Clam Flats and Swimming Areas

Casco Bay Plan

CLAM FLATS and SWIMMING AREAS

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:

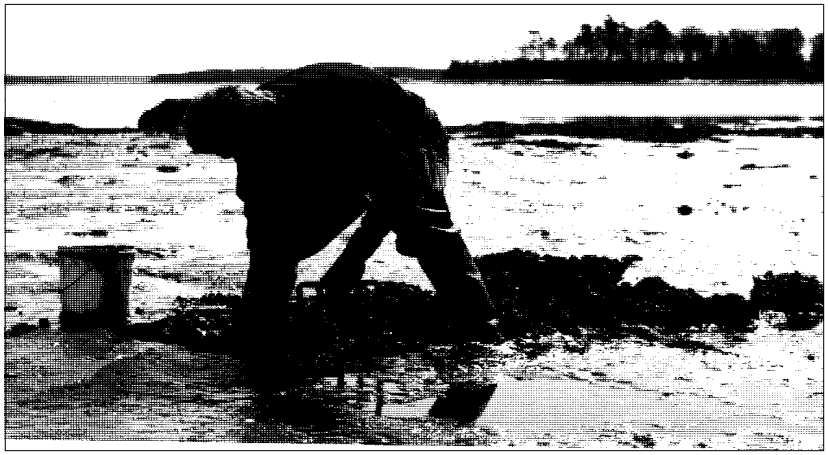
- *Increase open shellfish acreage currently impacted by poor water quality.*
- *Swimming areas of Casco Bay shall meet bacterial standards.*

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 re-



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

Sources of Contamination

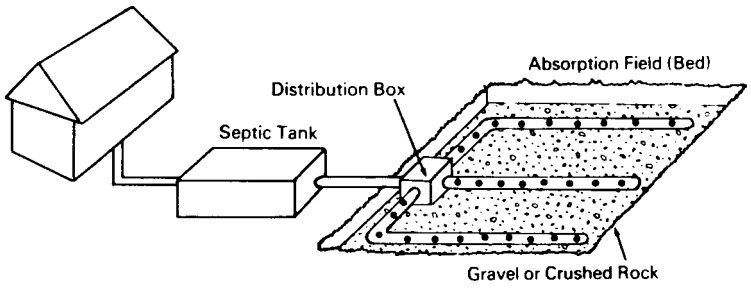
Shellfish flats and swimming areas are closed when elevated bacteria levels indicate the presence of human or animal waste, since exposure to contaminated water and shellfish can cause illness. Too many nutrients, especially nitrogen, can pose additional problems for shellfish harvesting and the bay *(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.*

Figure 3-1

Typical Bed Septic System Used in Maine



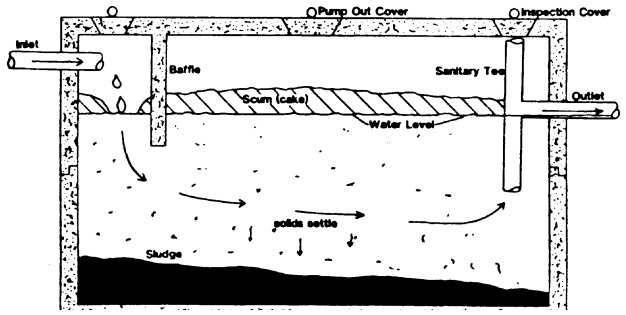
Source: Maine Department of Environmental Protection and Maine Department of Community and Economic Development, l993

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

Figure 3-2

Septic Tank



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

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 in-

clude 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.*

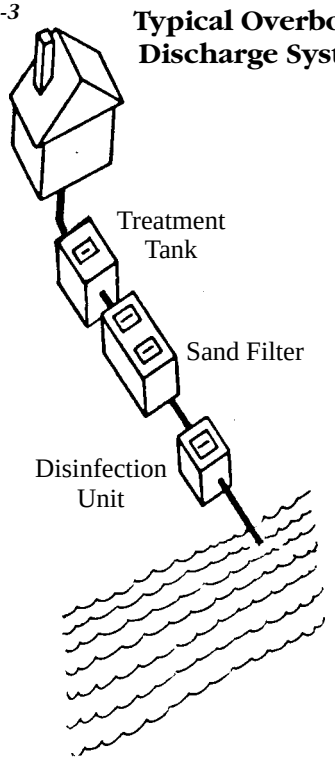
An overboard discharge system is similar to a septic system except that the leach field is replaced by a combination of a sand filter or mechanical aerobic tank and a chlorination unit to disinfect the effluent before it is discharged into a water body.

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 permitee 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.

Harpswell 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

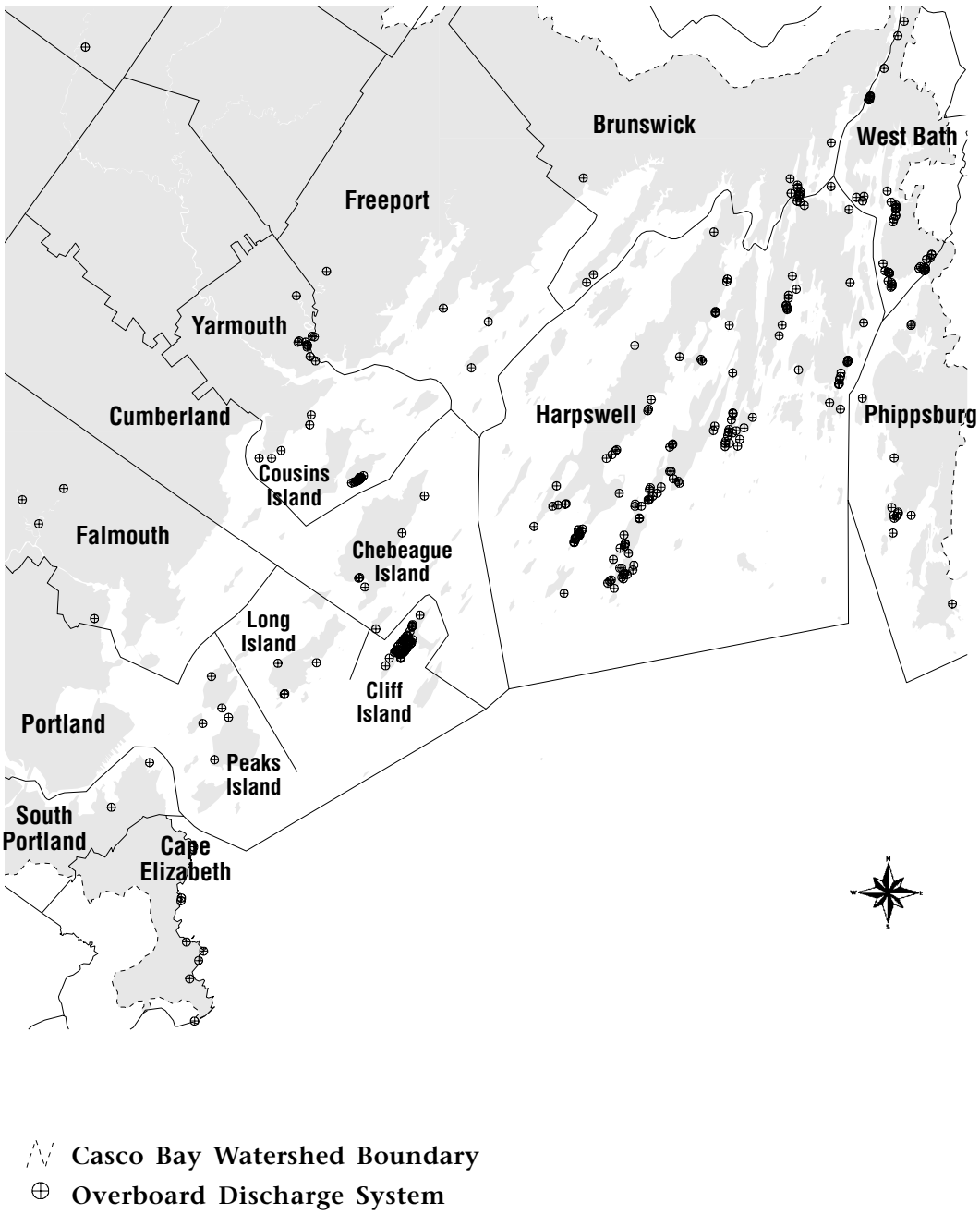
MUNICIPALITY	TOTAL UNITS AS OF 3/22/96	UNITS REMOVED TO DATE	UNITS INACTIVE	PERMITTED UNITS NOT YET INSTALLED/USED
Cape Elizabeth	5	2	1	1 permitted not installed
South Portland	1	1		
Portland	53	2		
Falmouth	2	2		
Cumberland	3	3		
Yarmouth	15	13		1 permitted not installed
Freeport	11	0		
Brunswick	13	3		
Harpswell	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.

Figure 3-4

Location of Overboard Discharge Systems Currently in Use in Casco Bay as of March 1996

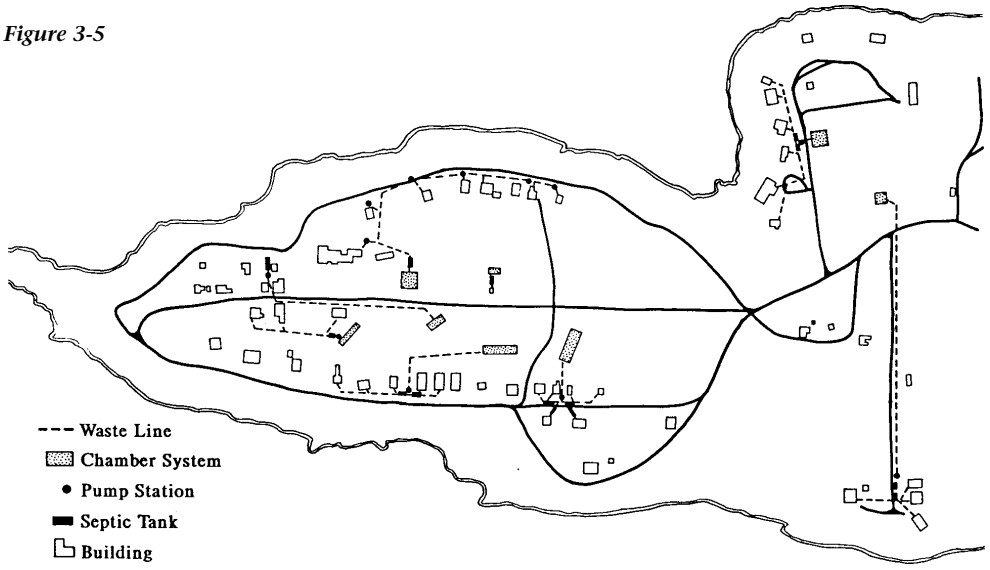


Source: Maine Department of Environmental Protection and Casco Bay Estuary Project, l994

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.

Figure 3-5



Mere Point — Recommended Plan

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

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.

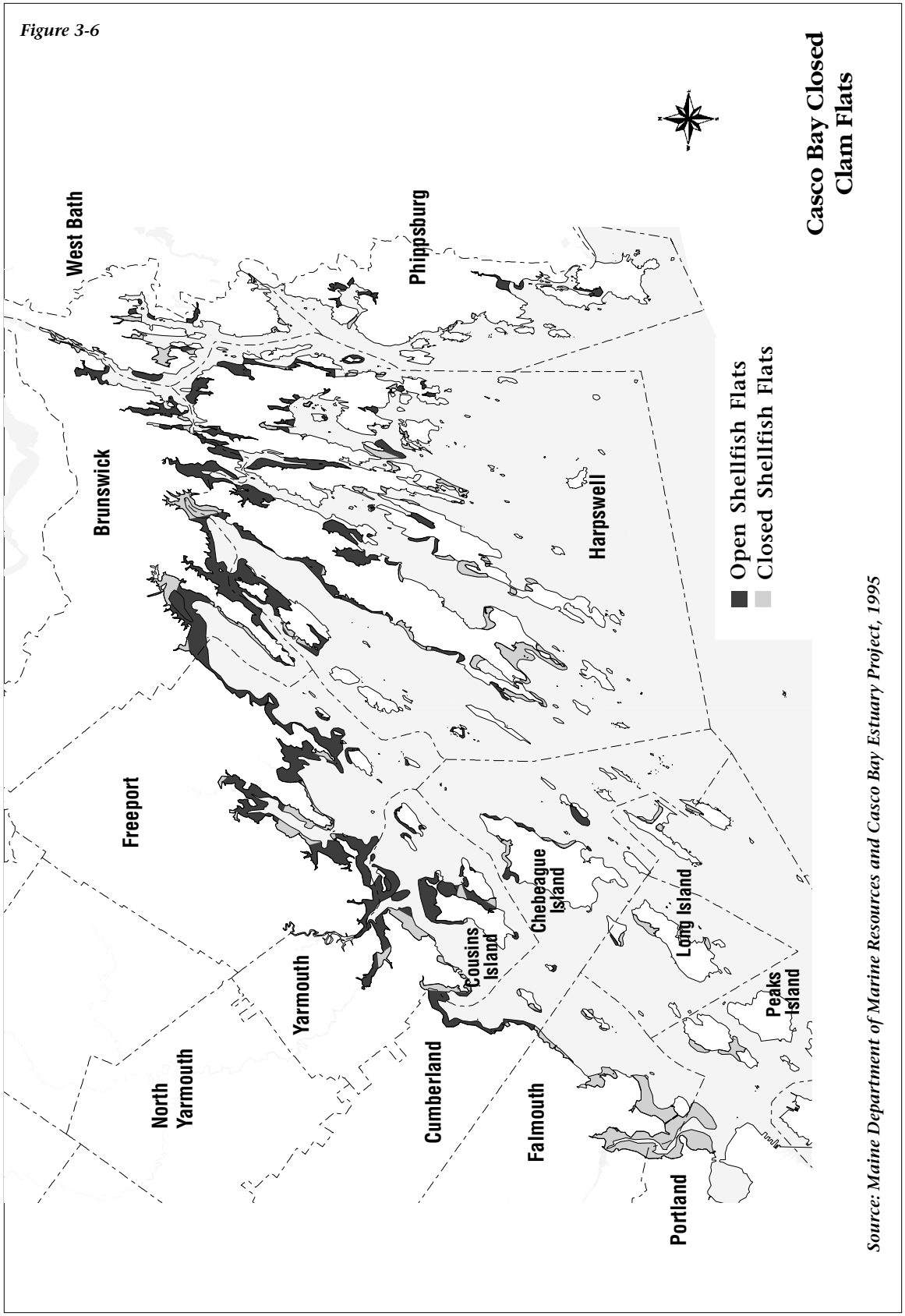
Economic Effects of Contamination

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

Figure 3-6



Source: Maine Department of Marine Resources and Casco Bay Estuary Project, 1995

disposal systems around Casco Bay function properly. *When flats are 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.

Although bacterial contamination does not represent a widespread environmental threat *per se,* the public perceives shellfish and swimming closures as a sign of environmental degradation. The Maine Department of Marine Resources frequently receives calls from tourists and property owners who do not want to harvest shellfish but are concerned because a local clam flat is classified "prohibited for shellfish harvesting."

Regulatory Measures

This section summarizes federal and state regulations and local ordinances that govern water quality standards affecting shellfish resource management.

National Shellfish Sanitation Program

The National Shellfish Sanitation Program was established in 1925 to prevent diseases caused by eating contaminated shellfish. In the early 1980s, uniform guidelines for classifying shellfish resource areas were established and documented in the National Shellfish Sanitation Program Manual. The federal Food and Drug Administration continually appraises each state's shellfish sanitation program to see if it is in compliance with program guidelines. The Maine Department of Marine Resources uses procedures outlined in the National Shellfish Sanitation Program Manual to assess bacterial contamination or the threat of bacterial contamination in shellfish areas.

The shellfish classification process involves a sanitary survey that must be conducted in each shellfish area prior to opening flats for harvesting. The sanitary survey has three components: (1) a shoreline survey for potential sources of bacteria; (2) evaluation of meteorological, hydrographic, and geographic influences; and (3) water quality sampling. The survey must be updated annually and re-evaluated every three years, with a new survey conducted at least once every 12 years.

Based on results of the sanitary survey and other factors *(e.g., c*losures around wastewater discharges and marinas), the Maine Department of Marine Resources classifies clam flats as approved *(i.e.,* open), conditionally approved, restricted, conditionally restricted, or prohibited (*i.e.,* closed to clamming). Occasionally flats are closed because the required number of water quality samples has not been taken or a recent shoreline survey completed.

The Subsurface Wastewater Disposal Rules

The Maine Subsurface Wastewater Disposal Rules (revised May 1995), which establish design and construction standards for all subsurface disposal systems, are set by the Division of Health Engineering (in the Maine Department of Human Services) and enforced by licensed municipal plumbing inspectors. Septic systems are to be set back 100 feet from the ocean, lakes, rivers, and major streams; 50 feet from minor streams; and 25 feet from wetlands. *Under*

the new Subsurface Wastewater Disposal Rules, homeowners are responsible for proper operation and maintenance of their septic systems. If a system is malfunctioning, the local plumbing inspector is required by state regulations to take enforcement action. The Subsurface Wastewater Disposal Rules also require a distance of at least 15 inches of continuously unsaturated soil beneath a septic leach field (variances may be allowed under certain conditions, such as large parcels) and that "grandfathered" systems function according to the standards in effect at the time of their installation.

The Maine Overboard Discharge System Law

The Maine Department of Environmental Protection licenses and periodically inspects existing overboard discharge units to make sure that they are not discharging unacceptable levels of bacteria. The Overboard Discharge System Law bans licensing of new, non-municipal, treated, and chlorinated overboard discharges into Maine waters, and sets up a procedure to phase out existing systems. Private overboard discharge systems cannot be relicensed after the system owner is offered a state grant to help fund a replacement system (90 percent state-funded for year-round systems; 50 percent for commercial systems; and 25 percent for seasonal systems).

The Maine Waste Discharge and Water Classification Laws

Under the Waste Discharge Law, the Maine Department of Environmental Protection may take enforcement action where it has evidence of unpermitted discharges into water bodies. Water classification laws further protect the usage of Maine's estuarine and marine waters for swimming and clamming, requiring that water quality not fall below the "fishable-swimmable" standard. No discharge is allowed in SA waters, and no new discharge that would cause closure of open shellfish areas is allowed in SB waters. A discharge might be allowed by the Maine Department of Environmental Protection in SC waters that could impact the status of clam flats. *(Please see Appendix B for an explanation of water quality classifications.)*

Federal Regulation of Discharges

The U.S. Environmental Protection Agency issues National Pollutant Discharge Elimination System permits for direct discharges into Maine's waters and must ensure, among other things, that water quality standards are met, including criteria to protect existing and designated shellfish areas.

State Regulation of Marinas

In 1989, the legislature required all marinas and yacht clubs with berths for 18 or more boats more than 24 feet in length to provide pumpout facilities. The law has not been enforced.

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)**