

## *Action Plan*

### *Planning For A Shifting Shoreline*

#### *Problem*

Buzzards Bay shores are subject to rise in sea level, erosion, natural shifts of barrier materials, storms, and other natural phenomena that change the shape and size of the shoreline. Rising waters and associated physical forces can shift barrier beaches and alter wetland areas, resulting in loss of habitat for certain species and financial losses to coastal landowners and communities.

Two principal ways of measuring these changes are through tidal data and shoreline migration. Tidal data collected over the past century indicates that global sea level has been rising at an average rate of approximately 0.3 ft per century. In Buzzards Bay, sea level has been rising at a slightly higher rate, approximately 0.8 ft per century, due to the slow subsidence of the earth's crust along the northeast coast (Braatz, 1987). Recent studies have indicated that the present rate of sea-level rise may accelerate dramatically within the next 10-100 years as a result of global warming (Charney, 1979; Smagorinsky, 1982).

#### *Background*

Shorelines have shifted significantly over geologic time. As recently as the last ice age, the southeastern Massachusetts land mass extended seaward 100 miles to the area now bounded by Block Island, Martha's Vineyard, Nantucket, and Georges Bank. In the 15,000 years since the ice began retreating, the shoreline has withdrawn slowly inland. At the same time, sandy shores such as those along southern New England have shifted, due to erosion largely in response to major hurricanes and winter storms.

These natural processes now appear to have been altered by a variety of environmental changes, including some prompted by human activities. In particular, atmospheric concentrations of carbon dioxide, methane, and other gases released during the combustion of fossil fuels such as coal and gasoline are increasing. The concentration of chlorofluorocarbons released because of wide-spread use in modern industrial society is also increasing. Because these atmospheric gases absorb and trap heat like the glass panels of a greenhouse, this phenomenon is known as the "greenhouse effect."

In recent decades, the concentrations of "greenhouse gases" have been increasing, and as the human population spirals upward and industrial growth continues, the rate of global warming is predicted to increase. Many scientists predict that a warmer planet could raise sea level by expanding ocean water and melting glaciers and polar ice sheets. This would result in increased coastal inundation, more severe storms, and significant changes along our coastline. Along the shores of Buzzards Bay, some low-lying shores may be particularly susceptible.

A recent study funded by the Buzzards Bay Project (Giese, 1989) evaluated the potential loss of upland area due to sea-level rise in the 11 communities directly abutting the Bay. Results showed that even under a conservative scenario, several

## Action Plan: Planning For A Shifting Shoreline

municipalities bordering Buzzards Bay would experience significant submergence of their coastal uplands by rising waters. Effects from these losses would include increased occurrences of floods at higher elevations, loss and erosion of wetland resource areas, and elevated groundwater levels and saltwater intrusion; these effects would be accentuated during major coastal storms. Table 5.5 shows the projected upland losses for the communities surrounding Buzzards Bay through the year 2100. The estimates shown in the table were calculated using a conservative rate of sea-level rise (1.3 to 2.1 ft per century), considering only increases in ocean volume that would result from higher ocean temperatures. If melting of ice and snow were also factored into the projected rate of rise (2.2 to 10.6 ft per century), upland losses could be 4 to 5 times as great after 2050.

**Table 5.5. Projected upland loss in acres (Geise, 1989)**

	YEAR			
	Town	2025	2050	2075
Westport	66	118	190	283
Dartmouth	121	215	348	519
New Bedford	35	63	102	152
Acushnet	13	23	37	56
Fairhaven	80	142	229	342
Mattapoisett	41	72	117	175
Marion	126	224	362	539
Wareham	227	493	799	1189
Bourne	90	161	260	387
Falmouth	225	401	649	966
Gosnold	34	61	99	147
<b>TOTAL</b>	<b>1108</b>	<b>1973</b>	<b>3192</b>	<b>4755</b>

## *Major Issues*

These issues can be described as problems in search of a policy. At the international and national levels, sea-level rise and climatic shifts are already receiving significant scientific attention. However, at a policy and management level, little has been done. This may be because the scientific basis for predicting the details of a natural phenomenon like global warming is uncertain. How can these uncertainties be translated into an equitable planning or zoning process?

## Action Plan: Planning For A Shifting Shoreline

Even though the magnitude and timing of future shoreline changes is not well known, the fact that shorelines migrate is incontrovertible. Unfortunately, regulations at all levels of government currently assume a static sea level and shoreline. Recently, the Coastal Zone Management Office (CZM) has begun to address the issue. CZM has developed a draft policy that calls for consideration of sea-level rise for projects within the 100-year floodplain. Towns should also consider shifting shorelines in all development and redevelopment requests.

The major issues surrounding shoreline dynamics involve changes that will occur within three hydrologic regions: flood-prone areas, surface-water areas, and groundwater areas. Issues to be considered include loss of uplands, increased flooding impacts, loss of wetlands, accelerated shoreline changes, saltwater intrusion, and elevated groundwater levels. For currently developed areas, two basic management strategies are available: retreat from the rising water or attempt to protect threatened areas, with varying combinations of both. For undeveloped areas, avoidance is another possibility. However, political, legal, and economic considerations will probably override the scientific issue. Although we know that changes are occurring now and cannot be reversed, the issues of property rights and equity will probably dominate how the problem is managed. The challenge is to incorporate existing scientific information, even with its uncertainties, into a rational and equitable management scheme.

### *Goals*

- 1. Protect public health and safety from problems associated with higher waters and shifting shorelines.**
- 2. Reduce the public financial burden caused by the destruction of or damage to coastal property.**
- 3. Plan for the loss of buffering wetlands and shifting sand formations.**

### *Objectives*

1. To incorporate sea-level rise and shoreline change phenomena into all relevant planning and management programs.
2. To develop a comprehensive strategy for handling existing structures in areas predicted to be affected by future shoreline changes.
3. To adopt regulatory and nonregulatory measures for guiding growth and development in areas that will be influenced by new shorelines.
4. To restructure the flood and hazard insurance programs in threatened areas so that the financial burden on the general public is decreased.

## ***CCMP Commitments***

### ***Department of Environmental Protection (DEP)***

**DEP will amend its wetlands regulations and adopt performance standards for the resource area "Land Subject to Coastal Storm Flowage" (100 year floodplain).**

Target date: 1991

### ***Coastal Zone Management Office (CZM)***

**1. CZM will provide technical assistance to Buzzards Bay area planning boards, conservation commissions and other relevant local committees, commissions and boards in mapping coastal areas that are, or will be, affected by erosion and/or sea level rise.**

Target date: Beginning 1991

**2. CZM will provide technical assistance to Buzzards Bay communities in developing by-laws, regulations, guidelines, and policies for building in flood zones mapped by the Federal Emergency Management Agency.**

Target date: Beginning 1991

## ***Other Recommended CCMP Actions***

**1. Buzzards Bay communities should pass bylaws increasing the required setback for septic systems from groundwater, waterbodies, and vegetated wetlands for areas subject to sea-level rise, erosion, or flooding.**

Target date: 1992-1994.

The new setbacks should take into account site-specific information on tidal fluctuations of groundwater, predicted movement of the coastline, and anticipated inland migration of wetlands.

**2. Buzzards Bay communities should establish coastal construction setbacks and regulate construction activities more stringently for areas predicted to be subject to sea-level rise, erosion, or flooding.**

Target date: 1992-1994.

The new setbacks and regulations should address those portions of the 100-ft buffer zone from a vegetated resource area that would be affected by a likely shift in shorelines, and should incorporate erosion, sea-level rise, and shoreline data. In particular, these regulations should prohibit the construction of seawalls, revetments, and groins to allow wetland and natural sediment migration processes.

Action Plan: Planning For A Shifting Shoreline

**3. Buzzards Bay communities should establish higher flood elevations that exceed the minimum elevations mapped by the Federal Emergency Management Agency.**

Target date: 1992.

New flood elevations should be based on reasonable scenarios for sea-level rise and shoreline erosion. These new elevations would make it harder for coastal developers to obtain flood insurance from the Federal Emergency Management Agency for construction in threatened areas.