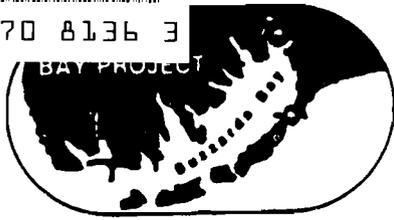


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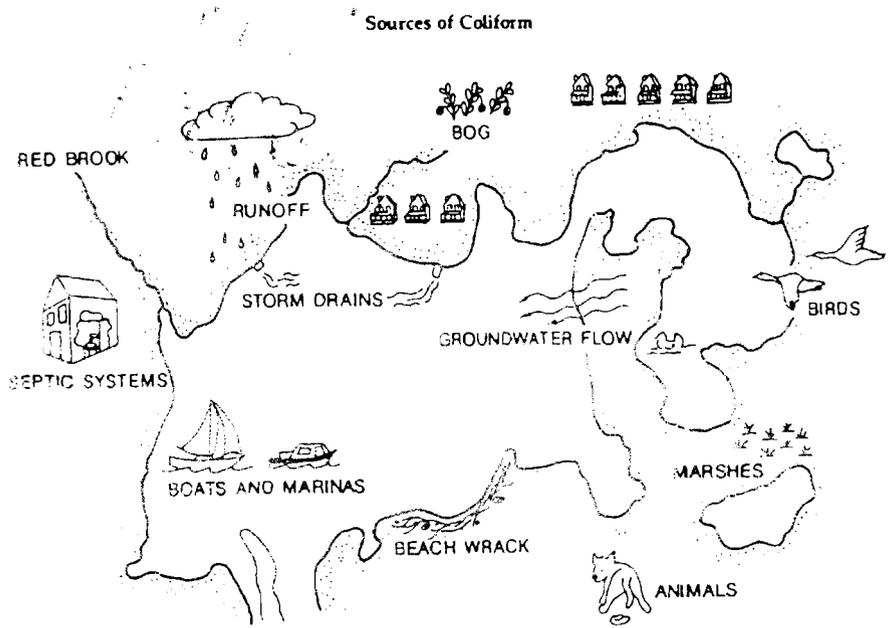


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# POLLUTION SOURCES IN BUTTERMILK BAY

## KEEPING IT ALL IN PERSPECTIVE



**What do we mean when we say the bay is too polluted for shellfishing ?**

**What are the sources of pollution that cause shellfish bed closures ?**

**Could marinas be the problem ?**

**Are sewage discharges responsible for pollution ?**

**How can a few dogs walking on the beach be a major pollution problem ?**

**Aren't we getting a little carried away ?**

**Ducks ? Geese ? Swans ?**

**How can we control pollution caused by them ?**

**How about all those septic systems in that major development ? They have to be the problem, what is being done about them ?**

**How can stormwater be affecting the bay ?  
Where does the contamination come from ?**

**Is the problem too big ? What can I personally do ?**

**What are the state and federal governments doing to resolve the issue of marine water pollution ?**

*Prepared By George Heufelder of the Barnstable County Health and Environmental Department. Cover graphic by Wendy Armington, U.S. EPA Region 1. Layout by JoAnne Hanna. Printed by EPA for the Buzzards Bay Project, a cooperative effort between EPA and Massachusetts Coastal Zone Management.*



Over the past months, residents around Buttermilk Bay and many of our marine embayments have been asking these and other pertinent questions about the "health" of our marine waters. What follows is a summary of our findings from studies of Buttermilk Bay and an update on activities currently underway to resolve some of the above questions and issues.

## INDICES OF POLLUTION: HOW DO WE KNOW AN AREA IS POLLUTED ?

No discussion of pollution in our estuaries can be complete without a clear understanding of two concepts: 1) what we mean by pollution; and 2) what we use as an indication that an area is polluted. Pollution, broadly defined, is **any activity that prevents a resource from being used for its intended or desired purpose**. For areas like Buttermilk Bay, one of the major pollution problems is related to bacterial contamination that force closures of shellfish beds, bathing beaches and all water contact sports. In 1984, all of Buttermilk Bay was closed to shellfishing due to bacterial contamination. Periodically, certain areas of the bay have even exceeded the level of bacterial contamination considered safe for contact recreation such as swimming or wading. It is likely that human activities have been a primary cause.

Determining causal relationships between shoreline development and land use practices and bacterial contamination is the subject of continuing study. Although remedial actions and best management practices (BMPs) are being developed and implemented, there are still a number of unanswered questions which require further research.

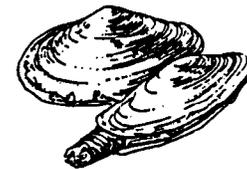
### What do we use for an "index" of pathogen pollution ?

There are scores of disease-causing bacteria and viruses (also known as pathogens) associated with human sewage that could make their way into the marine environment. Because it is too difficult and expensive to test for all of these pathogens, "indicator" species have been used since the 1920's in an attempt to assess the possibility that viable human pathogens are also present. An **indicator organism is an organism that, by its presence, suggests the concurrent occurrence of other organisms**. In the case of shellfish harvesting areas, as well as contact recreation waters, **coliforms are presently used to assess the degree of public health threat**. Coliform bacteria are present in the fecal material of warm-blooded animals in large numbers. When a certain concentration of fecal coliform is reached (14 fecal coliform per 100 milliliters (ml) of sample in the case of shellfish areas and 200 fecal coliform per 100 ml in the case of swimming areas), the area is considered unsafe for these uses. The fecal coliform indicate that fecal material from warm-blooded animals is present and human pathogens could also be present. For the most part, fecal coliform bacteria are not considered pathogenic; however, their presence is associated with other organisms that cause disease in humans.

Shellfish harvesting area classifications are based on the interrelationship among various sources of pollution, bacterial levels in the water, and the association between fecal coliforms and human pathogens.

### With a well-established indicator system like this, why are there questions ?

As simple and straightforward as the previous concept may sound, there are some fundamental problems. Does the presence of fecal coliform always suggest a public health threat? If it can be shown that the fecal coliform being measured originated from human sewage or wastes, most scientists and medical experts would agree that a health risk is indicated. However, complicating the situation is the fact that numerous warm-blooded animals (dogs, birds, horses, rodents, etc.) also carry and defecate fecal coliforms. The health risk and implication of the presence of fecal coliform originating from non-human sources has not been determined. **In the absence of this information and our inability to determine the origin of the fecal coliform observed in monitoring samples, we must assume the health risk is the same as if the fecal coliform were of human origin.**



## SOURCES OF POLLUTION: KEEPING THEM ALL IN PERSPECTIVE

Now that we have a basic understanding of what constitutes pollution and how we measure it, the next step is to determine where it all comes from. There are a number of sources of pathogen pollution: failing septic systems, stormwater runoff, sanitary waste discharges from marine craft, municipal wastewater discharges, various point source discharges, waterfowl and wildlife. What follows is a discussion of each of these sources, and how they have been determined to affect Buttermilk Bay. The importance of each source may differ from embayment to embayment.

### Failing Septic Systems

During the course of the "Buttermilk Bay Study," a number of failing septic systems, as evidenced by discharge on top of the ground, were discovered. These types of failures are the most immediate threat to the public health, especially in situations where the overflow has a surface route to the water. Current regulations under Title 5 of the Massachusetts Environmental Code give full authority to local Boards of Health to order repair of these failing septic systems.

In addition to these "overt" types of septic system failures, the potential for pathogen transport to the bay through groundwater was also investigated. Analyses of groundwater near the bay containing discharge from septic systems support the contention that, in most cases, soils act as filters screening out enteric (intestinal) bacteria from wastewater over the course of only a few yards. Although properly functioning septic systems (no observed overflow), for the most part, did not contribute to the indicator bacteria levels in the bay, there is still much concern that the much smaller viral pathogens may pass through the soil and reach the bay. This contention is based on a review of published studies from Long Island where entrainment of viruses in groundwater occurred and viruses were found at distances up to 200 ft from the source. These studies are particularly relevant to our area since the soil types on Long Island are similar to those in Buttermilk Bay.

In addition to viruses, the nutrient inputs to the bay from septic systems may be causing increased bacterial levels by supplying direct and secondary nutrients. Findings from recent studies in Buttermilk Bay and elsewhere

suggest that products of decomposed human wastes stimulate bacteria and algae production, particularly in the nearshore areas and situations where there is less tidal flushing. The resulting imbalance of waste products and nutrients has been shown to even stimulate the growth of human pathogenic bacteria outside a human host. Over the coming years, this relationship between nutrients and pathogen growth must be clarified and the results incorporated into our management plans for waste handling near marine resources.

### Stormwater Runoff

At least three years of site-specific data from Buttermilk Bay, as well as data produced nationwide, have pointed to stormwater as a major source of bacterial contamination. Over 22 discharge points into Buttermilk Bay were investigated. No illegal sanitary hookups to stormwater pipes were found. However, during rain events the stormwater pipes were found to discharge significant amounts of bacteria. Because the shellfish sanitation program mandates that sampling be performed during the adverse pollution conditions, the inputs from stormwater discharge often lead to shellfish bed closures.

What is the origin of coliforms in stormwater? Paved roads, connected to the bay with drainpipes, offer new pathways to the bay. Pet wastes, bird wastes, wastes from overflowing septic systems once remote to the bay, now find a surface route into the bay causing contamination.

Under a grant from EPA, two of the main "offending" drains will no longer flow directly into Buttermilk Bay. In the case of the Electric Avenue discharge pipe, a structure that resembles a large septic system will receive the stormwater flow and discharge it to the ground adjacent to the bay. Monitoring wells will be installed near the discharge points to determine the effectiveness of this method. Using a similar principle, the Red Brook drain in Wareham will be diverted into a ponding area where the water can percolate naturally through the soil before it reaches the bay. If these methods prove successful in reducing coliform counts, local communities may be willing to improve other drainage systems. As further encouragement, recent allocation of funds through the Transportation Bond Issue may soon allow towns to apply for monetary assistance in these efforts. Funds may also become available through the state's Nonpoint Source Pollution Program.

## Discharges from Marine Craft

The bacterial contribution of sanitary wastes from boats and marina operations has become an issue with many bay area residents and has received considerable attention from both the Barnstable County Shellfish Advisory Committee and the Cape Cod Marine Water Quality Task Force. A survey, recently published by the Task Force, indicated that there are less than five pump-out facilities servicing the entire Barnstable County.

In response to letters from the Shellfish Advisory Committee and others, the State Executive Office of Environmental Affairs (EOEA) has recently formed its own task force to resolve the issue. A document recently compiled by EOEA has underscored the complexity of the issue both politically and technically. Needed efforts in this area will be to "dog the heels" of the state task force and make sure that the effort toward resolving the issues of proper disposal of marine sanitary wastes will not wane.

The actual impact of discharge practices from marine craft on embayments has been difficult to define. The magnitude of the problem is obscured primarily by the seasonal presence of boats, other sources of contamination and difficulty in demonstrating the specific sources. Even without specific information about the relative contribution of marine head discharges, an immediate goal should be to provide boat owners with incentives for disposing of sanitary wastes in an environmentally sound manner.

## Wastewater Discharges

Of primary concern to Buttermilk Bay area residents has been the sanitary discharge from the Massachusetts Maritime Academy (MMA). In 1985, DEQE's Division of Water Pollution Control sampled the discharge from this facility extensively and found areas of noncompliance. Since that time, the facility has made a number of recommended improvements both in equipment and sampling. The state reports that MMA has been in compliance since the fall of 1986. A study by FDA (Carr, 1987) has indicated that contamination from this source could reach the entrance to Buttermilk Bay in the event of a plant failure. In response to numerous inquiries regarding this discharge, we will be attempting in the coming months to verify the proper treatment of wastes from this facility.

In addition to the discharges from MMA and other businesses and industry, Buzzards Bay receives the effluent from five municipal wastewater discharges: Wareham; Marion; Dartmouth; Fairhaven; and New Bedford. Periodically, the Division of Water Pollution Control monitors the discharge of these plants as part of the requirements of the Federal Clean Waters Act, determining whether compliance with appropriate regulations is attained.

## Waterfowl, wildlife and pets on the beach: where will it all end?

Animal wastes in the water closely resemble human wastes, each producing fecal coliform, that are indistinguishable from one another. Because the possibility of human origin of fecal coliform in our monitoring samples cannot be discounted, the conservative approach of assuming a public health threat, when certain levels are reached, has been adopted.

What can we do? Regarding pet waste, the simple procedure of proper collection and disposal will help. Our study in Buttermilk Bay has confirmed that animal wastes on the beach do have an effect on the quality of the water. This pollution level increases when the wastes become entangled in the wrack or sea weed that washes up on the beach. A number of towns have adopted a "pooper scooper" law that is designed to encourage pet owners to be responsible for their pet's waste. Unfortunately, the component contributed by waterfowl and wildlife is more difficult to regulate. However, recent regulations passed in some towns prohibiting the feeding of waterfowl has been designed to minimize human interference with the natural migration of Canada Geese and other waterfowl, thereby discouraging the birds from congregating in recreational areas.



**IS THE WHOLE PROBLEM OF MARINE POLLUTION TOO BIG ?  
WHAT CAN I PERSONALLY DO ?**

A famous cartoon character, Pogo, once said "We have met the enemy, and they are us!" We have indeed, by our love of the water and desire to live near it, become the problem. The ability of our marine environment to handle the wastes we produce and discharge into it is being exceeded, but it is not too late to "turn the tide". While we are, indeed, the problem, we can and must become the solution. Each small successive step, such as proper maintenance of your septic systems, proper handling of your pets' wastes and observance of local by-laws and regulations pertaining to control of surface water pollution all move toward the solution. Singularly and collectively, your participation in forums and workshops as well as your political involvement **make a difference.**

While individual responsibility plays a major role in reclaiming clean waters, some of the problems can only be solved by a commitment of resources. Stormwater treatment systems, upgrading of municipal wastewater treatment systems, pump-out facilities for marine craft, personnel to monitor compliance, etc. all require money and political resolve. As citizens, we can stay involved, informed and interactive with our representatives in local, state and federal government. It is neither too big a problem, nor too late to correct our past mistakes. Together we can make the difference and have clean waters for now and the future.

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