



# ESTUARIES ON THE EDGE:

## The Vital Link Between Land and Sea

A survey of the economic resources and environmental problems found in 28 "nationally significant" estuaries.



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—Dawn





# Buzzards Bay in Massachusetts

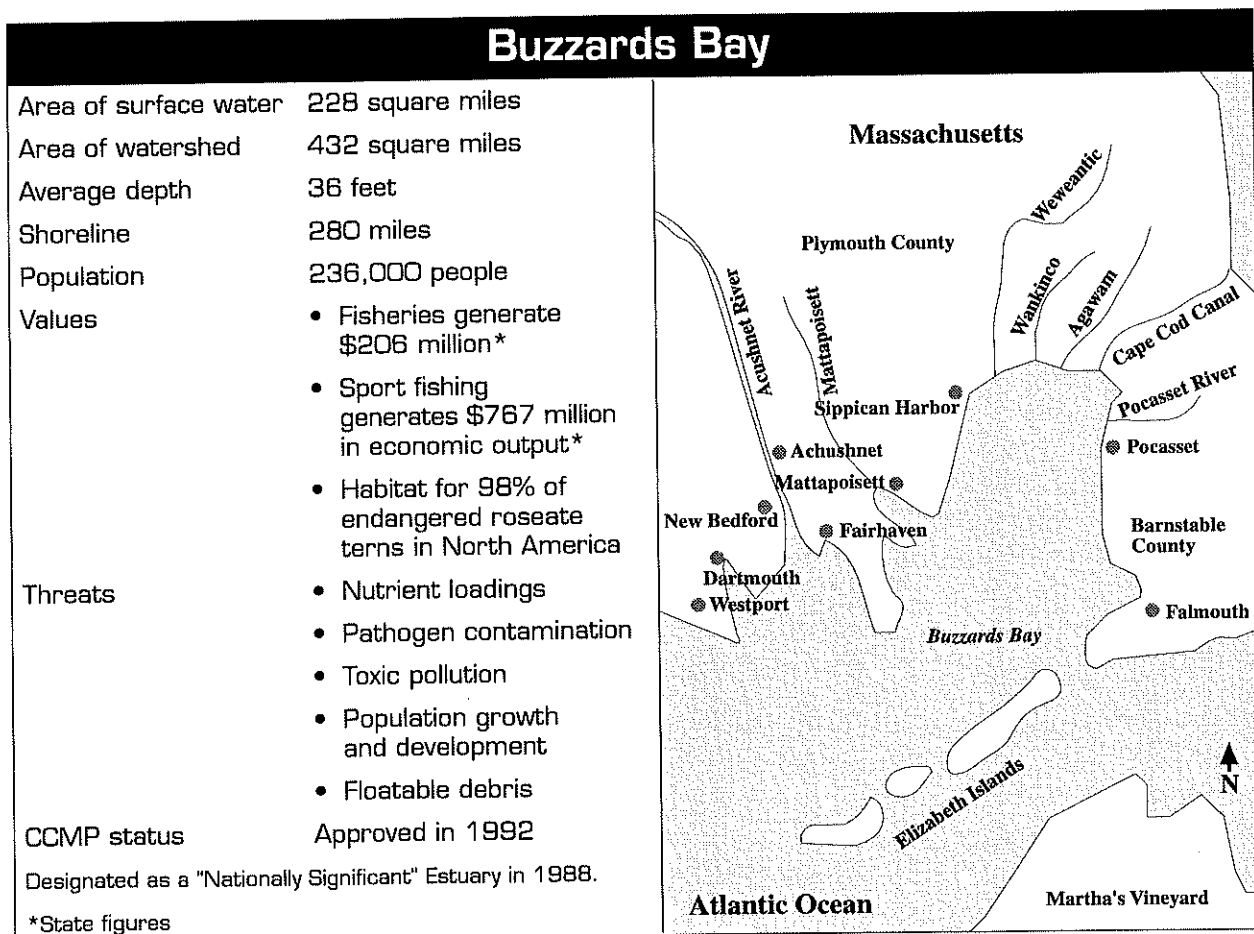
**B**uzzards Bay is a multiple use estuary. We rely on its waters for food and shellfish production, in addition to its value for recreation, tourism and pleasure. On the darker side, Buzzards Bay is also used as an outfall for sewage discharges and road runoff, and as a major shipping and transit route through the Cape Cod Canal. Despite large areas of undeveloped land remaining within its watershed, one of the major threats to Buzzards Bay is excessive nutrient loading. We are slowly learning how to balance these uses, with emphasis on the regional challenges of proper watershed planning, development, and protection of natural resources. Our vision for the future is to stay vigilant and

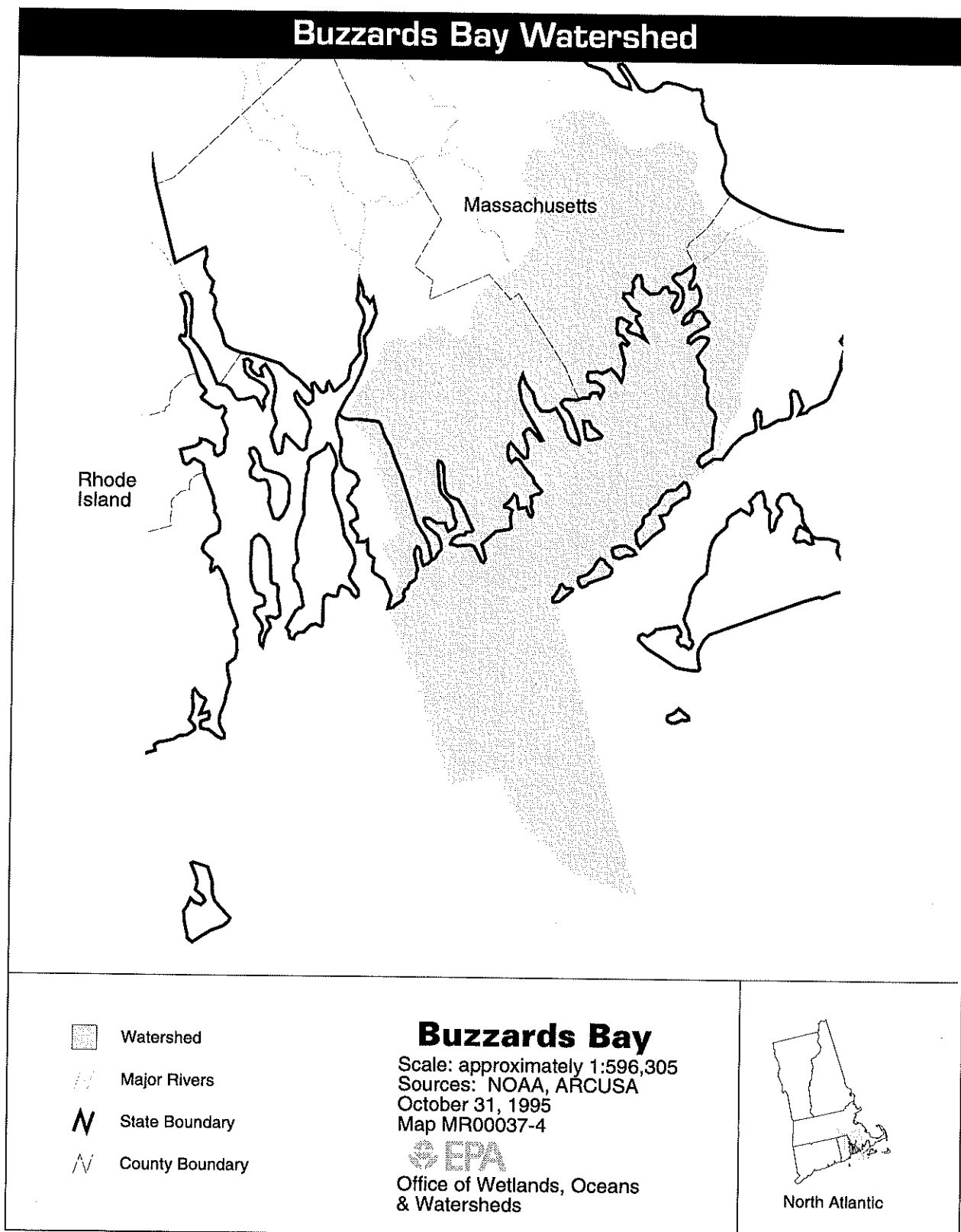
protective of this beautiful and diverse estuary for generations to come.

— Pamela Truesdale, Executive Director  
The Coalition for Buzzards Bay

## Portrait of the Bay

The Coalition for Buzzards Bay is working in concert with the Buzzards Bay Project to examine the water quality and habitat problems of the Bay and the impact that the greater watershed area has on the estuarine system. The surface water area of Buzzards Bay measures approximately 228 square





miles.<sup>1</sup> The Bay is bordered by southeastern Massachusetts to the west, the Elizabeth Islands to the south, and Cape Cod to the east. The Cape Cod Canal in the northern part of the Bay connects Buzzards Bay to Cape Cod Bay. Buzzards Bay contains 280 miles of jagged shoreline, of which 11 miles are public beach. The average depth of the Bay is 36 feet.<sup>2</sup>

The Buzzards Bay watershed area encompasses approximately 432 square miles. Within this area, the population exceeds 236,000 people, representing a density of 540 people per square mile. Seventeen municipalities are entirely or partially located within the watershed.<sup>3</sup> Of these, the city of New Bedford and the coastal communities of Dartmouth, Falmouth, and Fairhaven have the largest populations. In fact, New Bedford constitutes approximately 40 percent of the watershed population.<sup>4</sup> Also included in the watershed are two of the fastest growing counties in New England, Barnstable and Plymouth counties.<sup>5</sup>

Groundwater and a number of rivers provide the freshwater flow into the Bay. Along the western shore, the prominent rivers delivering freshwater to the Bay include the Agawam, Wankinco, Weweantic, Mattapoisett, Acushnet, Paskamanset, Westport and several others. Groundwater is the major freshwater source on the eastern shore. The smaller streams that drain this portion of the watershed include the Herring Brook and the Back, Pocasset, and Wild Harbor rivers.<sup>6</sup>

The jagged coastline creates a wealth of diverse tidal habitat for marine life, including, approximately 5,000 acres of salt marsh, 5,000 acres of tidal flats, 1,700 acres of barrier beaches, and subtidal areas.<sup>7</sup> More than 10,500 acres of eelgrass beds, which support a diversity of marine life, can also be found in the Bay.<sup>8</sup>

## Values of the Bay

Buzzards Bay affords numerous benefits for residents and tourists of southeastern Massachusetts. Valuable commercial shellfishing resources, tourist attractions, scenic vistas, and good water quality are just a few of the reasons why people flock to Buz-

zards Bay. In addition, nearby academic and scientific institutions, such as Woods Hole Oceanographic Institution (WHOI) and the Marine Biological Laboratory, conduct extensive research on coastal waters in the Bay.

## Recreation/Tourism

Buzzards Bay provides numerous recreational opportunities for tourists and residents within the watershed. Tourists in the coastal counties of Massachusetts spent an estimated \$1.5 billion in 1993.<sup>9</sup> Boating, sport fishing, and sunbathing on area beaches are common activities in the area. Nearly 20,000 marine vessels pass through Cape Cod Canal annually and about 10,000 vessels anchor in the Bay throughout the summer.<sup>10</sup>

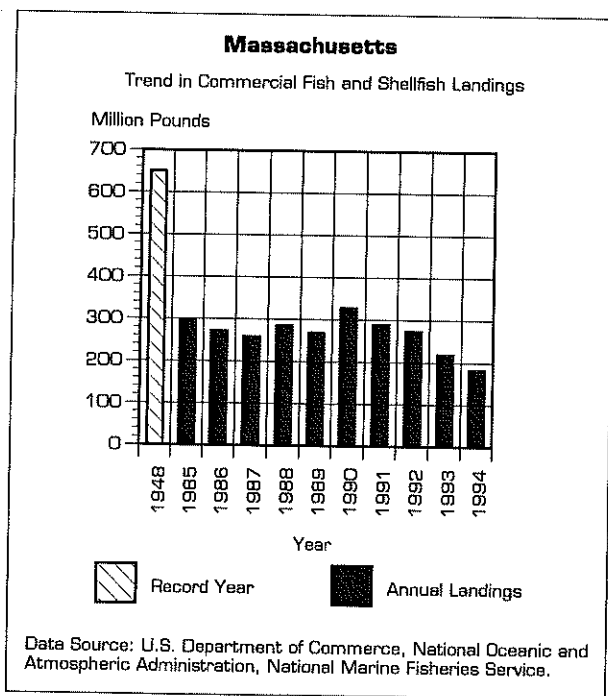
In order to maintain the interests of tourists and to expand the tourist and recreational revenues generated in the Bay area, it is essential that the water and beaches are kept clean. A significant amount of revenue is generated each year by public beach parking. For example, parking sticker sales at just three Massachusetts' beaches netted \$1.6 million in 1990.<sup>11</sup>

Recreational fishing in Massachusetts generated approximately \$767 million in economic output and employed nearly 10,450 people in 1991.<sup>12</sup> Saltwater fishing alone draws thousands of persons to Massachusetts each year. In 1991, approximately 393,000 saltwater anglers fished a total of 3.2 million days off the Massachusetts coast. Thirty percent of these fishermen were non-residents of Massachusetts.<sup>13</sup>

## Fisheries/Seafood

In 1994, the combined market value of commercial finfish and shellfish landings in the New England region totaled approximately \$583 million.<sup>14</sup> Many of the commercially valuable species in the New England region depend upon the health of Buzzards Bay for survival. In 1994, the State of Massachusetts' commercial finfish and shellfish landings totaled approximately 183 million pounds, valued at \$206 million.<sup>15</sup> Massachusetts is second only to Maine in annual landings of lobster.

Buzzards Bay is highly acclaimed for its shellfish harvests. In 1988, the value of the Bay's commercial



shellfish harvest was \$4.5 million — almost 24 percent of the total State shellfish harvest.<sup>16</sup> Bay towns issued 485 commercial, 9,144 nonresident, and 3,168 recreational shellfish permits in 1994.<sup>17</sup> In the same year, the Bay's combined commercial and recreational quahog, bay scallop, soft shell clam, and oyster harvest was valued at \$6 million.<sup>18</sup>

While Buzzards Bay provides critical nursery habitat for lobster larvae, its warmer temperatures and sandy bottom inhibit the development of a larger fishery for adult lobsters, which prefer colder waters. Nevertheless, the Bay's lobster harvest produces approximately 253,000 pounds, an average annual retail value of one million dollars to the local economy. In 1988, the total value of the Buzzards Bay lobster fishery, including lobster landings, gear, and vessels was approximately \$2.3 million. In that same year, approximately 250 commercial lobstermen fished for lobsters in Buzzards Bay.<sup>19</sup>

## Wildlife

Geographically, Cape Cod represents the division between the colder climate waters of the Gulf of Maine and the more temperate, mid-Atlantic coastal region.<sup>20</sup> As a result, species diversity is uncommonly high in the Bay. Since the Bay is

situated on the edge of this transition zone, it is in the southernmost range for many northern species and the northernmost for many semi-tropical creatures.

Waterbirds, including the osprey, populate the islands and shoreline of Buzzards Bay. Decades ago, the osprey population was decimated by DDT-related reproductive problems. By the late 1980s, years after the banning of DDT, osprey sightings began to slowly occur again throughout the Bay. Wading birds, such as snowy egrets and black-crowned night herons, use the shoreline of the Bay for nesting grounds. A number of waterfowl, such as common eiders, Canada geese, canvasbacks, and black ducks also inhabit Buzzards Bay.<sup>21</sup>

A few species of marine mammals can also be found in the Bay. The most common is the harbor seal, which primarily uses Gull Island in the Bay for wintering habitat. On rare occasions, grey seals, whales, porpoises, and dolphins can be observed in the Bay.<sup>22</sup>

Massachusetts has twenty-two species on the federal endangered and threatened species list,<sup>23</sup> of which seven are wetlands-dependent.<sup>24</sup> The threatened bald eagle and piping plover, and the endangered roseate tern are protected bird species which use the estuarine wetlands in Massachusetts during their life cycles.<sup>25</sup> Bird Island of Buzzards Bay remains a critical nesting area for 98 percent of the roseate terns in North America. In addition, endangered leatherback and Kemp's ridley sea turtles live in the Bay.<sup>26</sup>

## Threats to the Bay

Despite localized toxic contamination in the Acushnet River adjacent to New Bedford, the site of the largest marine Superfund project in the nation, Buzzards Bay has avoided many of the Bay-wide water quality problems to the degree that they plague other more urbanized coastal watersheds on the eastern seaboard. Nevertheless, land use practices and a growing population have degraded the Bay's natural resources, particularly in the Bay's 32 small embayments and harbors where the impacts of inappropriate development activities affect the



estuary most severely. The limited flushing capacity of these areas further intensifies the decline of valuable resources such as eelgrass and shellfish habitat.

The Buzzards Bay Program has identified excessive nutrient loadings, pathogen contamination, and toxic contamination as the priority threats to the health of the ecosystem.<sup>27</sup> Land use practices and marine debris pose additional threats to the Bay system.

### **Nutrient Loadings**

Excessive nutrient loading poses the greatest long-term threat to Buzzards Bay. Nutrients, such as nitrogen and phosphorus, are introduced to the estuary through a variety of sources, such as individual septic systems, sewage treatment plants, agricultural runoff, atmospheric deposition, and lawn care products. Groundwater underflows, point source outfalls, and stormwater deliver the nutrients to the estuary. Nutrient enrichment causes increased algae growth that eventually starves the water of oxygen. Nutrient impacted waters can become visibly cloudy thereby blocking sunlight needed by eelgrass beds. In addition, drift algae smother shellfish beds. Algae require a great amount of dissolved oxygen to decompose, creating low oxygen conditions which stress fish life and cause foul odors.

Over 62 percent of the nitrogen contribution to the Bay comes from sewage treatment plants and combined sewer overflows.<sup>28</sup> The sewage outfalls are situated in the deeper and better flushed portions of the Bay; as a result, the effects of nitrogen loadings are restricted to the areas around the outfall.<sup>29</sup> In the shallower embayments of the estuary, the majority of nitrogen is from individual septic systems. In fact, septic systems far from the coast can contribute excessive nutrient loadings through groundwater transport if they lie in the watershed of an embayment or harbor. Due to the diminished flushing capacities of these embayments, the effects of nitrogen inputs are more significant.

### **Pathogen Contamination**

Pathogens are disease-causing microorganisms found in human and animal wastes which enter estuaries through sewage treatment plant discharges,

combined sewer overflows (CSOs), polluted urban stormwater, agricultural runoff, boating waste, and septic systems. Pathogens in coastal waters pose risks to humans who eat contaminated shellfish or who recreate in beach waters. Gastroenteritis, hepatitis, and other diseases can result from ingestion of pathogens. For this reason, beaches and shellfish beds are closed or restricted when water monitoring indicates high levels of fecal coliform bacteria or enterococcus (indicators of pathogen contamination) are present in coastal waters.

Sewage treatment plants and individual septic systems are significant sources of pathogens which enter Buzzards Bay. Over 37 million gallons of treated sewage from five municipal wastewater treatment plants enter Buzzards Bay each day.<sup>30</sup> Occasionally, these plants will malfunction and release wastewater containing pathogens. The construction of a secondary treatment facility in New Bedford will soon eliminate the largest source of primary treated sewage to the Bay. Combined sewer overflows in New Bedford, however, continue to discharge large amounts of untreated, raw sewage during significant rainfalls when the city's antiquated collection system is unable to handle the combined sewage and stormwater flow. There are 38 CSO discharges in the New Bedford and Clark Cove areas of the Bay.<sup>31</sup>

Localized pathogen contamination of many smaller embayments and the resulting closure of shellfish beds and swimming beaches are mainly attributed to old, failing septic systems along the shore and the conversion of many summer communities into year-round neighborhoods. Almost one-half of the watershed's residents use septic systems and cesspools to dispose of their sanitary waste.<sup>32</sup>

Between 1985 and 1990, the percentage of harvest-limited shellfish beds in Buzzards Bay increased from seven to 48 percent.<sup>33</sup> In January 1995, 13,648 acres of shellfish beds were closed due to fecal coliform contamination, and 3,949 acres were conditionally restricted based on rainfall and seasonal events.<sup>34</sup> Closed shellfish beds create economic problems for the shellfishermen and local communities dependent upon shellfish resources. In the New Bedford Harbor, it is estimated that the lost

value of closed quahog beds is \$5 million. In addition, the annual loss of revenue caused by the closed lobster fishery in the Harbor is \$250,000.<sup>35</sup> These closures cause fishermen to begin fishing for less desirable species. As more commercial fishermen seek fewer fish, increased pressures for maintaining productive populations arise.

The positive effects of shellfish bed reopenings were revealed in 1992, when Clark's Cove in New Bedford was reopened after nearly 80 years of public health closure. The first year of shellfish revenues from the Cove resulted in more than one million dollars.<sup>36</sup>

### Toxic Pollution

Between the 1940s and 1970s, industries within the greater New Bedford area contaminated the Bay with polychlorinated biphenyls (PCBs), hydrocarbons, and trace metals. High PCB levels are responsible for the closure of 18,000 acres of productive lobster and fishing grounds around New Bedford Harbor.<sup>37</sup> Sediment, lobster, fish and shellfish samples from the New Bedford area reveal significant levels of toxic pollutants. Samples of lobster tomalley and hepatopancreas are sometimes close to the FDA limit.<sup>38</sup>

### Population Growth and Development

Each of the major threats mentioned above is directly related to the region's historic and continuing population growth and the misuse of land. Since 40 percent of the land situated within one-half mile of the Bay's coast is forested, land management is critical to the future of this estuary. Maintaining the benefits of forests, wetlands, and other natural habitats will assist in restoring the Bay. Wetlands and other natural lands absorb and filter pollutants before they can enter the Bay, as opposed to pavement, roofs, and other impervious surfaces that aid in the direct discharge of pollution into the Bay. Thus far, Bay-wide efforts have not adequately addressed open space protection and land use planning. Communities surrounding the Bay must better manage the effects of polluted stormwater resulting from urban and residential development.

### Floatable Debris

Trash accumulated on estuarine beaches threatens the ecosystem and its wildlife inhabitants. During the period between September 17 and October 10, 1994 several beach clean-ups were conducted in which volunteers cleared 50,000 pounds of marine debris from 200 miles of Massachusetts beaches. Of the total amount of marine debris, 61.8 percent was plastic, 13.9 percent was paper, 8.9 percent was metal, and 15.4 percent was other debris.<sup>39</sup>

## The Buzzards Bay Project

In 1985, the Environmental Protection Agency completed a study of estuaries which revealed the ecological health crises facing the nation's coastal waters. As a result of this research, Buzzards Bay was selected in 1988 as one of the original estuaries of "national significance" to be included in the National Estuary Program. The Massachusetts Office of Coastal Zone Management in cooperation with EPA Region I has authority over the Buzzards Bay Project (BBP). In 1992, the Buzzards Bay Comprehensive Conservation and Management Plan (CCMP) became the second plan in the NEP to be approved by the EPA Administrator. It is now in its fourth year of implementation. In the same year, the Buzzards Bay Action Compact which endorsed the implementation of the eleven action plans outlined in the CCMP, was also signed by the twelve coastal municipalities in the watershed.<sup>40</sup>

Key stakeholders of the Bay Project are the citizens and the municipalities, each of which has its own needs and priorities that are not always consistent with one another. As a result, the Citizens Advisory Committee of the BBP split into two independent non-profit organizations during the early stages of the planning process. The voice of the citizens and environmental groups joined under the umbrella of the Coalition for Buzzards Bay, while the cities and towns have representation under the Buzzards Bay Action Committee.

The principal mission of the Buzzards Bay Project is to provide financial and technical assistance to municipal governments to help reverse the major problems of the Bay. The BBP

engaged the municipal governments early on in the process of developing the CCMP. It was clear that the local governments had the greatest authority, particularly under the "home rule" concept in Massachusetts, as well as the capacity to manage the polluted runoff problems plaguing the Bay. Through NEP funding, mini-grants are provided to communities to fund model projects addressing water quality declines and resource management issues. Modest forms of financial assistance have been able to augment considerable local actions to protect the Bay. Tax incentives have also proven to be a valuable land use tool contained in the CCMP. Land owners are offered tax incentives in exchange for the development rights to their properties.

## National Coastal Caucus

The Coalition for Buzzards Bay is leading citizen efforts to save the Bay. The Coalition for Buzzards Bay (CBB), a private non-profit organization founded in 1987, currently includes nearly 2,800 members. CBB promotes environmental education and awareness in its work to protect and restore Buzzards Bay and its greater watershed.

The CBB currently has three programs which enlist citizen participation. The Coalition was granted NEP funding to establish a citizen monitoring network. This network of 100 volunteers tests 87 sites within embayments throughout the Bay on a weekly basis.<sup>41</sup> This program is one of the most ambitious citizen monitoring projects in the nation. Results are used to assess current conditions and trends as well as target areas for cleanup activities. The CBB's Water Quality Monitoring Program involves citizens in hands-on action and is the largest, ongoing monitoring effort in the Bay. CBB has completed four years of data collections from the water quality monitoring program, and has provided a "snapshot" view of the health of Buzzards Bay. This analysis, in turn, is used by the communities within the watershed to determine nitrogen loading limits and developmental buildouts. The Program has also developed a model nitrogen management strategy to control the residential nitrogen inputs to Buttermilk

Bay, a small embayment near the Cape Cod Canal. This land use approach to coastal resource planning is currently being applied to four additional embayments in Buzzards Bay.

CBB also has a corps of trained volunteers who monitor key local governing boards such as Conservation Commissions, Boards of Health, and Planning Boards, who are responsible for decisions which affect Buzzards Bay. Under the "home rule" concept, local ordinances can be written to be more protective than state laws. These Coalition monitors work to ensure that the decisions made by these agencies reflect a consistency throughout the region to protect the Bay and its watershed.

Educational efforts include school projects in the City of New Bedford as well as community efforts to discourage dumping into local storm drain systems. CBB has created a nature trail for the schools, organized beach cleanups and promoted bi-lingual stenciling of storm drains which discharge directly into Buzzards Bay. They have also sponsored an annual 1.18 mile swim across part of the Bay to celebrate the improving water quality.

The "Municipal Report Card" is a progress report released annually by the CBB that critiques municipal governments' efforts to meet CCMP goals, and has been highly effective at targeting and engaging communities in Bay restoration.

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## End Notes

- <sup>1</sup> United States Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service, *Estuaries of the United States: Vital Statistics of a National Resource Base* (Rockville: U.S. Department of Commerce, 1990) 60. Note: NOAA boundaries may not correspond with NEP boundaries.
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- <sup>19</sup> Buzzards Bay Project, *Comprehensive Conservation and Management Plan* 19-20.
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- <sup>26</sup> Buzzards Bay Project, *Comprehensive Conservation and Management Plan* 22.
- <sup>27</sup> Buzzards Bay Project, *Comprehensive Conservation and Management Plan* 25.
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