

## Action Plan 19: Protecting Public Health at Swimming Beaches

### **Problem**

Public and private beaches are found throughout Buzzards Bay (Figure 101) and are an important recreational, aesthetic, and economic resource to the residents of the Buzzards Bay watershed and surrounding areas, and an important source of revenue for municipalities, both in the collection of fees (Table 44), and through the attraction of tourists.

Bathing beaches for many represent the only direct exposure or use of Buzzards Bay, and as such, the quality and condition of bathing beaches plays an important role in the public perception of the health and condition of Buzzards Bay. These bathing beaches also represent potential human exposure to contaminants discharged to surface waters. Of these contaminants, pathogens in particular represent the most immediate potential threat to public health. Exposure to pathogens can occur either by direct contact with, or ingestion of, contaminated waters by bathers, and may result in illness.

This action plan identifies ways in which local and state government can minimize threats to human health from the risks of pathogen contamination at swimming beaches. The solution to the problems outlined in this action plan will require better designed testing, improved reporting, education of the public, and action to reduce the most serious forms of pollution.

### **Goals**

***Goal 19.1. Reduce or eliminate pollution sources contributing to beach closures.***

***Goal 19.2. Manage beach use to reduce human exposure and health risks based on site-specific conditions.***

### **Objectives**

Objective 19.1. Reduce contaminated stormwater discharges to beach areas.

Objective 19.2. Increase public awareness about areas prone to contamination or conditions that may lead to elevated contaminant levels at beaches.

Objective 19.3. Prohibit pet use of beaches and encourage pet waste collection in stormwater drainage areas.

Objective 19.4. Develop and implement more rapid assays to document existing conditions, and where necessary implement preemptive rainfall closures.

### **Solutions**

To meet the goals of this action plan requires two types of actions. First, pollution sources causing beach closures must be identified and eliminated. Second, beaches should be tested more rigorously to capture poor water quality after adverse conditions, such as after moderate to heavy rains. Current beach testing practices only catch these by chance. Evaluating beaches during adverse conditions will better protect the public from water borne diseases and minimize health risk. Municipalities with 15% exceedances each summer at their beaches should test their beaches at least twice per week and conduct sampling to identify sources.

Because staff may have to work after hours to collect samples for such an evaluation of adverse conditions at a beach, this creates a burden. Hiring a contractor to conduct a detailed study of the relationship between rainfall and bacteria levels at the beach may be the sound approach that could allow municipal officials to determine if rainfall conditional beach closures are warranted. MA DPH and other agencies should continue to evaluate and promote rapid assays.

Programs and regulations to eliminate pets from beaches, or to promote pet waste cleanup in coastal drainage areas can help alleviate problems.

### **Costs and Financing**

Remediating pollution sources can be costly, especially for those beaches near a brook or drainage system where many sources may be contributing to elevated pollution loads. Most of these pollution sources will be associated with stormwater discharges, and these costs are addressed more comprehensively in the Stormwater Action Plan.

The cost of increased monitoring is relatively modest, but because laboratories charge extra fees if samples are taken at times that require processing during non-working hours, sampling analyses costs can increase and must be budgeted. Dog waste receptacles have minimal costs and are good education tools.

### **Measuring Success**

The final measure of success of this action plan will be the documentation in the reduction of beach closures for any given sampling scheme.



## Background

Bathing beaches are popular around Buzzards Bay, and are an important source of revenue for municipalities (Table 44), and are a popular tourist stop. Beaches can also pose a health risk if pollution discharges at or near the beaches are not properly managed. The most frequent illness documented from contaminated beaches are various forms of gastroenteritis (e.g. campylobacteriosis), but potentially more serious diseases may result including salmonellosis, giardiasis, and hepatitis A. In fresh water ponds, skin lesion diseases such as impetigo can also occur.

To minimize these and other disease threats, state and federal agencies have promulgated beach testing regulations that are primarily implemented by local government. In Massachusetts, bathing beach water quality is regulated by the Massachusetts Department of Public Health (MDPH) under Massachusetts General Law (MGL) Chapter (C) 111, § Section (S)5 and regulations cited as 105 Code of Massachusetts Regulations (CMR) 445.000: Minimum Standards for Bathing Beaches (State Sanitary Code, Chapter VII; Appendix A and B). To protect public health, these regulations require all public and semi-public beaches to be monitored for indicator bacteria, and on occasion other environmental contamination during the beach season and closure of beaches when levels of indicator organisms exceed regulatory standards.

In recent years, these regulations have become more stringent, and indicator bacteria have changed, as has required testing frequency. These new regulations require local government to evaluate beaches during adverse conditions, such as after heavy rains, rather than testing on a prescribed day of the week.

Because of the resource burdens and costs related to beach water monitoring, municipalities may not meet all beach monitoring requirements. Few cities/towns

Table 44. Municipal Beach Parking Sticker Costs

Town	Resident/Taxpayer	Non-Resident	Senior	Town Fee parking
Falmouth	\$30	\$200 (season)	not offered	3 beaches, \$10-\$20
Bourne	\$15	\$30	not offered	none
Wareham	\$20	\$40	\$5 at 65	\$5
Mattapoisett	\$10	not offered	free at 65	\$10
Marion	\$10	\$35	free	none
Fairhaven*	\$25	not offered	free at 60	\$5*
New Bedford	free	free	free	none
Dartmouth	\$70	\$100	\$50 at 65	none**
Westport	\$20	not offered	\$10 at 60	none***

\* Fairhaven is the only town with a fee (\$2) for bicyclists and pedestrians. They also have a \$5 auto daily parking fee for residents only.

\*\*There is \$7 parking fee at the state operated [Demarest Lloyd State Park](#).

\*\*\*There is \$7 parking fee at the state operated [Horseneck Beach State Reservation](#).

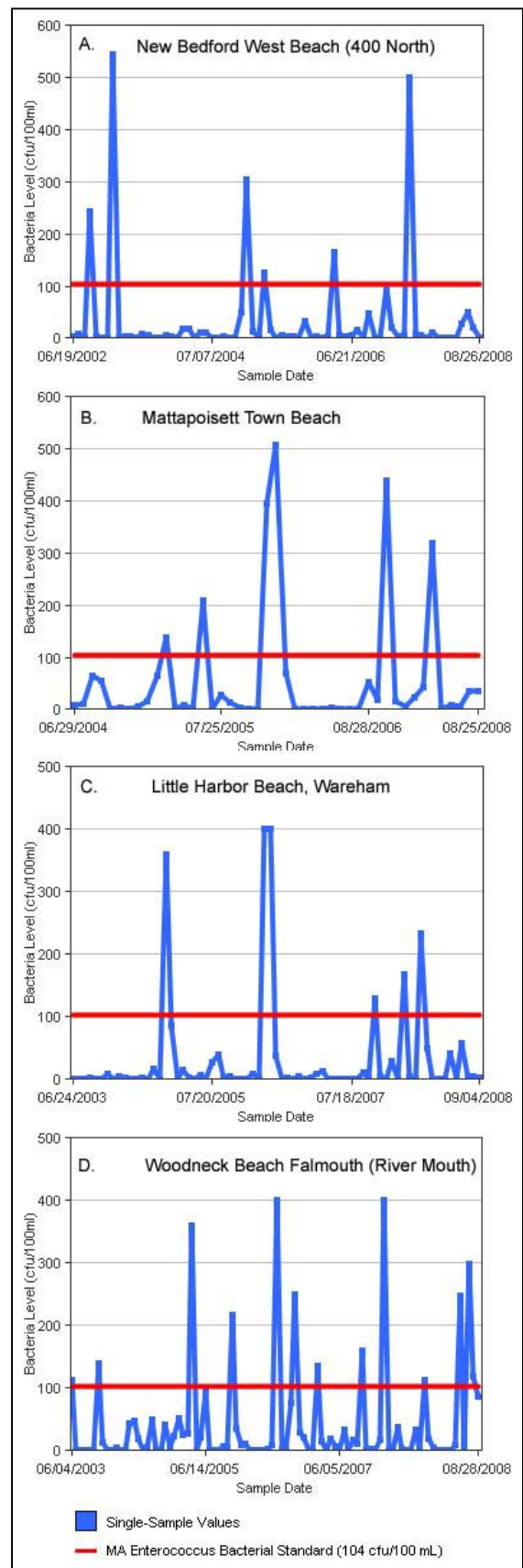


Figure 102. Selected Buzzards Bay beach monitoring site results compared to the safe swimming standards.

Data from Massachusetts Department of public health, data at <http://mass.digitalhealthdepartment.com>.

have implemented preemptive rainfall conditioned beach closures, despite the fact that ample data justify such actions. Municipal officials privately admit that preemptive rainfall beach closures would be unpopular with residences and they are concerned with potential impacts to local tourism and the economy. Municipal officials are also concerned with the potential high cost of remediating stormwater related beach closures.

This action plan principally addresses minimizing human health risks from beach contamination. Loss of the use of beaches due to erosion and shifting shorelines is addressed in the Planning For A Shifting Shoreline and Coastal Storms Action Plan. Aesthetic and health risks associated from debris on beaches are addressed in the Reducing Beach Debris, Marine Floatables, and Litter in Wetlands Action Plan. Contamination of shellfish with pathogens is addressed in the Protecting and Enhancing Shellfish Resources Action Plan.

There are about 70 public beaches (municipal and state owned including sub areas) stretching across 13.4 miles of Buzzards Bay, with roughly an additional 40 "semi-public" beaches covering 31.9 miles<sup>116</sup>. A map of these beach areas is shown in Figure 101. Public beaches are available to both residents and non-residents, but parking restrictions and parking costs affect use of these beaches (see Table 44). These parking fees typically pay for life guards and other services, and may also pay for beach water testing programs.

Semi-public beaches include some large tracts of state, municipal, and private conservation coastal lands where the public may have some right to use, and bathing may occur, but generally, these areas do not have posted lifeguards. On the other hand, semi-public beaches also include beach association and community beaches, private pay-to use beaches, club and resort beaches, which are not open to the general public, but may still have intense use. The rest of Buzzards Bay's coastline is largely privately owned parcels. In Massachusetts, private property rights generally extend to the low tide mark, and these beaches are typically used for bathing only by property owners and their guests. The water quality at these beaches is usually not tested, but may be done at the owner's request and expense.

<sup>116</sup> This total is for the 310 miles of coast for the mainland portion of Buzzards Bay, including both the Cape Cod side and western or "south coast" side of the bay. This total does not include the 9 miles of coastline of the Cape Cod Canal within the Buzzards Bay watershed, nor does it include an additional 40 miles of coastline on the bay facing side of the Elizabeth Islands. The length of coastline from Westport to Wareham ("South Coast") is 245 miles, and the length of public and semi-public beaches from Westport to Wareham ("South Coast") is 11.7 and 26.6 miles respectively. (source: BBNEP calculations posted at <http://www.buzzardsbay.org/phbeachinfo.htm>).

Table 45. Number of marine beach testing exceedances in Buzzards Bay in 2006 and 2007.

Data from MDPH. Only Bourne and Falmouth beaches in Buzzards Bay included in the analysis. Both public and semi-public beaches included.

<b>2006 results for Buzzards Bay Beaches</b>			
Municipality	# of Tests	# of Single Sample Exceedances	Number of Postings
Bourne	175	6	5
Dartmouth	134	9	6
Fairhaven	75	5	4
Falmouth	243	6	3
Marion	126	12	8
Mattapoisett	156	11	0
New Bedford	126	6	6
Wareham	142	2	0
Westport	126	3	0
Grand Total	1303	60	32
percent exceedances		4.6%	

<b>2007 results for Buzzards Bay Beaches</b>			
Municipality	# of Tests	# of Single Sample Exceedances	Number of Postings
Bourne	176	4	4
Dartmouth	138	2	2
Fairhaven	61	5	3
Falmouth	276	5	5
Marion	122	2	2
Mattapoisett	160	8	4
New Bedford	130	7	6
Wareham	152	6	6
Westport	75	0	0
Grand Total	1290	39	32
percent exceedances		3.0%	

Massachusetts is one of five states<sup>117</sup> with such property ownership to the low tide mark. Under [Chapter 91 of the Massachusetts General Laws](#), some public rights in the intertidal zone are preserved (principally fishing, fowling, and navigation), and more information on the origins of this law and public rights in the intertidal zone in Massachusetts can be found on the Buzzards Bay NEP's [Public Access to Buzzards Bay and its Shore](#) page, and Massachusetts Coastal Zone Management's [Public Rights Along the Shoreline](#) page.

In 2000, the U.S. Congress enacted the Beaches Environmental Assessment and Coastal Health (BEACH) Act to improve the quality of coastal recreational waters. Also in 2000, the Massachusetts Beaches

<sup>117</sup> The other states are Delaware, Maine, Pennsylvania, and Virginia.

Act (Chapter 248 of the Acts of 2000) was passed, with new state regulations promulgated in April 2001 ([105 CMR Section 445](#)). The Act mandated that the state Department of Public Health (MDPH) establish a program to provide for monitoring, testing, and posting of public and semi-public beaches. MDPH requires beaches be tested at least weekly during the bathing season using standardized protocols with improved indicators; the results of these efforts to be posted in a timely manner. By 2004, these new water-quality standards and monitoring procedures were implemented in all Massachusetts coastal communities. This increased compliance also resulted in increases in the number of beach closures statewide due to more frequent testing.<sup>118</sup>

The most important elements of the Massachusetts beach testing regulations is that they required minimum weekly sampling and changed the indicator organism for marine waters to Enterococci (from fecal or total coliforms). For fresh water the indicator organisms remained either fecal coliforms or Enterococci. In marine waters, the standard required beach closures if Enterococci exceeded 104 colonies per 100 ml or a geometric mean 35 colonies per 100 ml for the most recent five sampling dates. Beaches that do not meet these requirements must be posted with a sign that states "WARNING! NO SWIMMING. SWIMMING MAY CAUSE ILLNESS." Local boards of health could also issue such a notice after any significant rainstorm at a bathing beach where there has been a history of rainstorm related violations. However, no municipality in Buzzards Bay has adopted such a policy. While few municipalities have enacted pre-emptive closures, some have posted beaches during periods of intense rain, as well as a few for public safety reasons (i.e. jellyfish at the beach).

## Major Issues

The biggest challenge for state and local health officials to reduce and minimize the frequency of beach closures is to minimize the impacts caused by stormwater discharges, particularly during heavier rains. Most of the high concentrations of enterococci at the beaches in Figure 102 occurred after rainstorms. During exceptionally heavy rains six to twelve beaches in Buzzards Bay may be closed; during rainfalls of 1 to 2 inches, several beaches may be closed. Because cities and towns tend to sample on prescribed days of the week rather than intentionally sampling after a heavy rain, the true extent of the rainfall related water quality health risks is underreported and underestimated.

A comparison of beach testing results for 2006 and 2007 as reported to MDPH is shown in Table 45<sup>119</sup>. As shown, 4.6% and 3.0% of all tests in 2006 and 2007 respectively exceeded beach closure standards. In 2006, only 53% of the beaches were posted with warnings, but in 2007, 83% of the beaches were posted as required. Also, three Buzzards Bay beaches were listed by MDPH in the top ten beaches in the state in terms of percent exceedances. These beaches were Moses Smith Creek beach in Dartmouth, Oakdale Avenue Beach in Marion, and Town Beach, Mattapoisett. Of the three, only the Mattapoisett Town Beach is heavily used. In 2004, the Town of Mattapoisett Board of Health also received a complaint from a resident that their child developed skin lesions after swimming at the beach.

Among freshwater ponds in the Buzzards Bay watershed, the Town of Falmouth has the most freshwater beaches tested. Bourne, Rochester, and Wareham follow with two ponds each, as well as a few dozen ponds tested in Plymouth. Each of the four towns has experienced at least one exceedance at a freshwater beach during the past five years. A number of towns (Dartmouth, New Bedford, and Westport) have closed municipal freshwater beaches due to resource issues and low use in the past several years.

In the Buzzards Bay watershed, combined sewer overflows are problematic only in the City of New Bedford. In most areas, stormwater runoff from pipes, overland sources, or discharges from rivers and streams that receive appreciable stormwater discharges are the principal causes of beach closures. Mattapoisett Town Beach (Figure 102) is affected by a culvert that discharges groundwater and stormwater. In Falmouth, Wood Neck Beach (river station) is affected by stormwater discharges to a salt marsh area, but even during dry conditions, bacteria concentrations can be high during ebb tides when draining tidal creeks affect water quality in the swimming area.

Other cases of beach high bacteria counts and closed beaches have been tied to waterfowl. For example, Canada geese in particular have been known to congregate in areas to such an extent that the beach wrack line consists mostly of goose feces. In these situations, geese control methods, like low fencing and shrubbery plantings have proved effective in discouraging the congregation of geese because of the animal's perceived threats from predators<sup>120</sup>.

<sup>119</sup> Marine & Freshwater Beach Testing in Massachusetts Annual Report 2007, last accessed 11/18/2009 at [http://www.mass.gov/Eeohhs2/docs/dph/environmental/exposure/beach\\_annual\\_report07.pdf](http://www.mass.gov/Eeohhs2/docs/dph/environmental/exposure/beach_annual_report07.pdf)

<sup>120</sup> Department of Conservation and Recreation. 2004. "Goose Fencing a Success!" 2 page fact sheet, Lakes and Ponds Program at <http://www.mass.gov/dcr/waterSupply/lakepond/hottopic/Goose%20Fencing%20a%20Success.pdf>, last accessed 11/18/09

<sup>118</sup> "Cape beaches rank among best in state." Hilary Russ. Cape Cod Times August 09, 2007 (last accessed 11/18/2009)

Another problem often documented is the role of dog waste on beaches and in neighborhoods of stormwater networks contributing to beach stormwater discharges. Because of increased government and public awareness of the problem, the state and most municipalities have banned pets from bathing beaches, provided collection bags and disposal containers in parks and other public lands, and have undertaken public education using signage in public locations (e.g. Figure 103, and Figure 104).

When beaches exceed the 104 enterococci bacteria per 100 ml standard, public health officials are required to post warnings. More importantly, municipalities confronting frequent closures should implement programs to characterize the closing and determine if high coliforms are stormwater discharge related, and where appropriate, implement advisory or closure programs tied to rainfall volumes. For financial and political reasons, such programs are rarely implemented.

In 2003, the Massachusetts Department of Public Health completed a GIS inventory of beaches in Massachusetts and began posting municipal water quality testing results online. By 2005, all 60 Massachusetts coastal municipalities were reporting their bathing beach data to DPH as required by law<sup>121</sup>. This program has helped improve public understanding of public health risks and helped create local public interest in taking action to control pollution sources contributing to beach closures. Full compliance with testing and closure posting is yet to be achieved in semi-public beaches.

In 2003, as part of a Beach Grant from the U.S. EPA, MDPH also proposed a "Public Health-Based Beach Evaluation, Classification, and Tiered Monitoring Plan."<sup>122</sup> In 2006, MDPH developed a sanitary survey form for Massachusetts beaches, comparable to the sanitary surveys used previously to evaluate pollution sources to shellfish beds. The development of the tiered system and the sanitary survey forms allowed communities to apply for sampling variances according to Massachusetts' regulations (105 CMR 445.100) and also allowed MDPH to implement a tiered monitoring approach to sampling. The goal of this effort was to direct water quality monitoring resources to the beaches that pose the greatest health concerns.

In the tiered system, every public and semi-public marine bathing beach was classified as "Tier One," "Tier Two," or "Tier Three." Tier One includes heavily used beaches with known pollution problems. Beaches with "multiple exceedances for three or more years" are classified as Tier One. MDPH has proposed these

<sup>121</sup> Marine & Freshwater Beach Testing in Massachusetts Annual Report 2005, last accessed 11/18/09 at [http://www.mass.gov/Eoohs2/docs/dph/environmental/exposure/beach\\_annual\\_report05.pdf](http://www.mass.gov/Eoohs2/docs/dph/environmental/exposure/beach_annual_report05.pdf)

<sup>122</sup> Available at [http://www.mass.gov/Eoohs2/docs/dph/environmental/exposure/beach\\_valplan.pdf](http://www.mass.gov/Eoohs2/docs/dph/environmental/exposure/beach_valplan.pdf), last accessed 11/18/09.

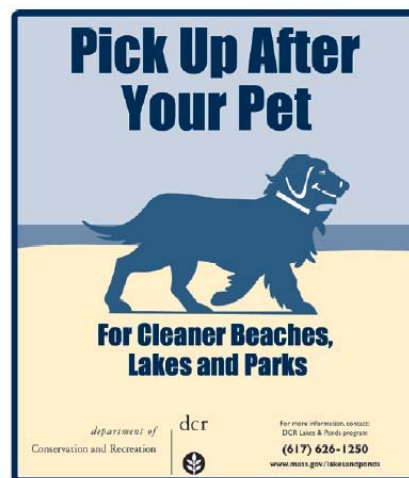


Figure 103. Sign posted by Massachusetts DCR at state parks and beaches.

beaches be tested twice per week. Tier Two includes higher use beaches with some pollution. These beaches must be tested once per week. Tier Three beaches are those with no known pollution problems (zero exceedances for two or more years). These beaches are required to be tested once every two weeks or less, as determined by MDPH through the variance process.

Among Massachusetts marine beaches, there are currently seven Tier One beaches, 421 Tier Two, and 86 Tier Three beaches. In Buzzards Bay there are no Tier One beaches designated and 11 Tier Three beaches that started a variances sampling frequency in 2008. All other public beaches are tested weekly as Tier Two.

For public health officials, the biggest obstacle in utilizing water quality testing data is that it takes 24 hours to receive the results because of incubation times needed for bacterial growth in media. This delay increases exposure of bathers to unsafe bacterial levels, and also contributes unnecessarily long closures if an ephemeral event contributed to the closure. The testing results delay also makes it very difficult for investigators to track the origins of contamination because sources may dissipate before a field investigation be-



Figure 104. Dog waste bag dispenser in Bourne.

gins. For these reasons, state and federal agencies have been continuing to develop and evaluate more rapid assays.

From an evaluation perspective, certain common trends can be discerned by an examination of water quality field data. Many of these trends have been observed in site investigations with frequent monitoring at shellfish resource areas. For example, beaches near salt marshes or streams tend to have worse water quality during low and outgoing tides because discharges from land drainage sources are most likely to appear (for example, Woodneck Beach in Figure 102). These sites and others near storm drain discharges may experience heavy bacterial loadings during rain storms. The intensity of rainfall can have a profound effect on water quality. A storm with several inches of rain can degrade water quality for days whereas a rainfall of 0.1 inch may have a negligible impact on water quality. During periods of strong winds and heavy surf, sediments contaminated with bacteria can be suspended in the water column, elevating bacteria counts.

For all these reasons it is important for water testers to record, on their field sampling data sheets, the volumes and dates of recent rainfalls, tidal level and current direction, wind speed and direction, surf conditions, water quality, and temperature to aid in the evaluation of data sets at a later time by analysts. Not all this information is included as fields in MDPH field data sheets but should be recorded to help identify site-specific closure conditions, and such information can help define a pollution source tracking monitoring plan for problematic sites.

In the end, government officials have two options to reduce health risks associated with swimming beaches. The long-term solution is to reduce pollution discharges. The short term solution is to manage exposure through beach closures based on water testing, and to manage exposure in known problem areas by preemptive management (e.g. closing beaches or areas near stormwater pipes after certain rainfall volumes, prohibiting swimming in tidal creeks during outgoing low tides). In addition, public education and outreach is vital to ensuring best pet management at the beach. To this end, MDPH created an informational pet waste brochure available on its website and distributes it annually to local health officials. With these steps recreational uses of bathing beaches will continue for generations.

## Management Approaches

Implementation of this action plan requires more effective monitoring to adequately assess the risks associated with pathogen contamination of beaches, and measures to reduce pollutant discharges causing beach closures.

Currently beaches are monitored on a set day and time conducive to laboratory and personnel schedules.

However, in reality, risks are typically associated with rain and stormwater discharges, and regularly scheduled beach testing practices only catch water quality threats by chance. Beaches with 15% exceedances each summer should automatically be tested at least twice per week and conduct sampling to identify sources. Boards of health should also conduct rain related beach testing, and upstream source testing whenever a beach has shown a history of closures coincident with heavy rains. Where warranted, boards of health should implement a rainfall conditional beach testing program. Only in this way, can boards of health better characterize typical pollutant levels after different amounts of rain in order to better inform the public of what health risks might be faced at a particular beach in the hours and days after a heavy rain. Evaluating beaches during adverse conditions will better protect the public from water borne diseases and minimize health risk. Where appropriate, signage should be posted advising against bathing near outfall pipes and streams.

Where beaches are subject to greater than 15% water quality testing exceedances in a summer, municipalities should implement pollution source identification and reduction programs. In many cases, these efforts will address the needed action identified in the stormwater management action plan. Other programs, like efforts to reduce pet waste may contribute to the goals of this action plan.

## Financial Solutions

The cost of increased monitoring is relatively modest, but because laboratories charge extra fees if samples are taken at times that require processing during nonworking hours, sampling analyses costs can increase and must be budgeted. Dog waste receptacles have minimal costs and are good education tools.

Remediating pollution sources can be costly, especially for those beaches near a brook or drainage system where many sources may be contributing to elevated pollution loads. Most of these pollution sources will be associated with stormwater discharges, and these costs are addressed more comprehensively in the Stormwater Action Plan.

Because pollution remediation costs can be appreciable, rainfall conditional closures and signage about particular health risks will be the most cost effective initial action.

## Monitoring Progress

The success of this action plan will be defined by changes in beach closures in the Buzzards Bay watershed. The existing reporting program to the Massachusetts Department of Public Health, and the annual reports they publish will provide an adequate basis for tracking beach conditions.