

## Action Plan 2. Protecting and Enhancing Shellfish Resources

### Problem

Shellfish (molluscs and crustaceans) are an important but diminishing resource in Buzzards Bay. Catch statistics suggest that populations of many mollusk species and lobster populations are declining. Declining catch of lobster may be related to disease and water quality degradation. Mollusk catch declines are the result of habitat declines and sanitary closures. Although the acreage of shellfish bed permanent closures have declined in Buzzards Bay in recent years, numerous areas remain permanently closed. Exacerbating the problem, funding for shellfish propagation and relay programs has been cut back appreciably in recent years.

The Massachusetts Division of Marine Fisheries (DMF) implements shellfish bed management based on ambient water quality in shellfish beds and a mostly visual evaluation of potential pollution sources along the coast (Shellfish Sanitation Survey Program). Additional coordination and collaboration is needed between DMF and municipalities to further minimize closures.

This Action Plan narrowly addresses steps to enhance the availability and productivity of shellfish resource areas. It compliments other action plans that target specific pollutants and impacts, especially *Managing Stormwater Runoff*, and *Managing Nitrogen-Sensitive Embayments*.

### Goals

**Goal 2.1. Increase availability of shellfish resources for recreational and commercial use.**

**Goal 2.2. Restore habitat to increase the abundance and distribution of shellfish resources.**

### Objectives

Objective 2.1. To keep open all shellfish resource areas now open, and to open priority resource areas that are now closed.

Objective 2.2. To increase the ability of DMF to carry out the sanitary survey program and provide technical assistance to municipalities to better manage shellfish resources.

Objective 2.3. To increase the capacity and commitment of municipalities to remediate pollution sources that are contributing to shellfish bed closures.

Objective 2.4. To expand the use of the conditionally approved classification for shellfish areas.

Objective 2.5. To eliminate pollution sources and disturbances contributing to the permanent loss of shellfish habitat.

Objective 2.6. Expand programs to propagate, seed, and relay shellfish.

### Solutions

To achieve the goals and objectives of this Action Plan requires improved coordination and collaboration between the DMF and municipalities. To reduce bacteria concentrations, both municipalities and DMF must better monitor and document upstream pollution sources contributing to shellfish bed closures and take action to eliminate these pollution sources or minimize their impact. State sanitary surveys should be posted online to assist town boards and committees establish pollution remediation priorities. Solutions relating to shellfish habitat loss are addressed in other action plans.

Additional monitoring is essential, because "end of the pipe" solutions are expensive, and upstream source reduction strategies can often achieve the same benefits at less cost. Such monitoring can also help establish priorities to target available programs and funds to address the most problematic discharges contributing to shellfish bed closures. Additional water quality data can also enable the state to expand conditionally approved areas, or reduce the extent of permanently closed shellfish areas. These outcomes may also depend on municipalities eliminating identified pollution discharges.

Expansion of propagation or seeding programs can provide benefits to the public in the absence of broader water quality or habitat improvements. Towns can construct shellfish upwellers to meet these needs.

### Costs and Financing

The legislature and local government needs to provide funds for staff needed to implement this Action Plan. A watershed-scale upstream source identification program, could be established at a cost of \$100,000 per year if it utilized existing staff and a volunteer monitoring program like that established by the Buzzards Bay Coalition in their nitrogen pollution water quality monitoring program. Programs like EPA's 604(b) program can assist with these watershed assessments. Funding for shellfish propagation seeding (including upwellers) and habitat creation programs can be included in state and local budgets. Tackling pollution like treating stormwater discharges to open shellfish beds or reducing nitrogen to restore shellfish habitat will cost billions over decades. Those costs and issues relating to these efforts are addressed in other action plans.

### Measuring Success

Acres of shellfish beds permanently closed, and commercial shellfish catch will be the principal long-term tracking measures to evaluate progress toward the goals of this action plan.

## Background

The shellfisheries of Buzzards Bay have long been a valuable ecological and economic resource worth protecting. Today, quahogs are the principal species harvested in terms of poundage (see Figure 21 in Chapter 3), but in terms of dollar value, bay scallops, soft-shell clams, and oysters remain important. In 2003, DMF estimated<sup>30</sup> the annual value of shellfish harvested from Buzzards Bay was \$4 million. Using an economic multiplier effect of 4.5, this catch contributed \$18 million to the local economy.

Scallop landings, although always variable, have declined in recent years (Figure 38), with loss of eelgrass and change in bottom habitat from nitrogen loading being a likely important cause. Similarly, soft shell clams, long a popular recreational species, have seen a near collapse of the fishery (Figure 39). Recent studies have suggested that the population of this species has suffered greatly due to predation by non-native invasive crabs that are now common in the intertidal zone of Buzzards Bay. This problem is discussed further in the Managing Invasive and Nuisance Species Action Plan.

Lobsters are the most important crustacean species harvested in Buzzards Bay (Figure 40), but in recent years, like the rest of southern New England, populations have declined due to factors that may include shell disease, pollution, and elevated summertime temperatures. This action plan does not specifically address lobster catch issues, but some related management problems are included in the Reducing Toxic Pollution Action Plan.

Throughout the 60s, 70s, and 80s, shellfish beds in Buzzards Bay were closed due to fecal coliform contamination at ever increasing rates, and these closings were one of the most pressing concerns with area residents (see Figure 41). In 1970, slightly more than 4,000 acres of shellfish beds were closed in Buzzards Bay; mostly near large wastewater discharges. By 1990, the state had closed more than 16,000 acres. This degradation of water quality due to pathogen contamination represented both a serious human health risk and an economic loss. Whenever the state and municipalities closed important recreational and commercial shellfish areas, the remaining open areas received additional fishing pressure, often depleting shellfish populations.

The Buzzards Bay shellfish bed closure story was a bit more complicated than these numbers alone indicated. In 1988, the Division of Marine Fisheries replaced DEP as the principal water quality-testing agency. When DMF assumed responsibility for the Shellfish Sa-

<sup>30</sup> Reported in DMF 2003 newsletter at <http://www.mass.gov/dfwele/dmf/publications/dmfng303.pdf>. This is considerably less than the 1988 estimate for the original CCMP, which was \$4.5 and \$18.8 million respectively in 1988. These values equal \$6.9 and \$28.9 million in 2003 dollars when adjusting for inflation dollars (based on inflation calculator at <http://www.westegg.com/inflation/infl.cgi>.)

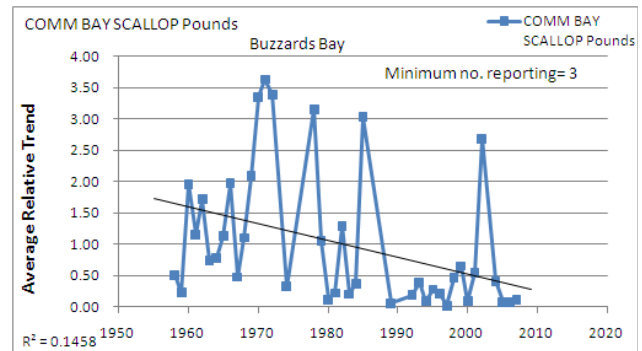


Figure 38. Relative trend of scallop catch in Buzzards Bay.

Calculated by the BBNEP, data and explanation at: [http://www.buzzardsbay.org/shellfish\\_catch\\_trends.htm](http://www.buzzardsbay.org/shellfish_catch_trends.htm)

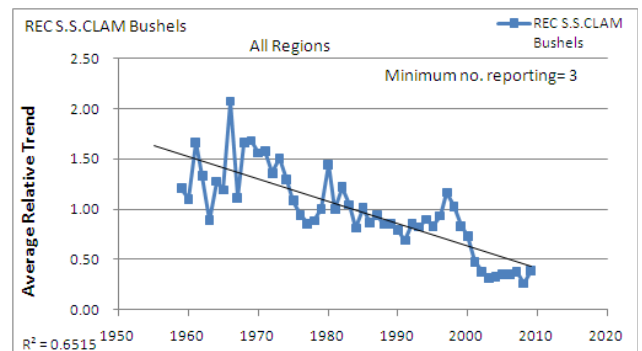


Figure 39. Relative trend of soft shell clam catch in Buzzards Bay.

Calculated by the BBNEP, data and explanation at: [http://www.buzzardsbay.org/shellfish\\_catch\\_trends.htm](http://www.buzzardsbay.org/shellfish_catch_trends.htm)

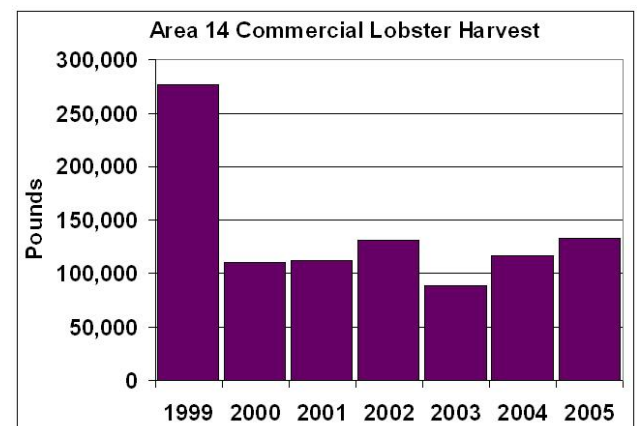


Figure 40. Recent annual commercial lobster catch in NMFS Area 14, which includes Buzzards Bay.

Data from Massachusetts DMF annual Massachusetts Lobster Fishery Statistics Technical Reports.

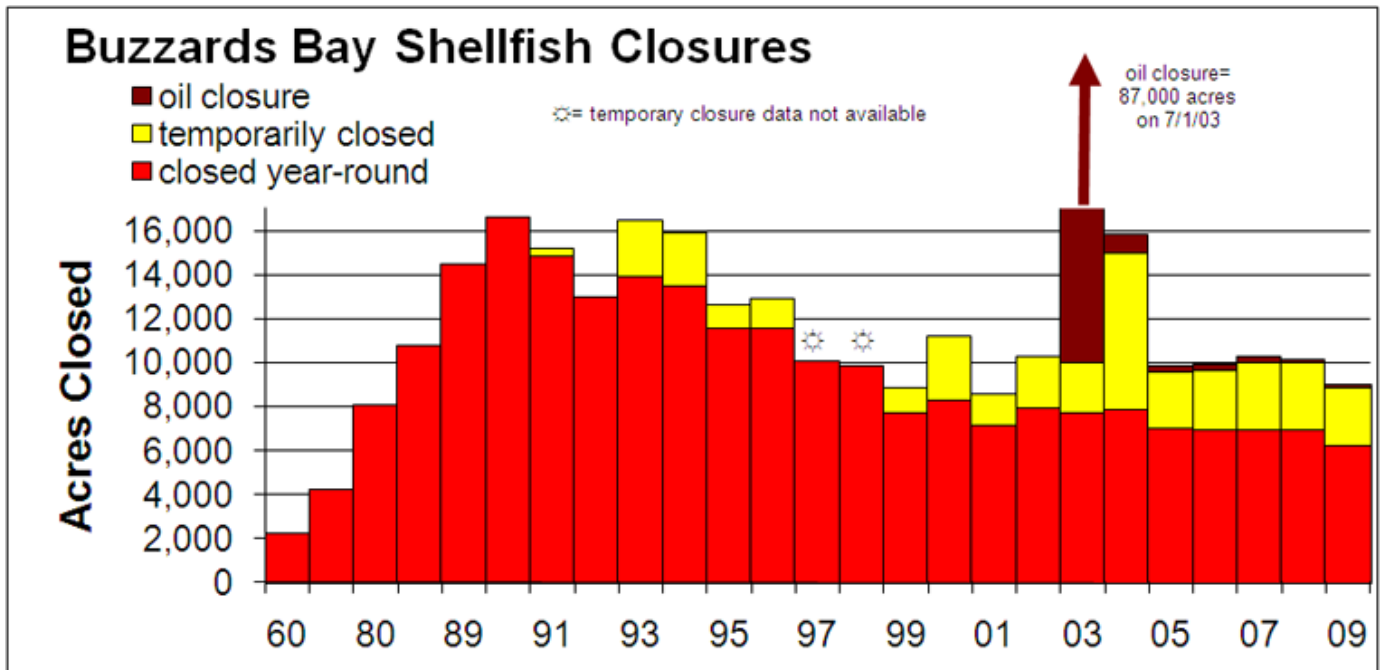


Figure 41. Permanent and rainfall or seasonally conditionally closed shellfish bed acreage in Buzzards Bay.

nitiation program, it received only half the necessary funding to implement the program, which was especially problematic because new federal mandates for testing and evaluation were imposed. Furthermore, during that decade, there was also a tremendous increase in new development along the shore, coupled with a large increase in boating traffic, docks and piers, new shore roads and discharges. The new development impacts and non-point sources of pollution associated with them, together with more rigorous testing requirements contributed to much of the shellfish bed closures during the late 1980s and early 1990s.

An early challenge faced by DMF occurred in 1989 when approximately 420,000 acres of shellfish resource areas statewide were threatened with “Management Closures” because the new federal testing mandates would not likely be met as DMF did not have adequate staffing to conduct sanitary surveys and water quality analyses. The Buzzards Bay NEP assisted DMF by providing funding for an additional staff person at DMF. Furthermore, Buzzards Bay municipal officials, principally health agents or shellfish wardens, took training programs and assisted DMF to complete the shoreline evaluation and water testing mandated by the new FDA Sanitary Survey requirements. This strong collaborative relationship of municipalities with DMF has continued to this day.

Another effort that began in the 1980s, and has continued to expand, is the use of the “rainfall conditional” shellfish bed closure system to open shellfish beds during some portion of the year below certain rainfall thresholds (yellow portion of bars in Figure 41). This rainfall conditional approach recognizes that elevated bacte-

ria counts in many of the bay's embayments are directly related to surface runoff during rain events. To implement a conditional program requires more testing and evaluation than the minimum required under the Sanitary Survey program. This strategy was defined as one of the primary goals in the 1991 Buzzards Bay CCMP.

The expanded use of the rainfall conditional closure approach by the Division of Marine Fisheries has been responsible for most of the bed openings in Buzzards Bay since 1990. The Buzzards Bay NEP has supported testing related to the reclassification efforts beginning with a \$10,000 grant to Westport. Westport was the first watershed community to begin the use of rainfall conditional closures in 1990, and similar efforts to establish rainfall conditional closures followed in New Bedford, Fairhaven, and Wareham. Large areas in the Westport River, Clark's Cove, outer New Bedford Harbor, and Little Bay in Fairhaven now have these rainfall conditional closures in place. This management technique establishes a rainfall threshold unique to each embayment by which the local shellfish warden raises a red flag adjacent to the shellfish beds alerting fishermen that the area is closed.

The most striking of these reopenings were those around New Bedford and Fairhaven that were reopened for the first time in 40-80 years. These openings were made possible because of the elimination of dry weather discharges from CSOs, expansion of sewerage, and upgrades to the city's municipal wastewater facility. The first reopenings of shellfish beds in Clarks Cove in 1992 resulted in millions of dollars of shellfish reaching markets. A comparable opening on the Fairhaven side of

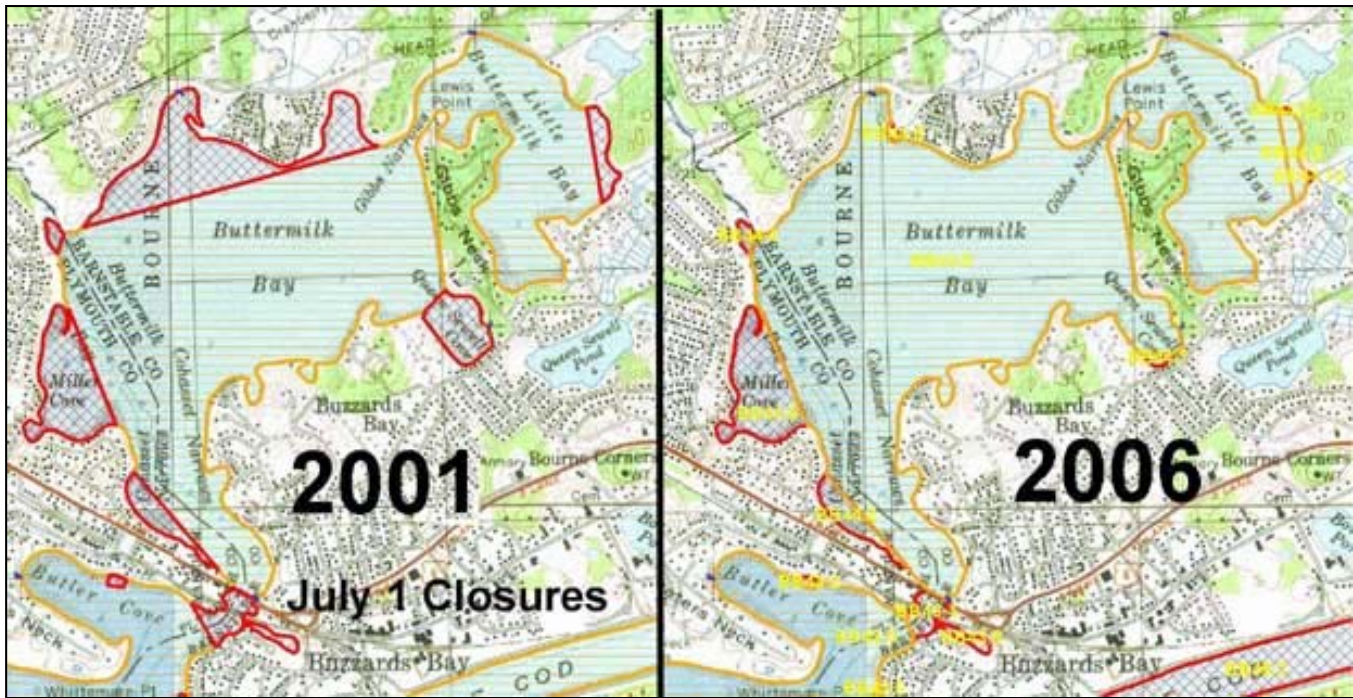


Figure 42. Incremental openings in Buttermilk Bay between 2001 and 2007 (closure status as of July 1 for each year).

New Bedford outer harbor showed similar benefits in 2008.

Of course, most shellfish bed openings in Buzzards Bay during the past decade were not the result of adopting the rainfall conditional approach. All around Buzzards Bay many smaller fringing reopenings, and some large areas around New Bedford Harbor were the result of the reduction in pollution discharges and treatment of

contaminated stormwater. The openings in Buttermilk Bay between 2000 and 2006 are typical of this pattern of openings (e.g., Figure 42). The shellfish resource area closure map for 2008 is shown in Figure 43.

The principal sources of pollution causing shellfish bed closures around Buzzards Bay remain pathogens and coliforms entering from sewage treatment plants, combined sewer overflows (CSOs; found only in New Bed-

Table 15. Shellfish permit fees in Buzzards Bay Municipalities (data from 2011).

Municipality	Commercial	Recreational: Resident	Recreational: Non-Resident	Temporary Non-Resident	Senior	Online regulations	Phone Recording
Bourne (1)	\$625	\$35	\$175		\$10 at 65	<a href="#">yes</a>	759-0621 x2
Dartmouth	\$225	\$25	\$75		free at 65	no	NA
Fairhaven	\$260	\$30	\$135		free at 65	<a href="#">Yes, Shellfish Quahog Dredging</a>	NA
Falmouth	\$300	\$25	\$80		\$5 at 65	no	495-7334
Marion, Rochester, & Mattapoisett (5)	\$250	\$25	\$120	\$25 (30 days)	free at 70	no	NA
Mattapoisett (3)	\$100-\$200	\$25	\$125		free at 65	no	NA
New Bedford (4)	\$225	\$12	\$50		\$3 at 59	no	NA
Wareham (2)	\$700	\$30	\$120	\$30 (2 weeks)	\$15 at 65	<a href="#">yes</a>	NA
Westport	\$100	\$25	\$100	\$50 (14 day)	\$10 at 65	<a href="#">yes</a>	NA

(1) Commercial Fee for Masters License, quahog \$250, clam \$250, scallop \$250, apprentice \$100  
(2) Commercial Fee for Masters License, quahog 300, scallop 300, oyster 300 clam 300, eel 150  
(3) Quahog: \$200 with boat, \$100 with no boat  
(4) Quahog only taking allowed, commercial price for full year.  
(5) \$250 for all species if purchased by 3/31, \$150 per species if purchased after.3/31

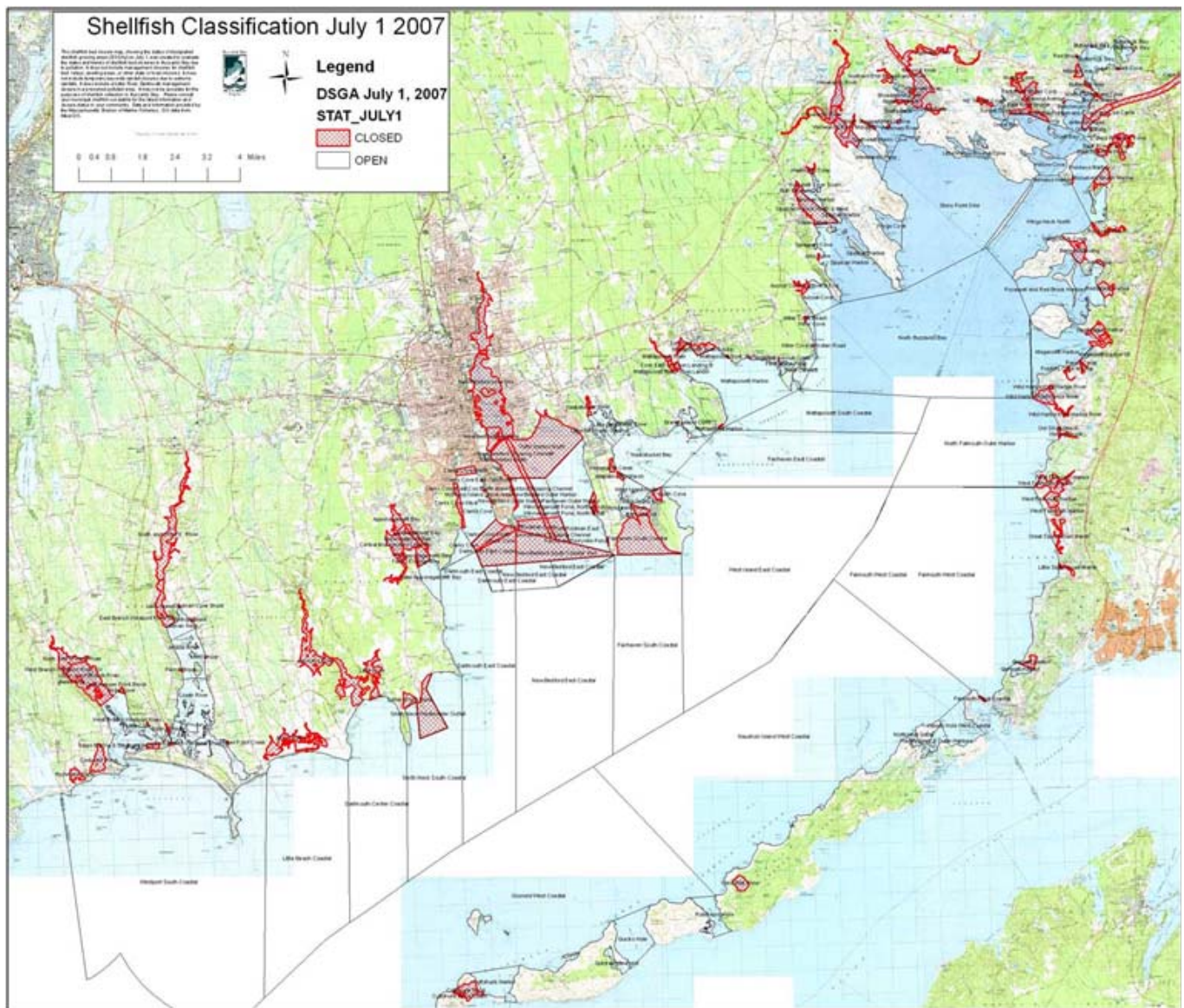


Figure 43. Map of permanent, rainfall, or seasonal conditionally closed shellfish beds in Buzzards Bay as of July 1, 2007. Data Courtesy of the Massachusetts Division of Marine Fisheries.

ford), stormwater runoff, boat sewage, and failed septic systems, but the relative importance of any of the sources in a particular embayment may have changed appreciably over the years. Chapter 4, Characterization of Pollution Sources, presents a fuller discussion of the sources of pathogens entering Buzzards Bay, but overall, the management and treatment of stormwater is increasingly the focus of management programs. This is because in most urban and suburban areas stormwater runoff remains the most significant potential source of pathogens impacting shellfish-harvesting areas.

Beginning in 1989, DMF completed an extensive effort to survey shellfish-growing areas along the coast (Sanitary Surveys) as required by FDA. These reports have been updated every few years ever since. These reports, together with DMF notices are the basis of closure maps like the one shown in Figure 43.

Besides the closure of shellfish beds, the productivity of open areas, and the impact of fishing pressures are a focus of concern. In general, the state delegates shellfish management authority, including catch limits to local communities, with only size limits and possible open areas set by the state. To help ensure shellfish populations, the state and municipalities have implemented relay, transplant, and seeding programs. These efforts are largely dependent on state funding, which has diminished in recent years. For example, reseeding areas with shellfish is both popular with municipalities and effective. In 2008, \$90,000 a year was going to Barnstable County to purchase seed that was then distributed to the municipalities on Cape Cod. This funding was cut in half in 2009, and completely eliminated in 2010. Similarly, the cost to purchase shellfish for relay through DMF has increased dramatically from \$20 to \$80 per

bag. While this increase reflects real costs to the state, municipalities have insufficient funds to make large purchases. Some towns, like Bourne, fund these efforts through a revolving fund supported by the sale of commercial shellfish licenses, the number of these licenses sold continues to decline.

Other impediments to sound shellfish management at the local level include lack of consistent and reliable catch data and lack of state oversight for management planning. Currently, municipal shellfish officers collect data on commercial and recreational harvest, but methods vary from town to town, and some towns do not report this data. Information is often based on personal observations or estimations, reducing its reliability. Few municipalities have implemented post-season survey questionnaires. This catch data is important and can be used to evaluate trends, set quotas, establish economic value, and assist in predicting future populations.

## Major Issues

Increased state funding is necessary to carry out the Shellfish Sanitation Program and to continue providing the appropriate level of technical and financial assistance to local communities to enhance resource productivity and improve shellfish management. To further increase the areas of rainfall conditional closures will require appreciable local and state monitoring efforts, for which there are no funds.

While many shellfish beds have been opened in the past 20 years due to remediation of stormwater inputs and through the use of rainfall conditional closures, summer seasonal closure areas have expanded in terms of area and duration in many parts of Buzzards Bay. This pattern appears driven by increased development and boating activity along the coast. This pattern will only be reversed with more aggressive pollution reduction efforts.

As noted in Chapter 4, use of fecal coliform bacteria as indicators of public health risk has raised serious questions. While this indicator has provided reasonable protection from bacterial pathogens, it has not been shown to correlate well with the occurrence of viral pathogens. Despite this, research has not yet provided a more cost-effective indicator that meets practical management needs.

The sale of commercial and recreational shellfish permits has been an important source of revenue for Buzzards Bay municipalities for decades (municipal fees shown in Table 15). Some towns place fees from commercial licenses, and occasionally from recreational licenses, in a fund to finance local shellfish restoration and propagation efforts. The loss of shellfish resources due to either overfishing, loss of shellfish habitat, disease, predation or competition by invasives, or other unknown variables has diminished overall harvest amounts in Massachusetts, and the sale of permits. While recrea-

tional shellfishing has diminished somewhat since the 1970s and 1980s in most communities, the continued decline in shellfisheries is most clearly expressed in the purchase of commercial licenses. For most Buzzards Bay communities, the trends of the Town of Bourne, shown in Figure 44, are most typical. Exceptions to these trends can be found in the City of New Bedford, and the Town of Fairhaven, after large shellfish resource areas were reopened for the first time after decades.

State funding for local seeding, relay, and propagation programs has continued to decline, and this pattern needs to be reversed to ensure a sustainable fishery in Buzzards Bay. Some municipalities have met some of their shellfish propagation needs through the establishment of municipal aquaculture programs. These efforts require the purchase of "upwellers"<sup>31</sup> to raise larval shellfish to an appropriate size for transplant, and also require adequate local funding of staff to manage such efforts. Some of these programs have been started with grant funds, but long term implementation of these efforts requires sustained local funding for staff, an expenditure often difficult to pass through town meetings.

## Management Approaches

This Action Plan focuses principally on improving the management of shellfish beds, expanding propagation and relay efforts, and collecting additional water quality data, especially bacterial concentrations, in upstream pollution discharges. Most actions will need to be undertaken by DMF or municipalities, but successful collaborations could involve citizens groups and the BBNEP. When needed, towns could assist DMF with their water quality-monitoring testing in support of triennial sanitary surveys. Typically, the shellfish constable and health agent have the greatest capacity to assist in these efforts, and some towns have provided this support to DMF in the past.

To reduce the size and duration of shellfish bed closures, water quality collection should focus on better defining problems identified in sanitary survey reports. In a practical sense, priorities must be established based not only on closures, but whether there are shellfish resources in the closed areas. In general, DMF could encourage Buzzards Bay towns to work cooperatively to maintain or expand rainfall conditionally approved shellfish areas. This approach generally requires local action to eliminate pollution discharges.

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<sup>31</sup> An upweller is a floating shellfish seed culturing device that consists of seed containers, called silos, attached to a float-like apparatus attached to a pier or raft. The young shellfish are placed in the silos, and a wave driven pump system brings a continual flow of water over the shellfish.

Municipal collaboration with DMF can also help prioritize pollution sources most likely to result in openings of new shellfish areas if remediated. This approach is only practical where the most problematic discharges are identified and solutions implemented by the town. It is essential that boards of health take enforcement action to eliminate illicit discharges or failing septic systems identified by DMF's sanitary surveys. In the case of stormwater discharges, municipal MS4 permit stormwater committees should utilize the DMF sanitary surveys to help the town set priorities for stormwater treatment. DMF sanitary surveys should be posted on line to facilitate the exchange of information contained in those reports.

Broader actions that meet the goals of restoring habitat and water quality by reducing stormwater discharges and nitrogen loading can be found in the Managing Stormwater Runoff and Managing Nitrogen-Sensitive Embayments Action Plans. The most important are those municipal actions to meet any adopted bacteria TMDLs and Phase II stormwater permits.

A separate set of efforts are required to create or improve shellfish habitat. Creating new shellfish habitat, such as establishing oyster beds by the addition of shell to the bottom to create suitable habitat, not only creates additional shellfish resources that can be harvested by commercial and recreational fisherman, but the filter feeding of shellfish can help ameliorate the impacts of nitrogen pollution.

### Financial Solutions

Existing state and local staff may not be able to accomplish all the elements of this action plan, so the towns would need to increase funding, especially for those efforts that support the Shellfish Sanitation Survey Program.

Funding for shellfish seeding and propagation programs has diminished greatly in recent years. Local funding through town meeting (or through the city council in New Bedford) or the legislature would be needed, but this would only occur if shellfish propagation were a higher priority for both the Commonwealth and municipalities. Some towns have established dedicated funds with shellfish permit revenues to implement local shellfish seeding and propagation programs, and this is a good model for other communities. These programs, and pilot efforts to establish shellfish aquaculture in coastal bays, may get a boost because increasing shellfish biomass is being viewed as a possible strategy to

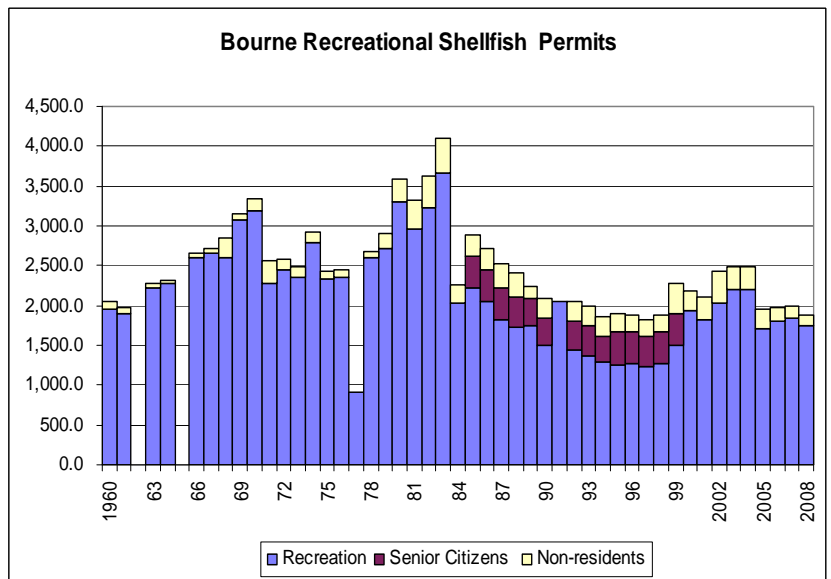
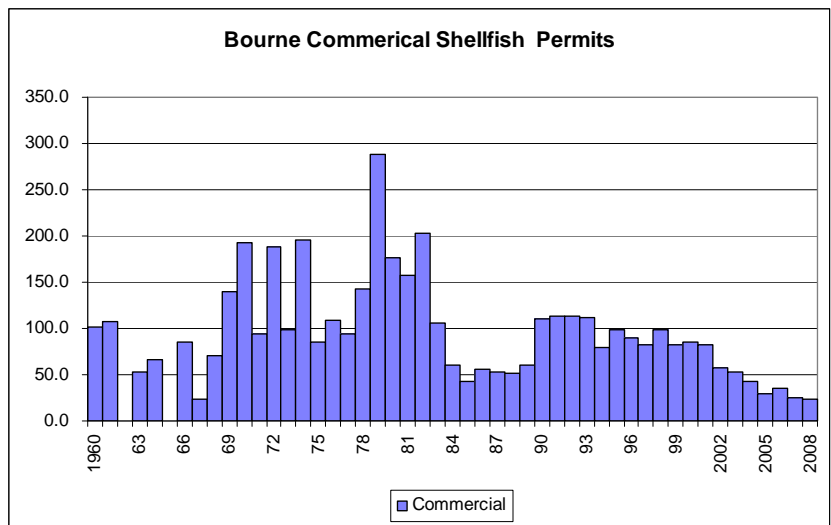


Figure 44. A fifty year record of shellfish permits in the Town of Bourne. Top: Commercial permits. Bottom: recreational permits of various types.

ameliorate the impacts of nitrogen pollution in coastal waters.

Various state and federal grant programs, or pollution trust programs that manage fines or court settlements, may provide grants for shellfish enhancement efforts. These programs generally do not support seeding programs because they are a temporary solution to increasing shellfish abundance. Instead, these programs are more likely to fund proposals that create longer term solutions, such as creating shellfish habitat (e.g. creating an oyster reef), or programs that expand local efforts to seed areas in a sustained way, such as funding for municipal upwellers.

The costs of water quality monitoring could either be appropriated at the local or state level (with funding provided by town meeting and the legislature respective-

ly). Federal water quality assessment programs like EPA's 604(b) program is a viable funding source for both watershed wide programs and subwatershed pilots.

Once upstream problems are identified, improving water quality will depend on the type size of the pollution source. Stormwater treatment solutions can be expensive, and these are addressed in the Managing Stormwater Runoff action plan.

The best outcomes will be achieved by use of sanitary surveys, upstream source identification, and exchange and coordination of information between municipal health agents, Phase II stormwater coordinators, shellfish officers, and conservation agents.

The success of these efforts can be tracked by enumerating the number of illicit and illegal discharges eliminated, the number of stormwater discharges eliminated or treated, and ultimately the size and duration of shellfish bed closures.

### **Monitoring Progress**

To evaluate progress towards the goals of this action plan will require tracking acres of shellfish beds closed particularly during the summer, acre-days closed on an annual basis, and commercial shellfish catch.