

### Chapter 3. Wetland Resources and Aquatic Vegetation

#### Chapter Summary

Wetland resources cover more than 2,300 acres, or twelve per cent, of the Pleasant Bay study area. When open water bodies are counted, wetlands cover forty per cent of the area. The abundance of Pleasant Bay's wetland resources is matched by the variety and condition of those resources. Sixteen categories of wetland resources have been identified in the study area, and most are in generally healthy condition.

Wetlands serve many critical environmental functions. Tide marshes, in particular, are central to Pleasant Bay's ecology. Marshes serve as habitats and feeding areas to many species of marine life, as well as birds and upland fauna. Marshes also provide a natural transition between ocean and upland waters. They filter pollutants from upland run-off before they enter the ocean. Marsh vegetation also helps to mitigate storm erosion along the shore. Some of the Bay's tide marsh resources have been lost over the past three decades. Causes for the loss of marshes include erosion, which can be hastened in some areas by erosion control structures, as well as encroaching land uses which prevent marshes from migrating upland as shoreline erosion occurs.

Eelgrass is a form of wetland vegetation that is critical to Pleasant Bay's role as a spawning and feeding area for several marine species. The history of eelgrass in the Bay has largely followed trends along the eastern seaboard which have been influenced by periodic episodes of wasting disease. Although the distribution of eelgrass in the Bay has not changed significantly over the past twenty-five years, its health has improved in some areas due to greater flushing allowed by the Chatham breakthrough. Still, recurring wasting disease, and reductions in water quality in some areas of the Bay, may pose threats to this fragile and important resource.

#### 3.1 Wetland Resources within the Pleasant Bay Study Area

Characteristic of the region, the watershed of the Pleasant Bay estuary is rich in wetlands resources that are vital to the area's ecology, its natural beauty, and its commercial and recreational values. The term wetlands is generally used to describe marshes, bogs, dunes and tidal flats. Open water bodies such as ponds, lakes, rivers, and creeks are also categorically wetlands. Wetlands are recognized and protected because of their important environmental functions. On Cape Cod, where one in four acres of land is a wetland, these resources also support agricultural and recreational activities that are important to residents and to the regional economy.<sup>18</sup>

The Department of Environmental Protection (DEP) has identified sixteen categories of wetlands within the Bay's watershed, and most of these are healthy. It is both the variety and the condition of wetland resources found here that make Pleasant

<sup>18</sup> 1996 Final Regional Policy Plan, Cape Cod Commission,

Bay unique. Each type of wetland resource acts as a building block in the estuarine system. Loss or degradation of one or more type of wetland resource can easily upset or destroy the system's delicate ecological balance.

### 3.2 Tide Marshes

The extraordinary system of tide marshes is perhaps the most unique and significant wetland resource within the Pleasant Bay study area. Tide marshes produce organic matter and nutrient salts that, when distributed through the water column, provide the foundation for the food chain.<sup>19</sup>

**Wetland Resources in the Pleasant Bay Study Area**

Wetland Resource Type	Acres in Study Area
Barrier Beach System	36.7
Bog	5.7
Coastal Bank Bluff or Sea Cliff	68.1
Coastal Beach	81.2
Coastal Dune	50.2
Cranberry Bog	31.7
Deep Marsh	24.7
Rocky Intertidal Shore	1.3
Salt Marsh	1,101.1
Shallow Marsh Meadow or Fen	28.7
Shrub Swamp	179.9
Tidal Flat	224.5
Wooded Swamp Deciduous	66.6
Barrier Beach - Coastal Beach	37.8
Barrier Beach - Coastal Dune	352.4
Barrier Beach - Marsh	6.9
Barrier Beach - Shrub Swamp	10.3
Wooded Swamp Coniferous	30.0
Wooded Swamp Mixed Trees	23.9
Total Acres of Wetlands Resources	2,361.7
Wetlands as % of Total Watershed Acres	11.5%
Source: Massachusetts Department of Environmental Protection, Wetlands Conservancy	

Thirty years ago there were approximately 1,200 acres of salt marsh in Pleasant Bay. At that time, nearly half of the salt marsh area was publicly owned or protected by

<sup>19</sup> Fiske, et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.

a conservation trust.<sup>20</sup> By comparison, there are approximately 1,100 acres of salt marsh today.

At least eleven different species of marsh vegetation have been recorded in Pleasant Bay.<sup>21</sup> Salt meadow grass ( *Spartina patens* ) was found to be the most predominant vegetation found on the marsh, often found mixed with spike grass (*Distichlis spicata*). Seabligh (*Suaeda Maritima*) and marsh rosemary (*Limonium carolinianum*) were also found within the salt grass zone. Eelgrass (*Zostera marina*) was found in tidal creeks, common rockweed (*Fucus spiralis*) on creek banks, and salt water cord grass (*Spartina alterniflora*) bordering along tidal creeks and marsh ditches. Marsh samphire (*Salicornia europea*) and woody glasswort (*Salicornia virginica*) were found scattered throughout the marsh . Found upland of the marsh were panic grass (*Panicum longifolium*), seaside goldenrod (*Solidago sempervirens*), black grass (*Juncus Gerardi*), and beach grass (*Ammophila breviguata*).

Numerous scientific sources have documented the vital role tide marshes play as a nursery, wildlife habitat, buffer, and water filter. Marshes function as a habitat for numerous forms of land and sea-based life. Many organisms depend on tide marshes for some portion of their life cycle. Some species of fin fish and shellfish use tidal creeks, eelgrass beds, and mud flats as nursery grounds. Crabs, worms and other invertebrates within the salt marshes provide critical food sources for other species. Migratory shore birds and warm blooded animals rely on marshes for foraging and nesting. The loss or degradation of marsh habitat is associated with loss of wildlife species, or the replacement of species by those more tolerant to human habitation.<sup>22</sup>

Marshes also provide important ecological transitions from ocean waters to uplands. Marsh vegetation -- particularly salt grasses and eelgrass -- acts as a natural baffle by dissipating wave energy before it reaches coastal banks . Marsh vegetation also filters metals, nutrients and other pollutants from upland run-off. A three hundred foot buffer of vegetated marsh may filter fifty to ninety percent of the nutrients from water before it enters receiving waters.<sup>23</sup> Loss of spartina grasses that provide much of this filtering function have been attributed to diminished oxygen levels and increase salinity caused by restrictions in tidal flow. Restrictions in tidal flow of marshes may be associated with trenching for mosquito control, or inadequately sized culverts<sup>24</sup>

### 3.3 Hydrologically Restricted Wetlands

<sup>20</sup> Fiske, et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.

<sup>21</sup> Fiske, et al, *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.

<sup>22</sup> Brady, Peg, and Buchsbaum, Robert, PhD.. *Buffer Zones: The Environment's Last Defense*. Gloucester, Massachusetts. 1989.

<sup>23</sup> Sears, James R., et al. "Die-back of Vegetation in a Massachusetts Salt Marsh." *Salt Ponds & Tidal Inlets: Maintenance and Management Considerations*. New Bedford, Massachusetts. November, 1983.

<sup>24</sup> Sears, James R., et al. "Die-back of Vegetation in a Massachusetts Salt Marsh." *Salt Ponds & Tidal Inlets: Maintenance and Management Considerations*. New Bedford, Massachusetts. November, 1983.

Given the importance of wetlands to the environmental health of the region, there is interest in restoring wetlands that may have been lost or degraded due to development or hydrologic restrictions. Two areas within the study area have been identified as hydrologically restricted wetlands that could be improved through the redesign of under-sized culverts. Culverts under Route 28 located at Muddy Creek and Frost Fish Creek in Chatham are too small to allow adequate flushing of sea water. As a result, the wetlands are stagnating, and salt water species are being replaced by freshwater species.

### 3.4 Eelgrass

#### 3.4.1 The Importance of Eelgrass to the Pleasant Bay Eco-system

Eelgrass, or *Zostera marina*, is a form of aquatic vegetation rooted in the Bay's bottom that can be fully or partially submerged depending on the tide. Although eelgrass is now widely recognized as an important indicator of the health of a marine eco-system, it was not always so. The 1967 Division of Marine Fisheries (DMF) study of Pleasant Bay's marine resources characterized the rapid spread of eelgrass as a problem because it hampered fishing and shellfishing. Although largely revered for its importance as a resource, eelgrass is still known to confound boaters and fishermen alike who unwittingly have damaged or lost equipment in its sometimes dense patches.

The importance of eelgrass stems from the multiple roles it plays in the marine environment. Eelgrass' long blades, ranging from six inches to three feet, help to stabilize sediments and protect the shore by absorbing wave energy. Eelgrass filters suspended sediments and also absorbs excess nutrients that otherwise could lead to algae blooms.<sup>25</sup>

Eelgrass is perhaps best known for its importance as a habitat for shellfish, finfish and water fowl. Eelgrass provides a breeding area for flounder, scallops and crabs, and protects these species from predators. Several species of migratory waterfowl feed off of eelgrass as well as the organisms that attach themselves to the leaves. Even decaying eelgrass provides an additional food source for invertebrates.<sup>26</sup>

#### 3.4.2 Trends in the Location and Health of Eelgrass

There is a modest amount of information available to trace the recent history of eelgrass in Pleasant Bay. Several sources confirm that in 1931 a blight that claimed ninety percent of the eelgrass along the eastern seaboard also devastated the eelgrass in Pleasant Bay. The loss of the Bay's eelgrass was responsible for the virtual

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<sup>25</sup> Short, Frederick T.. *Eelgrass in Pleasant Bay: Health Status Report*. A Report to the Friends of Pleasant Bay. Durham, New Hampshire. 1990.

<sup>26</sup> Short, Frederick T.. *Eelgrass in Pleasant Bay: Health Status Report*. A Report to the Friends of Pleasant Bay. Durham, New Hampshire. 1990.

disappearance of scallops from the Bay.<sup>27</sup> It was not until the 1960's that eelgrass beds significantly recovered, although eelgrass never returned to certain areas of the Bay.<sup>28</sup> In 1990 the Friends of Pleasant Bay commissioned Frederick T. Short to conduct a study of the Bay's eelgrass resources which concluded that the Bay's eelgrass, while fairly healthy overall, faced serious threats from disease and pollution.

The distribution of eelgrass in the Bay has not changed significantly in the past twenty-five years. Short reported that the distribution of eelgrass in the Bay in 1990 was similar to conditions in 1970. Current eelgrass maps compiled by the Massachusetts Department of Environmental Management Wetlands Conservancy indicate that there are more than 1,850 acres of eelgrass beds in Pleasant Bay today, and that the distribution of eelgrass in Pleasant Bay continues to be stable.

The formation of the Chatham breakthrough in 1987 has had little apparent impact on the distribution of eelgrass throughout the Bay. However, the increased flushing rate following the breakthrough has contributed to the vitality of eelgrass. Short reported that flushing in the central and southern portions of the Bay was significant enough to prevent eelgrass degradation in these areas.<sup>29</sup> Prior to the breakthrough, eelgrass beds in Little Pleasant Bay were observed to have had extensive epiphytic growth. The attachment of epiphytes on eelgrass plants was facilitated by the Bay's slower flushing rate prior to the breakthrough. With flushing increased, the incidence of epiphytes on eelgrass has been significantly diminished.<sup>30</sup>

### 3.4.3 Threats to Viability of Eelgrass

The apparent stability of the Bay's eelgrass beds may be misleading according to the Short study. A recurrence of the wasting disease, and reductions in water quality due to pollution pose serious threats to the Bay's eelgrass. The incidence of wasting disease, or *Labyrinthia zosterae*, varies in the Bay. Generally, eelgrass in high salinity waters is more susceptible to the disease than eelgrass in low salinity waters. Accordingly, the highest incidences of the disease were found in the most open and saline areas: off of Strong Island and Fox Hill. Conversely, some of the least infected areas were relatively more protected: Meeting House Pond, Ryder's Cove, Jackknife Point, and off of Sipson's Island.

The Short study concluded that, overall, the threat of wasting disease is said to be modest. However some of the most infected areas are where eelgrass appears to be abundant. Currently there is no known cure for the disease, and the only treatment discussed is experimentation with planting more disease resistant strains of eelgrass.

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<sup>27</sup>Fiske, et al., *A Study of the Marine Resources of Pleasant Bay*. Massachusetts Department of Natural Resources, Division of Marine Fisheries. May, 1967.

<sup>28</sup> Short, Frederick T.. *Eelgrass in Pleasant Bay: Health Status Report*. A Report to the Friends of Pleasant Bay. Durham, New Hampshire. 1990.

<sup>29</sup> Short, Frederick T.. *Eelgrass in Pleasant Bay: Health Status Report*. A Report to the Friends of Pleasant Bay. Durham, New Hampshire. 1990

<sup>30</sup> Orleans Conservation Agent, S. MacFarlane

The threat of wasting disease may be compounded by the impacts on eelgrass resources from pollution, or loss of water clarity. Suspended sediments from run-off, boat activity and tidal action block the flow of sunlight through the water reducing photosynthesis needed for eelgrass growth. Increased nutrients from run-off, septic systems, and boat waste discharge feed algae blooms which create a similar shading affect. Pollution effects tend to be greater in more protected areas of the Bay where flushing is less frequent and groundwater in-flows are greater. Notable areas where eelgrass has been wiped out by pollution include Round Cove and Muddy Creek. Although pollution tends to have its greatest impact in areas less likely to be afflicted by the wasting disease, it can weaken already infected plants, and can hamper the Bay's overall recovery from the blight by killing off eelgrass that otherwise would have survived the blight. For these reasons, pollution is viewed in the 1990 study as the larger threat to eelgrass. Actions to limit the negative impacts of pollution include upgraded septic systems or community waste treatment.<sup>31</sup>

### 3.5 Fresh Water Ponds and Tributaries

Although not directly linked to the salt waters of the Bay, there are numerous fresh water ponds within the study area. These include seven kettle ponds: Crystal Lake, Gould Pond, Sarah's Pond, Pilgrim Lake, Goose Pond, Stillwater Pond, and Lovers Lake. Other freshwater ponds include Minister's Pond, Mill Pond, Uncle Harvey's Pond and Uncle Seth's Pond, and many smaller ponds. These fresh water bodies are part of the system of tributaries that drain into Pleasant Bay, and affect marine water quality. Generally the sources of tributaries are discharges from kettle ponds, swamps, or bog systems.

The conclusion that Pleasant Bay receives a relatively small volume of fresh water from its tributaries was confirmed by a study of water quality in Pleasant Bay tributaries conducted in 1991. The study concluded that seven of ten sampling locations had very little impact on the Bay either because they discharged from kettle ponds and had very high water quality, or because they contributed little water volume to the Bay on an annual basis. Frost Fish Creek was singled out as the tributary with the most impact on the Bay because of a high concentration of nutrients and large volume of discharge. Storm water run-off was also tested at six locations along Route 28 was deemed relatively clean by national standards. The study concluded that more baseline testing and on-going monitoring would be need to fully understand the characteristics and dynamics of the Bay's freshwater tributaries.

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<sup>31</sup> Short, Frederick T.. *Eelgrass in Pleasant Bay: Health Status Report*. A Report to the Friends of Pleasant Bay. Durham, New Hampshire. 1990.