxics

- Develop written protocol for integrated pest management program
- Promote best management practices (available from the Maine Department of Environmental Protection and US EPA) with boatyards and marinas
- Require new developments to maintain naturally occurring vegetated buffers, to limit stormwater flow to pre-development levels, and to address stormwater quality (in terms of nutrients and toxics)
- Limit stormwater flow contributing to South Portland CSO

Manage land use to minimize pollution impacts

- Amend the shoreland zone to require 250 foot setback for streams, wetlands and other riparian areas
- Support public and private efforts to protect open space through acquisition and easements

Pond Cove in Cape Elizabeth

- Participate in NEMO: Nonpoint Education for Municipal Officials, an education program housed at the Southern Maine Technical College
- Complete infrastructure improvements listed in Town Center Stormwater Management Plan
- Inventory wetlands (using National Wetlands Inventory, state wetlands maps, aerial photographs, and field surveys) and establish a wetlands protection plan
- Conduct watershed-based nutrient loading analysis and use to assess potential impact of septic systems and impervious surface on water quality; consider adopting ordinance that limits housing density to protect water quality

Raise public awareness of water quality issues in Casco Bay

- Develop K-12 curriculum materials, service learning opportunities, and public access television programming related to the ecology, history, and recreational and commercial benefits of Casco Bay
- Distribute educational materials to landowners promoting the "BayScaper" program, a joint effort of the Friends of Casco Bay and the Maine Board of Pesticides Control, to encourage the use of ecologically sound landscaping practices by landowners - the goal of the program is to "motivate and teach residents how to apply knowledge instead of lawn care chemicals to maintain enjoyable, bay-friendly landscapes"
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- Provide information about discharge laws and availability of pumpouts to residents registering boats

Ship Cove at Fort Williams Park

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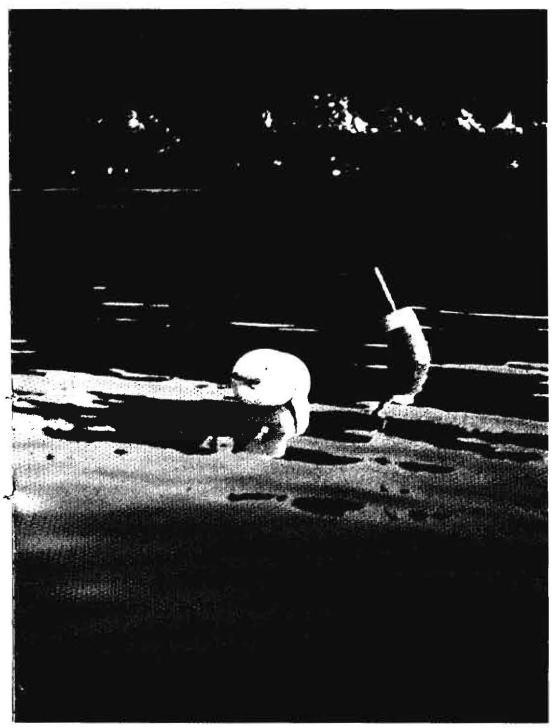

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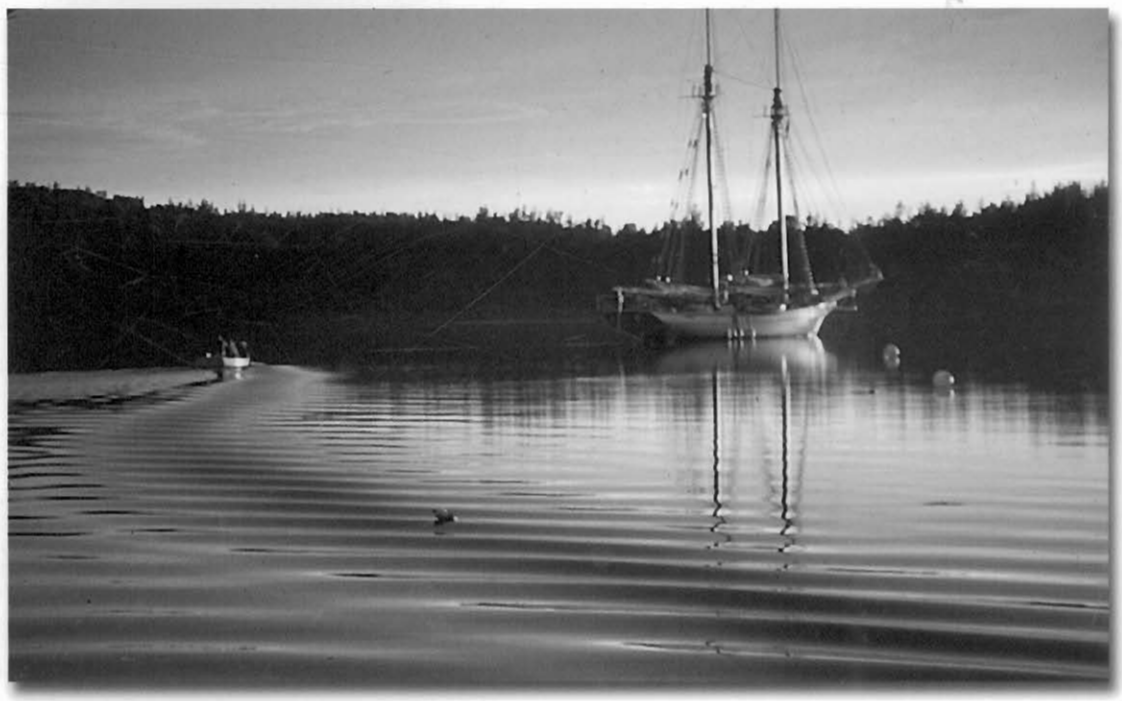
A project affiliated with the
Edmund S. Muskie School of Public Service
and the Marine Law Institute.

Community Strategies to Improve the Bay

Steps that can be taken locally to improve and protect Casco Bay



The Friends of Casco Bay
BAYKEEPER
April 2002

Casco Bay Estuary Project