



Draft Duxbury Bay Management Plan

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PREPARED FOR:

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DRAFT DUXBURY BAY MANAGEMENT PLAN

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1.0 INTRODUCTION/EXECUTIVE SUMMARY

1.1. History and Structure of the Planning Process

Duxbury Bay is an outstanding natural area with an estimated 1,200 acres of salt marsh and 4,650 acres surface water area (including Duxbury waters adjacent to Kingston). The Bay contains hundreds of acres of productive shellfish beds, eelgrass, a barrier beach, estuaries, and herring and rainbow smelt fish runs to name a few of its attributes. There is a great variety and population of resident and migratory birds supported by the Bay. This includes the largest tern colony in New England (5,000 pairs) and one of the largest heronries at Clarks Island. Additionally, Duxbury beach and the Bay flats support endangered species including piping plovers. The striped bass, bluefish and flounder fisheries are also thriving. Shellfish aquaculture is successful in the Bay. The variety and number of species indicates that this is a healthy example of a coastal ecosystem and it is enjoyed by a wide diversity of users. The health of this system is no accident. Although its fitness is attributed partially by its tidal flushing, which renews its waters every 24 hours, it is also due to the citizens of Duxbury who have taken action to preserve the Bay they love. Restoration of the barrier beach and innovative group septic and storm drain systems are a few examples of how the community acts to protect the Bay from severe storms and to maintain water quality. The health of the Bay demonstrates the success of the Town's tradition of caring for the Bay. This Draft Plan is a continuation of that tradition of Bay stewardship.

The Duxbury Bay Management Study Committee

The Duxbury Bay Management Study Committee (DBMSC) was appointed by the Board of Selectmen in 2002 to develop the Draft Duxbury Bay Management Plan. This is the first step to fulfill the recommendation in the Town's Master Plan to create a Bay Management Plan. At this time the bay is in generally good condition, however, the increasing variety and intensification of its uses and their potential conflicts and impacts on Bay ecology provided the motivation to create the Bay Management Plan. The Committee was comprised of 12 appointed members from the Duxbury community representing a wide range of bay and town interests.

The Duxbury Bay Management Study Committee has accomplished its primary goal of developing the Draft Duxbury Bay Management Plan and in so doing has established a new management structure for the Bay, the Duxbury Bay Management Commission. The Committee has also initiated restoration of the Island Creek fish run.

To accomplish its goals the Committee met every other Thursday since 2002 and accomplished these tasks:

- Hired Robert L. Fultz & Associates of Marshfield to assist in the development of a *draft plan*;
- Developed a 4 phase strategy for the development of a plan;

- Reviewed several other plans developed by local communities;
- Interviewed several public and private environmental firms;
- Held a public meeting to gather input from the community;
- Held a three part series of Public Workshops using the *Partnering Model* to gain further community input and guidance;
- Inventoried existing information on the resources and uses of the bay;
- Characterized existing conditions;
- Developed resource maps based upon existing digital information;
- Held focus group discussions on the following key topics, inviting state and local experts:
 - Ecology and health of the bay
 - Improving public access
 - Proliferation of moorings
 - Shellfishing and aquaculture growth
 - Boating and boating safety
- Drafted the Bay Management Plan; and,
- Initiated restoration of the Island Creek herring and rainbow smelt fish run.

The Committee has welcomed all members of the community to participate in the development of this Draft Plan and has enjoyed strong public participation in its public forums.

Definition of Study Area

The Study Committee reviewed various local and regional plans as guidance to help define the Draft Plan study area. The Committee determined that the most effective and therefore efficient environmental management approach was to match the management scale to the natural system. The Committee was cognizant of the fact that the natural system, of which the Bay is a part, encompasses its watersheds and the larger embayment that includes Plymouth and Kingston Bays. The Committee was also aware that developing a management approach that would include other Towns was a complicated and lengthy process that could perhaps best be accomplished by establishing a model in Duxbury Bay. The Committee decided to proceed with a Bay management plan that the Town could begin in Duxbury waters and to recommend active pursuit of a future planning partnership with Plymouth and Kingston. In addition, the Committee did not want to create any new bureaucracy where existing management appeared sufficient to protect the Bay. Therefore the Committee identified coastal wetlands within Duxbury Town boundaries as defined in the Wetlands Protection Act as the study area, including fish runs to their head waters. In this way watershed impacts critical to Bay resources can be managed under the Plan. Therefore the study area includes Duxbury Bay and all coastal waters within the Town boundaries and fish runs including but not limited to Island Creek, Stony Brook and Millbrook.

1.2. Identification of Topics and Trends

Topics for the Draft Plan were developed from public workshops and the analysis and deliberations of the Study Committee. From the initial public workshop participants identified

three topics with many subtopics for inclusion in the Draft Plan. These major topics were (1) use of the Bay, (2) scientific understanding of the Bay and (3) management of the Bay. For the series of community work plan work hops these topics were expanded into four topic areas: public access, uses, protection of Bay ecology, and Bay management. With the results of the work shops in hand the Study Committee conducted focus group meetings and further refined plan topics as water quality, shellfish/shellfishing and aquaculture, boating and safety, moorings, Bay access, restoration projects, and Bay management.

The overarching trend affecting each of these topic areas is increased use and potential conflicts between uses. Although water quality remains high, there is an increasing trend of beach closures and shellfish bed closures and restrictions. Aquaculture grants have increased to the point that potential conflicts with other uses, exploitation of the existing system and lack of clear goals and policy for the activity motivated the Board of Selectmen to declare a moratorium until an aquaculture management plan is in place. Increased boating has led to potential use conflicts that could lead to public safety issues. Establishment of new launch services has exacerbated the increase in moorings. As a result, no new mooring areas will be created without further study. Bay access is important to the community and more people are accessing the Bay every year. Access must be controlled in order to protect the Bay's ecology and existing uses. Projects to restore the Bay's ecology and its existing uses are taken on sporadically by existing boards when they have the staff and funds to do so. The stewardship ethic in the Town is strong and getting stronger as evidenced by the creation of the Duxbury Bay Management Commission, proposed by the Committee and approved at Town Meeting in March 2005. The Duxbury Bay Management Commission will be the primary management recommendation of this Draft Plan.

1.3. Mission Statement and Strategic Priorities

The Duxbury Bay Management Study Committee developed the following mission statement and strategic priorities with community input at Public Work Plan Workshops. The mission statement and strategic priorities were approved unanimously at the public workshop on October 19, 2003.

Mission Statement

“To develop a management plan that will enhance and preserve the ecological health, pristine waters and natural beauty of Duxbury Bay for future generations while sustaining harmony among all its uses.”

Strategic Priorities

- Welcome and encourage community input;
- Enlist, support and coordinate existing town regulatory structure;
- Develop and maintain a baseline of uses;
- Create and maintain a central source of available scientific data;
- Create a mechanism to review and act on scientific and environmental data;

- Establish a consensus for guidelines and parameters on bay carrying capacity based on science;
- Create a conflict mediation process;
- Recommend and support restoration and conservation projects;
- Provide and support education and training on the bay;
- Provide a structure for successful implementation of plans; and,
- Establish a funding program to sustain and manage the plan.

1.4. Prioritized Management Recommendations

Prioritized management recommendations were developed for all Draft Plan topics including; water quality, shellfish, shellfishing and aquaculture, boating and safety, moorings, Bay access, restoration projects and Bay management. Table 1 summarizes the recommendations and each section of the Draft Plan for more detail on that topic.

Table 1. Summary of Prioritized Management Plan Recommendations

TOPIC AREA	PRIORITY	RECOMMENDATIONS
I. Water Quality	1	Create and maintain a central source of available scientific data.
	1	A program should be established to prioritize storm drains for installation of Best Management Practices (BMPs) so that the Bay is protected from existing and future levels of non-point source pollution. As a first step locate all storm drains and water quality data from drains. Support establishment of storm water By-Law.
	2	Develop program to notify and involve relevant Town Officials of possible pollution problems needing further investigation after Division of Marine Fisheries triennial shoreline pollution source surveys.
	2	Create a standing program to specifically identify potential pollution sources and recommended mitigation measures and take action using existing authorities and or develop Best Management Practices projects to address water quality problems in affected areas with shellfish areas classified, conditionally open, or prohibited, and swimming areas that have experienced closures. Explore and if possible resolve differences between water sampling protocols and thresholds for shellfish and swimming.

Table 1. Summary of Prioritized Management Plan Recommendations (cont.)

TOPIC AREA	PRIORITY	RECOMMENDATIONS
I. Water Quality cont.	3	Support the Open Space Plans call to “Investigate and develop an Integrated Pest Management Plan to reduce or eliminate the application of pesticides and herbicides on Town owned properties” and support education of private property owners regarding environmental impacts of pesticides and herbicides.
	3	Support the Stormwater Management Program as outlined in the National Pollution Discharge Elimination System Notice of Intent proposed for the Town drains in the Snug Harbor area by the Department of Public Works and the Conservation Commission.
	3	Support the Harbormaster’s Office in the establishment and maintenance of a No Discharge Zone for marine sanitary devices in Duxbury waters.
II. Shellfish, Shellfishing, and Aquaculture	1	Implement thorough and consistent recordkeeping for the shellfish program as a basis for management decisions. Analyze related staffing needs.
	1	Each year publish the total aggregate number of shellfish harvested by species harvested, both recreationally and commercially (on a catch per unit basis), in the Town Report Assess the reasons for trends in the data, monitor growth rates and health.
	1	Create and maintain an Aquaculture Management Plan Determine the potential for aquaculture in the bay, and develop guidelines for grant siting and administration including use conflict analysis.
	2	Update comprehensive shellfish management plan, including monitoring and proactive restoration (Shellfish Committee).
	3	Explore use of Schools and Scouts to survey shellfish resources and habitats to further support management decisions. Survey extent and type of shellfish beds.

Table 1. Summary of Prioritized Management Plan Recommendations (cont.)

TOPIC AREA	PRIORITY	RECOMMENDATIONS
III. Boating and Safety	1	Review adequacy of vessel speed posting in Bay and add speed and swimming warnings where necessary.
	1	Improve boater education regarding safety, impacts to other Bay uses and requirements for planned events.
	1	Support established emergency storm procedure including: <ol style="list-style-type: none"> 1. determining need for vessel storage space and alternative locations. 2. use of automated emergency calling system to notify vessel owners.
	2	Determine appropriateness of existing vessel launch areas and provide signage where necessary.
	2	Investigate the possibility of identifying appropriate areas for marine activities such as sail training and racing, use of personal watercraft etc.
<i>Navigational Dredging</i>	3	Assess present and future dredging needs and develop dredge management plan to maintain existing navigation channels and anchorages and provide multiple benefits from sediment disposal including habitat creation and storm and flood control.
VI. Moorings	1	Identify and Establish Permanent Mooring -Free Areas <ul style="list-style-type: none"> • Open Area for Recreational and Commercial Access • Areas of Critical Marine Habitat(to be defined)
	3	Develop a Mooring Program to Reduce Environmental Impacts of Moorings.
	1	<u>Evaluate the following policies:</u> <ol style="list-style-type: none"> 1. Explore maintaining the number of mooring permits in the Duxbury Bay study area at appropriate management levels.
	2	2. Prohibit the placement or relocation of additional moorings in areas identified as <i>Areas of Critical Marine Habitat</i> , or “resource sensitive” areas.

Table 1. Summary of Prioritized Management Plan Recommendations (cont.)

TOPIC AREA	PRIORITY	RECOMMENDATIONS
VI. Moorings (cont.)	3	3. Work with the Management Steering Committee to develop testing protocols to monitor the use of new mooring technologies in terms of impacts on bottom vegetation, shellfish, boat security, and boating congestion.
	3	4. Through mooring attrition or mooring technique eliminate the intrusion of vessels into the fairway inside of "N"-22 and "C"-21.
V. Bay Access	2	Conduct Bay use survey including assessment of increasing demand for public services.
	1	Identify and evaluate any obstructions to Ch.91 public passage right as for fishing fowling and navigation between historic high and historic low water along the shoreline through regulation, enforcement, and voluntary incentives to property owners.
	2	Investigate the need to improve transportation options and support facilities at public access points where demand is evident, include sanitation facilities.
	1	Develop management guidelines, and a program of regular maintenance based on need for the Bay's Town Landings and Ways to The Water to support existing uses.
	3	Parcel by parcel analysis to determine the exact extent of intertidal ownership within the Bay, prioritized to protect sensitive receptors and examine the appropriateness of enhancing public access.
<i>Scenic and Visual Access to the Bay</i>	2	Support the Open Space Plan actions for preserving Scenic and Visual Access to the Bay.
	1	Coordinate with the Conservation Commission, and public works department to develop guidelines for maintaining vegetation on public lands along the shoreline so that invasive species and rampant vegetative growth do not block scenic vistas.

Table 1. Summary of Prioritized Management Plan Recommendations (cont.)

TOPIC AREA	PRIORITY	RECOMMENDATIONS
V. Bay Access cont. <i>Boat Ramps, Town Landings, and Ways to the Water</i>	1	Identify and standardize the names of Town Landings and ways to the water across all Town Departments, particularly public safety departments.
<i>Waterfront Facilities at Snug Harbor</i>	1	Review pier and float system and maximize efficiency.
	1	Support Mattakeeset Ramp repair with available State and Town Funds.
	1	Evaluate the need to delineate and mark Town Landings Ways to the Water and related parking on priority basis of use and encroachment.
	1	Analyze sufficiency of emergency vessel access throughout Bay.
	3	Survey number of vessels using the Bay, from access points, moorings, slips, rack storage, trailers on a peak use day and to determine average use.
	2	Survey existing uses at Landings and Ways including number of boats and cars and their appropriateness given use and facility impact criteria to be developed.
	3	Analyze and evaluate potential alternative boat launch areas, including Cove St., Bay Farm, West End of Powder Point Bridge.
	2	Develop public access point management plan based on need, appropriate use, time of day, day of week and season.
<i>Parking</i>	1	Establish baseline of parking capacity at all public access points.
	3	Survey number of cars using access points.
	3	Evaluate Shuttle System/Satellite Parking i.e., at Duxbury Schools, Harden Hill, Churches.
	1	Evaluate Installation of bike racks at Town Landings and Ways to the Water.

Table 1. Summary of Prioritized Management Plan Recommendations (cont.)

TOPIC AREA	PRIORITY	RECOMMENDATIONS
V. Bay Access cont.	2	Evaluate restricting parking to residents at public access points.
	2	Develop parking management plan related to needs, uses and time of day, week and season consistent with accepted change criteria.
VI. Restoration Projects	1	Continue to conduct Habitat Restoration Projects Such As: <ol style="list-style-type: none"> 1. Restore shellfish beds to unconditionally open where possible 2. Island Creek Rainbow Smelt and Herring Run Restoration Project 3. Other herring Runs, Blue Fish River
	1	Develop program to protect and restore (if warranted) eelgrass beds. <ol style="list-style-type: none"> 1. Determine cause of loss of eelgrass since 1951. Survey beds. 2. If appropriate use channel markers, other buoys, and tide gauges to direct vessels away from eelgrass beds and other sensitive shallow-water areas 3. Educate vessel operators about water quality issues and the need to avoid sensitive areas. 4. Strictly enforce protection of sensitive areas.
VII. Bay Management	1	Request Annual Town Meeting 2005 Establish Duxbury Bay Management Commission. A representative body to provide comprehensive review of changes as well as programs to restore and protect the Bays ecology and uses. Evaluate changes in intensity of use in last ten years based on change criteria including: <ol style="list-style-type: none"> 1. public safety, health and welfare 2. ecology and sensitive receptors including wildlife 3. uses and appropriateness of use and access 4. scenic views and aesthetic issues 5. levels of public and private services 6. supporting landside infrastructure
	1	Complete the development of a baseline of uses and monitor uses.

Table 1. Summary of Prioritized Management Plan Recommendations (cont.)

TOPIC AREA	PRIORITY	RECOMMENDATIONS
VII. Bay Management cont.	2	Conduct fee structure analysis in light of demands for service and capital needs of the Harbormaster/Coastal Natural Resource Dept. Include needs for new office and equipment, administrative. Support staff, new vessel (unit 16 years old), storage, replace hot water tank at showers, repair 3 dingy floats, replace launch float.
	2	Further Develop Bay Plan as per comprehensive table of contents.
	3	Explore need for and utility of "Watersheet Zoning".

2.0 HISTORY OF DUXBURY BAY¹

2.1 Geology

Geomorphology (shoreline change and stability)

Duxbury's shoreline is an amazing case study in barrier systems. The geological story begins 15,000 years ago when the last New England glaciation, known as the Wisconsin stage of the Laurentide ice sheet, receded north and uncovered a new Duxbury. As the ice sheet retreated north, sea levels rose. At the height of ice sheet growth, sea level was approximately 350 feet lower than it is today. "You could walk out to Georgia's Bank," said Jim O'Connell, a geologist at the Woods Hole Oceanographic Institution. "The Gurnet and Saquish were much bigger than they are today because the sea level hadn't reached and begun to erode those areas," added O'Connell.

As the glaciers receded, they left boulders, sand, cobble, and clay behind. Clarks Island, Gurnet and Saquish are drumlins under the glaciers that remained as the ice melted. We know this today because of the extensive boulder platform fronting these land forms.

Duxbury Beach is known as a coastal barrier beach because the bay borders its landward side, and the open ocean is on its seaward side. A barrier island occurs when a coastal barrier detaches from the mainland. When it remains attached to the mainland, it is called a *barrier spit*. Duxbury Beach is a barrier spit pinned by a land form, and in this case that land form is Gurnet Point.

The barrier beach, however, is in constant motion. Storms accelerate this movement as storm waves carry and deposit sand into the sheltered waters of the bay, forming a new beach and dunes on the bay side. This process is known as *landward migration*. Storms erode the foreshore, the shore face, and the backshore, and strong waves break through the dunes bringing the sand into the bay. The backshore is where most people sit on the beach; the foreshore is the part extending from the berm out to the low waters; the shore face is the seaward-sloping surface that remains submerged except during very low tides.

Storm erosion combined with rising sea levels produces a more marked and rapid movement landward. Past storms, like the infamous Blizzard of 1978 and the No-Name storm of 1991, have carried sand from the frontside of the beach to the bay side in what geologist call an *overwash*. These storm overwashings have occurred in several locations along Duxbury Beach over the years. They allow sand to wash over and fill marsh and bay areas, thus moving the barrier landward.

"If you drew a line 2,000 to 3,000 years ago off the coast of Duxbury, the barrier extended from Howland Ledge off the coast of Marshfield southward," said O'Connell. Figure 1 from

¹ Much of this section was provided by Debora Babin Katz and includes excerpts from her series on Duxbury Bay, called "Bay in the Balance," published in the Duxbury Clipper in 2002.

Hills & Fitzgerald (1992) illustrates the evolutionary model of the area showing cyclic barrier progradation and the anchor points for barriers and spits. Today, the Gurnet is a glacial drumlin holding Duxbury Beach, but this will change as future storms and climate variations impact the migration of this barrier beach. The International Panel on Climate Change has predicted that sea level will rise at an accelerated rate in the near future so that the current one-vertical foot in 100 years of sea level increase will almost double over the next 100 years. This scenario of increasing sea level rises combined with future storms will have a huge effect on how Duxbury Beach and the Bay look in the future. Some geologists predict that the barrier beach will migrate past Gurnet Point and attach itself to Clarks Island.

The history of Duxbury's barrier movement is seen in comparison studies of navigational charts over periods of years. O'Connell has been analyzing shoreline change from the mid-1800s to 1994 along Duxbury Beach. His study found that, in the mid-1800s, the width of the beach near the Powder Point Bridge is the same as it is today but it used to be 150 feet farther into the ocean.

Geologists have also determined that 3,700 years ago Duxbury's barrier was positioned approximately 500 meters offshore. That means Duxbury Bay is actually shrinking.

Other factors adding to the beach's front side erosion include the effects of the seawalls along Brant Rock and Marshfield's coastline. "Those coastal areas before the existence of seawalls provided a lot of the sand that created Duxbury Beach, which started as a small spit of sand," said O'Connell. Several thousands of years ago, the sand began to be added to the small spit, and then about 1,000 years ago, the rate of sea level rise slowed down and caused significant amounts of sand to be added to the spit. This process has made the beach longer and longer. However, constant erosion, the lack of new sand feeding the beach, and rising sea levels will continue to impact Duxbury Beach and the Bay.

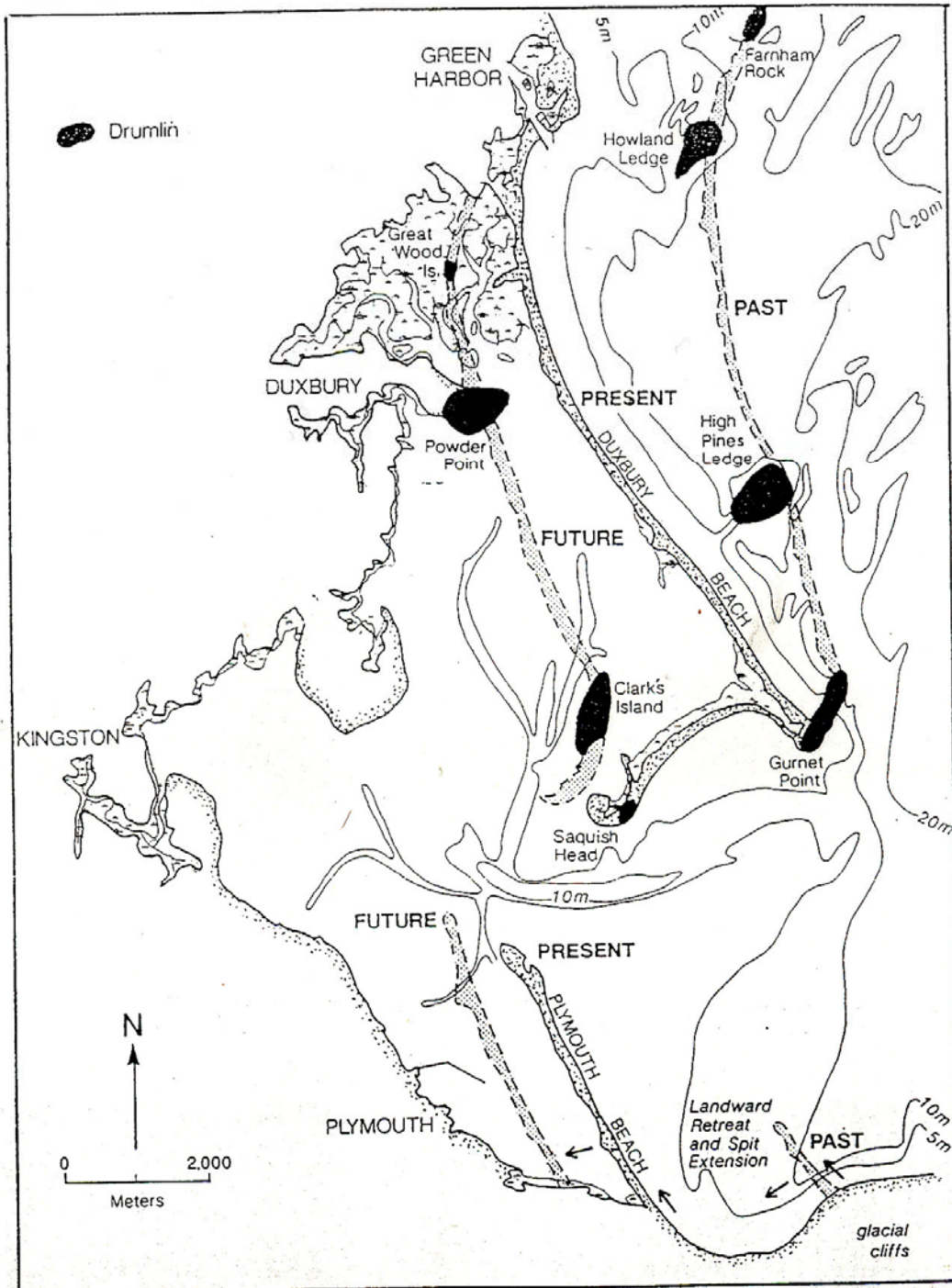


Figure 6. Evolutionary model of the area showing cyclic barrier progradation and the anchor points for the barriers and spits.

from Hill and FitzGerald, 1992

Figure 1. Evolutionary Model of Area Showing Cyclic Barrier Progradation and the Anchor Points for the Barriers and Spits (from Hill and FitzGerald, 1992)

2.2. Archaeology and Recent Human History

In the spring of 1627, the colony of Duxbury was arranged and, without going into great detail on the process of land grants, Pilgrim families had title to the land and, as the record states, they settled here “sometime before 1630.” Waterfront access was as prized then as it is today. The original grants, 20 acres for every man and 20 acres for each member of his household, fronted on the bay as much as possible and then extended inland. “The grants north of Plymouth ran to Jones River and on around the bay, some falling on the other side of the bay,” wrote Dorothy Wentworth, former town historian, in *Settlement and Growth of Duxbury, 1628-1870*.

These early settlers found the fields of the Native Americans, who came to Duxbury each summer from further inland to grow their crops along the shoreline and live off the abundant shellfish supply that Duxbury Bay provided them. They traveled the bay waters in their sturdy dugout canoes.

The pilgrims also relied on water transportation as one of the best means of travel. The beginnings of shipbuilding are found in their need for sturdy, reliable vessels. “It started in a small way, with a boat built here and there along the coast, as need suggested and farm work allowed,” wrote Wentworth.

Duxbury’s economy, however, consisted mainly of farming, with the bay’s marshes providing hay for cattle and its mud flats supplying shellfish, until the late 1700s. By 1780, the shores of Duxbury had begun to experience the bustle of a new and thriving industry—shipbuilding. From 1820-1840, the town, with a population of only 2,500, “was thoroughly given to the sea and related industry,” noted Wentworth.

In 1874, this chapter of Bay history ended with the launch of the last vessel built in Duxbury near the shore of Shipyard Lane. Other bay-related activities continued, with new industries and interests arriving to these waters. Today, commercial and recreational fishing and shellfishing, aquaculture, sailing, boat racing and other maritime activities share a place in bay history and have become the catalyst for finding a balance in order to maintain and preserve the very resource they so depend on.

Water Quality

With the tides rushing in and out twice a day, the Bay has been the beneficiary of a natural cleansing that for centuries kept its waters pristine. Statistics cited by environmentalists show that the bays—those in Duxbury, Kingston and Plymouth—have a tidal exchange of more than 66 percent. The advent of civilization and the unending pressure to develop the coastline, however, have produced an array of pollutants that have undermined nature’s ability to tidy up.

A 1974 study launched by the Mass. Division of Marine Resources in our bays resulted in water sampling stations, including three in Duxbury, being set up around the bays. The study cited pollution coming from several sources—factories, boat motors, surface drains, holding tank facilities, yacht clubs, and particularly the overflow at the Plymouth sewage treatment

plant, which was overloaded due to storm drainage and ground water. Also discovered were chlorinated hydrocarbons such as Lindane, Aldrin, DDD and DDT. The evidence of these pesticides promoted pesticide-sampling stations to be established throughout the greater bay area and included one at Blue Fish River and another at Back River.

Federal legislation enacted in 1972 established a marine-protected-areas system and made the Plymouth, Kingston and Duxbury Bays part of the Cape Cod Bay Ocean Sanctuary. The new law banned the expansion of municipal effluent discharges into local waters. It was a check on the increasing pollution coming from Plymouth's treatment plant, but not a check mate.

In the 1980s, the town of Duxbury worked diligently to stop Plymouth from expanding its treatment plant, which was already in violation of the Ocean Sanctuaries Act. Plymouth was seeking approval from the Massachusetts Legislature to increase wastewater treatment from 2.7 million gallons per day to 4 million gallons per day under certain conditions (the plant had been built to treat 1.7 million gallons per day). The Plymouth effort—facing strong opposition from Duxbury—failed as did a follow-up request. Duxbury resident, Robert Millar, chairman of Duxbury Ocean Sanctuaries Committee, spearheaded the drive to defeat both measures and pushed for regulations requiring that any ocean discharge from an expanded Plymouth treatment plant be sent east of a line from the Gurnet to Rocky Point in Manomet. Laws were finally enacted to ban any additional discharges into the Cape-Cod Bay Ocean Sanctuary.

In 1988, former state Senator William Golden, a Weymouth Democrat, proposed new legislation that would create strict environmental rules governing the Plymouth-Kingston-Duxbury Bay region. He wanted to designate the bays as an Area of Critical Environmental Concern (ACEC). A committee of Duxbury residents considered the idea, but officials from Plymouth and Kingston said no and Golden's proposal fell short.

In 1992 the Division of Marine Fisheries closed the Blue Fish River to shellfishing due to high levels of pollutants from abutting residences. In 1993 the Bayswide Committee (Duxbury, Kingston and Plymouth) proposed the Bluefish River Project. As a result, the Town, with the help of Mass Coastal Zone Management and the Mass Bays Program, initiated a group septic system project with a remote leach field at the Ellison Center for the Arts. This project became a model for similar projects at Snug Harbor and Bay Road. This project was a unique partnership between residents, the Town, several government agencies and a non profit group. At the same time, many of the septic systems along the Duxbury portion of the Kingston Bay (off of Bay Road) were failing or stressed. Coliform bacteria levels were abnormally high, well above the acceptable levels. Kingston eventually solved its issue by hooking into a new treatment plant, which their town built.

In 2002 Duxbury tackled its pollution problems along Kingston Bay by identifying about 30 properties along Bay Road that had no solution for replacing failed systems. Another shared septic system was created based on the Bluefish River model. The system pumps sewage to a leaching field in a Town Park. While this shared system has made an impact, it hasn't solved all the pollution problems.

In Duxbury, bay pollution has historically come from individual disposal systems, storm drains, powerboats and other “nonpoint” sources of pollution such as lawn fertilizers, pesticides and herbicides. The town, however, has always taken a proactive stance on water quality issues.

The town continues to address pollution problems caused by storm drainage. One example is the Snug Harbor drainage system redesign to address issues in that area. This project has just recently received a construction grant. In 1998, the town obtained a State grant to acquire a pump-out boat and a pumping station on the town pier. Other anti-pollution programs to improve water quality include Duxbury’s annual Beach Cleanup, which is part of the federal Coastal Sweep program. Battelle Labs, a not-for-profit organization in Duxbury, has sponsored the Beach Cleanup for the last twenty years.

Shellfishing and Aquaculture

The history of shellfishing in Duxbury is as rich as its supply. Mussels and clams helped sustain the early colonists, who relied on the natural resource as a main staple in their diets. Long before the Pilgrims arrived, Native Americans harvested shellfish from the mud flats of these waters.

In the 1800s, a commercial use for the common soft shell clam took hold, and Duxbury became one of the leading suppliers of bait to fishing ports in Boston, Gloucester and Provincetown. “The harvest from Duxbury, Kingston and Plymouth was estimated to be as high as 100,000 bushels of clams per year,” said Frank Germano of the Massachusetts Division of Marine Fisheries. Today, that quantity would translate into more than \$9 million annually to the local economy, he noted.

In the 1860s, another market developed as steamers grew in popularity in New York and Chicago. Not surprisingly, soft shell clams in the flats of Duxbury, Kingston and Plymouth bays were close to extinction from over-harvesting. Most towns responded by racking and removing mussels, which threatened the soft shell clams. Duxbury went even further in its efforts to save the soft shell—instituting the first clam transplant program by taking clams from the productive flats along the Jones River and Kingston Bay and transplanting them to Duxbury’s beds. By the late 1800s, certain intertidal flats were restricted as part of the town’s effort to reverse the clam’s steady decline. Duxbury was also one of the first towns in the state to limit shellfishing to “residents only” (Essex was the first).

In 1920, the town initiated a relay program with the Commissioners of Inland Fisheries in an effort to boost the economy in which Quahogs from New Bedford and Fall River were transplanted to Duxbury Bay (an early attempt in 1869 proved unproductive and too labor intensive). Other efforts to restore the soft shell clam in Duxbury included Roosevelt’s Works Progress Administration that provided man-power to establish shellfish predator control (eliminating thousands of horseshoe crabs—a major enemy of the clam). The efforts paid off, and by 1936 clammers were digging record bushels of soft-shell clams compared to previous years.

It was felt that large beds of mussels prevented the soft shell clam from making the comeback in quantities seen in the harvesting of the 1800s. Duxbury, like many Cape towns, attempted to restore its clam beds by eradicating the mussels (there being a very limited commercial demand for mussels in the 1950s).

There have been other efforts to control over-harvesting of Duxbury's shellfish species. In the 1980s, the town, under the advisement of the Shellfish Advisory Committee, a group of nine residents including ex-officio member Harbormaster Don Beers, introduced the Limited Entry Razor Clam license for commercial harvesting. This license is limited to 15 individuals per year, and licenses are issued via a lottery system. Commercial licenses for mussels are also limited, with only 10 licenses issued annually and a lottery system in place to fill open licenses.

Oyster farming is not new to Duxbury. Its history traces to the early 1900s and, of course, Native Americans and early colonists who relied on its cultivation as a primary food source. The earliest recorded commercial oyster grants in Duxbury date to 1901, when the town issued a grant to James Killion, who immediately transferred it to the Rocky Point Oyster Company in Providence. The grant authorized the company to plant, and later harvest, oysters along the full length of the beach channel south of the Powder Point Bridge. The seed came from Narragansett Bay. Unfortunately, Mother Nature played a major role in the failure of this enterprise, with cold winters causing the bay to freeze to more than a foot throughout the harvest season. After three consecutive winters of frozen waters, the project was abandoned.

In the 1930s and 1950s, additional attempts were made to seed oysters in the intertidal areas of the bay with little success. By the 1970s and 1980s, improved hatchery and grow-out techniques became more effective, and commercial oyster aquaculture grew in Massachusetts, although the state has lagged behind other states such as Connecticut.

In 1994, Massachusetts Governor William Weld, spurred on by the economic success of Connecticut's oyster industry (which was contributing \$200 million annually to that state's economy), directed a study known as the Massachusetts White Papers. This study outlined the factors constraining the state's marine aquaculture industry. The findings included a highly developed coastline, multiple competing uses of Massachusetts' waters, a redundant regulatory system, overbearing legal issues, and the misunderstanding of aquaculture by the public and fishing industry. Historically, the primary barrier to commercial aquaculture has been the process of obtaining a license with so many regulatory levels to meet. Other obstacles in oyster farming include the upfront financial capital requirements to start such a venture, threat of disease, the learning curve for new technology, and genetic problems with seed stock. The work is also extremely labor intensive.

In Duxbury, oyster aquaculture returned as a commercially driven enterprise some 12 years ago. Grant owners established the Duxbury Grower's Association in 2000, in an effort to provide sound stewardship to the environment and address issues critical to the shellfish farming industry.

Maritime

The pilgrims were the pioneers of sailing in Duxbury Bay. They relied heavily on water transportation, as land travel was arduous and sometimes unsafe. The Bay played an important role in transportation because it was a well-protected water body with direct access between Plymouth and eventually Green's Harbor and Marshfield through the Cut River. Pilgrims set sail to get from here to there, and it is not too much of a stretch to suggest that they sailed to live, as would their heirs for at least two more centuries. Maritime use for survival in colonial times gave way to shipbuilding and commercial fishing in the 1800s. In 1840, Ezra Weston ("King Caesar") of Duxbury was considered the "largest ship owner in America." Over the years the community's maritime use of Duxbury Bay has changed both in character and intensity from its original use for sustenance to its present primary use for recreational boating. Commercial fishing and boat building are not as prominent as they once were. However, the skilled hands and keen eyes that landed fish and bent wood to frame also shaped the homes and churches that we still see as Duxbury. The rich and storied maritime history of Duxbury Bay is well told in two books by local authors. The Duxbury Bay Management Study Committee highly recommends, *Duxbury Bay*, by Frank Benson Lawson and Margaret Farnsworth Lawson² and, *Duxbury a Guide*, by Katherine H. Pillsbury.

2.3 History of Duxbury's Herring Run

In the first comers period of the early 1600s, Squanto, a Pautuxet Indian from the Plymouth Area,³ is reported to have taught the Pilgrims how to plant corn in mounds fertilized with herring. Use of fish sustained native peoples and the Pilgrims. "Mattakeeset, meaning "place of many fish," is a Native American name still used in Duxbury."⁴ Land ownership at Island Creek was established with land grants in the early 17th century. The Town regulated the Island Creek herring run at the town meeting in 1693, "...that if the fisher men of Duxbury, shall clear Island Creek brook tat said men shall have livery then to get herring for bait from time to time without moletstation; and to that end the town do agree, that if any, either English or Indian, do hinder tem herein, by makin of weirs, or hindering the fish from coming to the Pond or going down, they shall thereby forfit five shillings for every time they do so..."⁵ The town meeting of 1702 shows "the town have given liberty to Ens. Seabury to make a dam upon Island Creek Pond brook, provided that he leaves a sufficient and free passage for the herrings up, and down, and also makes a sufficient cart way over the brook." This is the historic fish run which needs to be restored.

With access to the Bay, farm land and the Creek's herring run, the area had the resources to support a village. The name Island Creek eventually referred to a village with its "own school, post office, railroad station and social center, Island Creek Hall."⁶ The growth in fishing in the

² Frank Benson Lawson and Margaret Fransworth, *Duxbury Bay*, Duxbury Rural and Historical Society, 1993

³ Katherine H. Pillsbury, *Duxbury a Guide*, Duxbury Rural and Historical Society, 1999, p.18, Duxbury, Massachusetts

⁴ Ibid. p.3

⁵ Records of the Town of Duxbury, 1642-1770, Avery and Doten, 1893, 214-235.

⁶ Op.cit. p.51

early 18th century led Duxbury men to build ships or fish the grand banks. Island Creek provided herring as bait and sufficient deep water, and the area become important to ship building in the late 18th century. The shipping and ship building industry defined much of what we see today in Duxbury. In time, transportation and the economy changed, and the community turned away from the Bay and Island Creek. The herring run fell into disrepair until the 1940s when the present fish ladder was constructed. In recent history efforts have begun to restore these fish runs. Herring is important to many commercial and game fish including bluefish, striped bass, weakfish, and tuna. Herring is also important as bait for lobster. Towns that now celebrate the return of the herring include Bourndale, Middleboro, Weymouth, and Pembroke. The region has identified herring run restoration as important to the restoration of our environmental heritage and has included it in *The Regional Open Space Plan*, authored by the South Coastal Basin Team.

The Duxbury Bay Management Study Committee, in partnership with the Conservation Commission, the Department of Public Works, the Division of Marine Fisheries, the U.S. Fish and Wildlife Service, the Corporate Wetlands Restoration Program, Battelle Memorial Institute, and the Duxbury Bay Maritime School, has initiated the Island Creek Rainbow Smelt and Herring Run restoration project. This restoration project is part of the Conservation Commission effort to restore the entire habitat of the Island Creek and Mill and Island Creek Pond (the only great pond in Duxbury). Both ponds are public open space. The Town has received a deeded easement to access the land where the control structure will be modified – where Island Creek leaves Island Creek Pond. The Duxbury Rural and Historic Society recognize the historic significance of the Pond and owns property where the Creek leaves Island Creek Pond. This project is one step ahead in that the Conservation Commission has already restored water quality and removed invasive species from Mill and Island Creek Ponds. All that remains is to reintroduce the herring to this waiting spawning and nursery habitat. It is extremely important from an environmental as well as a historic perspective that we restore and protect the Island Creek herring run and thereby restore the community's historic relationship to its fresh water ponds, creeks and the Bay.

The Duxbury Bay Management Study Committee hopes that the other identified herring runs at Beaver Creek and Millbrook will eventually be restored. Debora Katz provided the following source notes from Duxbury historian Henry Fish, written about 1924, regarding herring runs:

From section on North Duxbury and Crooked Lane Neighborhood page 27 and on:

“Between the Cranberry Factory and the Marshfield line was a section of land that was settled on shortly before 1700, a part of the section was called Crooked Lane, from the fact through the place there was such a lane, and was said to have been crooked, but where it led to, no one seems to know.

Another old road entered the Crooked Lane clearing from the east by the way of the Herring Weir at the foot of Thomas Fishes swamp, now the cranberry bog of John Hadaway. This old path entered the clearing near the old tomb on Lincoln Street, and avoided the steep hill that is now used as part of the Temple St., which was not laid out as a road for many years

after the first way was laid out into the clearing.

East of the Caleb Sampson farm was another lot that was bounded on the easterly side by the line between Marshfield and Duxbury, this farm was owned by Thomas Fish; one of the prominent men of the town, who seems to have owned lands in several places, one being the swamp now commonly known as the Gifford Cranberry Bog, at the foot of which was his Herring Weir.”

From a section on Stoney Brook and Its Mills pages 95 and on

“In 1640 the town applied to the Court for permission to place the mill on this stream [Stoney Brook] and a committee was appointed to “View the same” and see if it was to be “Predjudicial.” The committee reporting that it was in no way prejudicial, and that the town should have the permission to turn the stream to the mill.

Standing near the site of the old mill at the present time, our thoughts wander from this yellow records, to that which is to be seen at the present time. The two ponds, the Spillway;(now the brook,) and the sites of the fulling mill, and the site of the last of the mills of the mill brook. Records may tell us of part of the history, yet there is more than they tell of. Tradition fails to tell much about the past, in regard to the early history of, and the many changes about the old mills....

Above the roadway may be seen two ponds, and between them a partition in which there may be seen a gateway, which was undoubtedly, the gateway of the first mill, and the small pond; the site of the first mill which stood at this place for about a hundred and five years, at which time it had become so out of repair that it was abandoned, and was replaced by another that was below the roadway, and a new dam constructed that flowed the site of the old mill, thus making what is now two ponds.

*By the reading of the Colony Court records, one can readily see that there was a small group of settlers at this locality, as in other sections of the town, their lots varying from a mearstead, to ten acres, and their “Great lots” were elsewhere, two reasons can be advanced for this supposition, one is, **the land near the brook was largely cleared by the Indians for their planting land, the Herring being their fertilizer for their corn fields, and this brook was once a famous resort for this lowly fish.** The second reason is the same as in other localities, “In unity there is strength” and find these small groups scattered along the shore from Jones river to the Mill Brook.”*

3.0 WATER QUALITY

3.1. Existing Conditions and Trends

Duxbury is fortunate to have some of the cleanest estuarine water on the Massachusetts coast. Duxbury Bay is the last major body of water and shellfish resource from Cape Cod to the New Hampshire border not seriously affected by coastal pollution. This situation is due in part to Duxbury's relatively low population density, to the concern of its citizens (who funded the State's first shared septic system at the Bluefish River and successfully fought increased discharge from the Plymouth Sewage treatment plant), and to the Bay's high tidal exchange rate of approximately 70 percent.

In the past years however, some warning signs have appeared that will require continued vigilance, and further action may be necessary to preserve the water quality of the bay. Sampling of bacteria by the state's Division of Marine Fisheries has resulted in the closing of part of the Back River to shellfishing, as well as changing the designation of an area at the mouth of the Bluefish River from "approved" to "conditionally approved."

Regular water quality measurements are taken in Duxbury Bay under two State programs. The Massachusetts Division of Marine Fisheries ("DMF") regularly samples stations in Duxbury Bay and adjacent waters for fecal coliform bacteria according to procedures in the National Shellfish Sanitation Program (NSSP) Model Ordinance promulgated by the U.S. Food and Drug Administration. Results of this sampling are used to determine whether designated areas are approved, conditionally approved, or prohibited for shellfishing. The other program involves regular testing of beaches during the bathing season by the Massachusetts Department of Health. Samples are taken weekly from June through August and tested for enterococci, as these bacteria are strongly associated with gastrointestinal symptoms reported by swimmers, and the results are used to determine the open or closed status of beaches.

Physical Condition

According to the NSSP criteria, Natural Resource Map 3, shows the location of the fecal coliform stations sampled by the DMF. A total of 23 stations were regularly sampled in Duxbury Bay and adjacent waters in 2003: eleven in Duxbury Bay proper, including Eagle's Nest Bay, three in the Bluefish River, five in the Back River, and four in the Duxbury portion of Kingston Bay (ten stations in the whole of Kingston Bay). Each of these areas is reported on separately by DMF, and recent reports contain a history of water quality related shellfish closings in these waters.

Division of Marine Fisheries Sanitary Surveys

Duxbury Bay. Duxbury Bay, with the exception of Eagle's Nest Bay and the Bayside Marine area, has always been classified as approved for the taking of shellfish. Eagle's Nest Bay and Eagle's Nest Creek were classified as "approved" until 1983, when the Department of Environmental Quality Engineering (DEQE), now the Department of Environmental Protection

(DEP), reclassified Eagle's Nest Creek south of the Marshall Street Bridge as "prohibited" due to unacceptable water quality. On November 8, 1969, the Division of Marine Fisheries closed all of Eagle's Nest Bay south of a line from Hardin Hill Road to Eagle's Nest Point when the water quality exceeded the NSSP variability criteria. In October 1995, as a result of improved water quality, the bay north of the Marshall Street Bridge was reclassified as "approved" and seasonally opened to shellfishing.

On April 6, 1994, the DMF closed a three acre area in Snug Harbor off Bayside Marine due to unacceptable water quality caused by three storm drains flowing into the area.

Bluefish River. The entire Bluefish River had been classified by DEQE as approved for the harvest of shellfish until June 4, 1984, when unacceptable water quality caused most of the area west of the Washington Street Bridge to be closed to shellfishing. On May 30, 1985, the closure was enlarged by a reclassification of the area east of the Washington Street Bridge as "seasonally approved," with shellfishing permitted only from November 1 to May 1.

High coliform levels found in surveys in 1987 and 1989 caused most of the Bluefish River to be prohibited to shellfishing for the entire year, with the exception of a triangular area at the mouth extending from Long Point to Thompson's Pier and Maxfield Point. Following completion of the 1993 survey report, a conditional, seasonally open area was approved north of a line from Thompson's Pier to Long Point, and this area was enlarged in 1999, although the interior parts of the river remained closed to shellfishing.

The source of the high fecal coliform counts that caused the 1991 closing appeared to be from three failing septic systems near the Washington Street Bridge. In 1996, these properties were connected to an off-site shared septic system, resulting in significantly improved water quality in the abutting section of the river.

The Bluefish River's water quality problems continued to persist, however. In 2003, the formerly approved area at the mouth of the river was changed to conditionally approved for shellfishing. This means that no part of the river is open for shellfishing year-round, and only the part nearest the mouth is open on a seasonal basis, from November 1st to June 15th.

Back River. The Division of Marine Fisheries' classification area known as the Back River is actually a collection of small tidal rivers and passages extending throughout the Duxbury Marsh at the north end of the Bay. The largest of these are the Great Woods River, Pine Point River, Little Wood Island River, and Duck Hill River.

The March 29, 2002 triennial report for the Back River by the Division of Marine Fisheries stated that "there are few actual sources of pollution and the area has a long history of excellent water quality. The pollution sources identified during the shoreline survey do not appear to have a significant adverse impact on the water quality in the resource area." During the summer and fall of 2003, however, high fecal coliform counts at Station 9, in the Duck Hill River in the western part of the marsh, caused the river upstream of the sampling station to be closed to shellfishing. This was the first time that any part of the Back River system had not

been approved for shellfishing. DMF personnel did not have an opinion as to the cause of the high coliform levels.

Kingston Bay. The northern shoreline and the northern half of Kingston Bay are in the Town of Duxbury, and four of Kingston's six DMF water quality sampling stations are in Duxbury. The Jones River empties into the west end of the Bay from Kingston, and just north of it, Island Creek enters the bay from Island Creek Pond in Duxbury. The shoreline along the south side of Kingston Bay in the Town of Kingston and extending south into Plymouth is densely populated and partially commercial. Kingston Bay has had more water quality problems than other waters within Duxbury.

In 1925, the National Shellfish Sanitation Program was established in response to a typhoid epidemic caused in part by the consumption of polluted shellfish, and in December of the same year the western part of Kingston Bay and an area along the Kingston and Plymouth shore extending southeast from Rocky Nook Point were closed to shellfishing. Among the main causes of pollution were discharges of untreated sewage from the Plymouth sewer system, and from 20 houses along the Jones River that did not have cesspools, but discharged their wastes through pipes directly into the river. Many of the houses in the Rocky Nook section of Kingston were seasonal and unoccupied in the winter months. The bay's water quality would fluctuate with the increase in population of the Rocky Nook area. Between 1934 and 1978, the bay underwent a series of openings and closures, and from 1978 until 1993, the closed area was periodically enlarged until most of the bay was prohibited for shellfishing. Following a sanitary survey in 1997, however, the closure line was moved to the west, allowing an area east of a line from Boundary Lane in Kingston to the pier at 146 Crescent Street in Duxbury to be opened to shellfishing. In 2003, the restriction on shellfishing in the bay was further lifted when a large part of the central bay was reclassified as conditionally approved and opened for shellfishing from November 1 to March 31, except for 48 hours after a rainfall of 0.3", leaving only the western most part of the bay prohibited for shellfishing (Resource Map). The DMF's Sanitary Survey Report attributed the improvement in water quality to the connection of more than 350 houses in Kingston, along the shore and the Jones River, to the new Plymouth wastewater collection system, and to the strict enforcement of septic regulations in Duxbury (which had taken 29 houses with failed or suspect septic systems and connected them to an upland community waste disposal system).

Department of Public Health Beach Testing

Another ongoing water quality testing program in Duxbury Bay is the bathing beach monitoring program. During the swimming season from June through August, personnel from the Harbormaster's Office periodically collect water samples from public and semi-public (what is considered a "semi-public beach"?) beaches and send them to a laboratory where they are analyzed for Enterococci. The results are then sent to the State Department of Public Health, which compiles them and issues an annual report. In addition, Duxbury's Dept. of Health will issue beach closures based on the findings by posting signage. Enterococci are bacteria that have been shown to be strongly correlated with swimming-associated disease, and if their concentration is over 104 colony forming units (CFU) per 100 ml for a single sample and 35 CFU per 100 ml for the geometric mean of at least five samples over a 30-day period,

the beach is closed until further testing. Fortunately, the high flushing rate of Duxbury Bay means that high levels of bacteria are quickly dissipated and do not soon return.

There are eight beaches sampled in Duxbury, two on the ocean side of Duxbury Beach, and the rest along the west side of Duxbury Bay and in Kingston Bay (Resource Map 3). In 2003, there was one beach closure when samples taken at Shipyard Lane were over the limit on August 5 and 7. Starting with the next sample on August 12, bacteria levels were again well below the criteria. [Need to add the beach closure records for 2004 here i.e. Landing Beach and others.]

Sources of Pollution

As part of the triennial sanitary surveys, DMF and the Town conduct shoreline surveys looking for and documenting any possible sources of pollution. The most recent such reports available are from 1999 for the Back and Bluefish Rivers, 2002 for Duxbury Bay, and 2002 for Kingston Bay.

Potential sources of pollution are individual septic systems, storm drains and stormwater runoff, and waterfowl. No significant sources of pollution were found in the Back River system, and at the time of the survey, there were no water quality problems in the system. In the Bluefish River, construction of a shared septic system for several houses with failed septic systems had improved conditions, but problems remain. Six properties along Washington, Harrison, and St. George Streets were listed as potential problems because of their close proximity to the marsh, and the DMF recommended that the Board of health inspect their septic systems. A storm drain at the A&P Plaza on Depot St. was cited as a problem, although plans were underway to correct this [what is the current status of this storm drain?] The Duxbury Yacht Club Golf Course and associated ponds contribute heavy runoff to the river during storm events, and may contribute nutrients, fertilizers, pesticides, and feces from waterfowl to the river.

In 2002, when DMF personnel conducted the shoreline survey of Duxbury Bay, they sampled several pipes which flow into the bay; none of these contained significant coliform numbers. The construction of a septic system shared by several properties in Snug Harbor has improved conditions in that area, and the Town is seeking a grant to install Best Management Practices (BMP's) and reconstruct the storm drains at Snug Harbor, which have been cited as a reason for closing the immediate area to shellfishing.

In Kingston Bay, as noted above, water quality has significantly improved since 350 houses in Kingston were connected the Plymouth wastewater collection system and 29 houses in Duxbury were connected to an upland community septic system. Storm drains still contribute fecal coliforms to the bay during wet weather, although there have been recent improvements because of the sewerage improvements and CPR grants to improve the drainage systems.

3.2. Current Bay Management

3.2.1. Permitting Regulations and Structure

Several regulatory programs are intended to control water quality. These include the State's Title V septic system regulations (310 CMR 15.00) and Section 1 of the Duxbury Board of Health regulations. Also, the EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from regulated Small Municipal Separate Storm Sewer Systems now applies to communities the size of Duxbury. Director of Public Works, Thomas Daley, submitted a Notice of Intent (NOI) for the Town to be covered under this permit on July 29, 2003. The NOI includes a list of all receiving waters and the number of storm drains discharging to them, and a summary of a Stormwater Management Program. The present structure for monitoring water quality and addressing water quality problems is fragmented between all the agencies cited above. This structure does not lead to effective proactive protection and restoration of the water quality of Duxbury Bay.

3.2.2. Town By-Laws and Regulations

Section 1 of the Duxbury Board of Health Regulations supplements the State's Title V code for individual septic systems. Among its provisions is a setback distance of 150' from any freshwater wetland, salt, marsh, of coastal or inland bank, considerably greater than the 50' setback required under Title V. Zoning to preserve the low density human impacts on natural systems in Duxbury is also vital to protection of water quality

3.2.3. Harbor and Bay Preservation and Restoration Efforts

Duxbury's citizens and town officials have worked diligently to preserve the Bay's water quality, and the success of their efforts is measured by the fact that Duxbury has the most unrestricted shellfishing of any town from Cape Cod to New Hampshire. An important factor in the preservation of this quality has been Duxbury's strict enforcement of its septic codes, projects such as the shared systems at the Washington Street Bridge and Snug Harbor, and the construction of a community upland disposal system serving houses on Bay Road.

The Stormwater Management Program, as outlined in the NPDES NOI, is another program to maintain and improve Bay water quality. It includes the following elements:

- Public Education - Put up posters in school and town buildings; stencil catch basins; pamphlets in water bills; educational material on web site; and seminars for community groups;
- Public Participation - Comprehensive plan and zoning bylaw implementation committees; paint day collections; open space and recreation, community preservation, and bay management committees;
- Illicit Discharge Detection and Elimination - Map drainage system; coordinate with

- DMF on testing outfalls; investigate pollution hot spots as needed via test results;
- Construction Site Runoff Control - Propose changes re: drainage quality to zoning and conservation bylaws at Town Meeting; projects reviewed by Development Review Team (DRT); review and update subdivision rules and regulations biannually (example: drainage BMP's; enforce all approvals by regulatory authorities);
 - Post-Construction Runoff Control - Require and review BMP operation manuals as part of DRT and Con Com approval; Maintain drainage BMP's; Require annual maintenance and inspection reports for regulated projects; Submit bylaw to Town Meeting for BMP's for projects greater than one acre;
 - Municipal Good Housekeeping - Construct Snug Harbor BMP project when grant obtained from CZM; Implement maintenance schedule for town-owned BMP's; sweep streets and clean catch basins;

The plan also specifies a responsible person and a measurable goal for each of these elements.

3.2.4 Existing Plans

Existing plans to maintain water quality include the septic regulations and Stormwater Management Program specified above.

3.3. Management Recommendations for Water Quality

Results show that Duxbury currently does an excellent job of maintaining the Bay's water quality, but that there is room for improvement in some areas. Management recommendations for water quality include:

1. Establish a program for monitoring and addressing water quality issues;
2. Designate one responsible party for overseeing such programming; and,
3. Apply for funding for an initial survey to measure and catalog pollution parameters not presently accounted for and maintain a central source for scientific data.

Establish a Program for Monitoring and Addressing Water Quality Issues

A program should be established to prioritize storm drains for Best Management Practices ("BMP") proactively so that the Bay is protected from existing and future levels of non-point source pollution.

After the Division of Marine Fisheries completes their triennial shoreline pollution source surveys, concerned town officials, (e.g., Board of Health and Conservation Agents) should immediately be notified of any problems needing further investigation, such as questionable septic systems or flows from discharge pipes. A program should be in place to inform the officials of the schedule for these surveys so that they can either participate or make sure they receive the information.

When a new problem occurs, such as when high fecal coliform levels in the Duck Hill River is discovered, there should be a program in place with standard procedures, similar to those used in the DMF shoreline survey, to find the source of the problem. The program should go beyond identifying pollution sources to taking a proactive approach to mitigating the pollution either through enforcement of existing health regulations and or developing a Best Management Practice project to mitigate the problem. The Bluefish River project is a good model of how this program should be run. However, this program should not be reactive but proactive in protecting and restoring the Bay's water quality.

Create a standing program to specifically identify potential pollution sources and recommended mitigation measures and take action using existing authorities and or develop Best Management Practices projects to address water quality problems in affected areas with shellfish areas classified, conditionally open, or prohibited, and swimming areas that have experienced closures. Explore and if possible resolve differences between water sampling protocols and thresholds for shellfish and swimming.

A program should be established to prioritize storm drains for installation of Best Management Practices (BMPs) so that the Bay is protected from existing and future levels of non-point source pollution. As a first step locate all storm drains and water quality data from drains.

Designate One Responsible Party for Overseeing Such Programming

The responsibility for monitoring, coordination, source and solution identification needs to be assigned to a single entity either existing or newly created within Town government. A town official, such as the Health Agent, Harbormaster, or Shellfish Constable, or a newly created position such as Bay Manager should be created to take responsibility for this task.

One of the responsibilities of the staff person overseeing the program will be to support existing programs and education including:

1. Support the Open Space Plans call to "Investigate and develop an Integrated Pest Management Plan to reduce or eliminate the application of pesticides and herbicides on Town owned properties" and support education of private property owners regarding environmental impacts of pesticides and herbicides.
2. Support the Stormwater Management Program as outlined in the National Pollution Discharge Elimination System Notice of Intent proposed for the Town drains in the Snug Harbor area by the Department of Public Works and the Conservation Commission.
3. Support the Harbormaster's Office in the establishment and maintenance of a No Discharge Zone for marine sanitary devices in Duxbury waters.

Apply for Funding for an Initial Survey to Measure and Catalog Pollution Parameters

The designated responsible party should seek funding for an initial survey to measure and catalog pollution parameters not presently accounted for. These could include the following:

- Bacteria
 - Trends in dry/wet-weather bacteria indicators
 - Trends in beach closings
- Nutrients and Eutrophication
 - Nutrient concentrations (NO₃, NO₄, NH₄, PO₄)
 - Particulate concentrations
 - Biological oxygen demand (BOD)
 - Dissolved oxygen (DO)
- Toxic Contaminants
 - Shellfish/benthic invertebrate tissue concentrations
 - Sediment contaminant levels
- Shellfish Disease
 - Dermo
 - Neoplasia

Nutrients from runoff or septic systems could lead to eutrophication of the Bay, resulting in excessive algal growth and subsequent depletion of oxygen needed by shellfish in other organisms. Sampling BOD and DO can determine if nutrients are having this effect. It may be that because of the high flushing rate of the bay, nutrient accumulation and oxygen depletion will not be a problem. An initial survey and/or bay modeling can help determine this.

Two surveys in winter and summer would be implemented initially, and if no problems were found, follow-up could be long-term. If some parameter of concern was found, a program to determine and remedy the cause, with follow-up sampling, would be implemented. High nutrient concentrations, for example, could lead to restrictions on fertilizer use.

A summary of the management plan recommendations and priorities are provided in Table 2 below.

Table 2. Summary of Prioritized Management Plan Recommendations for Water Quality

TOPIC AREA	PRIORITY	RECOMMENDATIONS
I. Water Quality	1	Create and maintain a central source of available scientific data
	1	A program should be established to prioritize storm drains for installation of Best Management Practices (BMPs) so that the Bay is protected from existing and future levels of non-point source pollution. As a first step locate all storm drains and water quality data from drains. Support establishment of storm water By-Law.
	2	Develop program to notify and involve relevant Town Officials of possible pollution problems needing further investigation after Division of Marine Fisheries triennial shoreline pollution source surveys.
	2	Create a standing program to specifically identify potential pollution sources and recommended mitigation measures and take action using existing authorities and or develop Best Management Practices projects to address water quality problems in affected areas with shellfish areas classified, conditionally open, or prohibited, and swimming areas that have experienced closures. Explore and if possible resolve differences between water sampling protocols and thresholds for shellfish and swimming.
	3	Support the Open Space Plans call to “Investigate and develop an Integrated Pest Management Plan to reduce or eliminate the application of pesticides and herbicides on Town owned properties” and support education of private property owners regarding environmental impacts of pesticides and herbicides.
	3	Support the Stormwater Management Program as outlined in the National Pollution Discharge Elimination System Notice of Intent proposed for the Town drains in the Snug Harbor area by the Department of Public Works and the Conservation Commission.
	3	Support the Harbormaster’s Office in the establishment and maintenance of a No Discharge Zone for marine sanitary devices in Duxbury waters.

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4.0 SHELLFISH, SHELLFISHING, AND AQUACULTURE

4.1 Shellfish

4.1.1 Existing Conditions and Trends

Current Conditions

A primary resource of Duxbury has always been an abundant supply of shellfish. Native Americans harvested shellfish from these waters long before European colonists arrived, and clams and mussels from the Plymouth-Kingston-Duxbury Bay area was a major staple for the Pilgrim's diet. Soft-shell or steamer clams have historically been the most prevalent shellfish resource in the bay, with quahogs, mussels, oysters, and razor clams also supporting significant fisheries at various times. Bay scallops appeared in the Bay in the 1950's and sustained a fishery for a few years due to certain climate and storm conditions, and then mostly disappeared.

Currently, Duxbury has 16,816 acres of water open for shellfishing, but not all of these contain shellfish. In 1974, it was estimated by the Division of Marine Fisheries that there were 103.9 acres of productive soft-shell clam habitat in the town⁷.

Soft-shell clams (*Mya arenaria*)

The soft-shell clam population has fluctuated greatly over the years in response to fishing pressure. In the 1800's the soft-shell clam achieved importance as bait, and Duxbury supplied large numbers of clams to the fishing fleets of Boston, Gloucester, and Provincetown. As reported by Debora Katz in her series *Bay in the Balance* published in the *Duxbury Clipper*, the harvest from Plymouth, Kingston and Duxbury bays was estimated to be as high as 100,000 bushels of clams per year in the 1800's, mostly for bait⁸. When an inland market for the human consumption of steamed clams developed in the 1860's, over harvesting of clams caused a decline in production. In response, the Duxbury Selectmen instituted the first clam transplant program and established a "resident only" clam harvesting limitation, making Duxbury one of the first towns in the state to do so. In the 1930's there was another surge in production, with the harvest peaking at 77,975 bushels in 1936, "over ten times more than the number in 1933" noted Katz.

The spread of mussel beds and the fact that horseshoe crabs are a natural predator of soft-shell clams eliminated areas of habitat for clams. To address this issue, the town sponsored programs to destroy horseshoe crabs and mussels. These programs were still underway as of 1963, when a bounty of 4 cents per live horseshoe crab was paid by the shellfish constable and

⁷ Iwanowicz, H.R., R.D. Anderson, and B.A. Ketschke, 1974. *A Study of the Marine Resources of Plymouth, Kingston, and Duxbury Bay*. Monograph Series No. 17, Division of Marine Fisheries, Dept. of Natural Resources, Comm. Of Massachusetts.

⁸ Katz, D. 2002. The Real Dig: Duxbury Shellfishing. *Duxbury Clipper*, Sept, 25, 2002

about 12,000 crabs were destroyed in the town. In 1950, only limited market for mussels in New York existed and, for this reason, thousand of bushels of mussels were destroyed by the town.

Specific estimates of shellfish harvests are not available for recent years, but the estimated recreational harvest of steamers climbed steadily from 250 bushels in 1983 to 12,000 bushels in 1996 (Table 3). According to recent reports by Shellfish Constable Don Beers, the soft-shell clam resource is apparently healthy, and recreational diggers never have trouble harvesting their limit of six quarts per week. For several years it has been possible to extend the recreational harvesting season past the traditional limits of April-May and September-October.

Soft shell clam flats tend to be close to the shore. The 1974 DMF report (Iwanowicz *et al.* 1974) shows productive clam flats along Standish Shore on the west side of the bay south of Eagle's Nest Point, along the west side of the mouth of the Bluefish River just north of Long Point, and along the shore southwest of Powder Point, off King Caesar Road. In December 2003, a map available for shellfish license applicants at the Town Clerk's office showed a similar distribution, with soft-shell clams along the shore from Eagle's Nest Point to the Bluefish River, and from the Bluefish River to Powder Point, as well as, along the back side of Duxbury Beach on either side of the Powder Point Bridge. Recently, a part of Kingston Bay has been opened to clamming and, the large intertidal flats on the Duxbury side of the bay have been productively harvested. The one area indicated as containing razor clams is south of Powder Point, also further offshore.

Quahogs (*Mercenaria mercenaria*)

The quahog or hard clam is another important Duxbury shellfish resource, although this has not always been the case. According to the 1974 DMF report, quahogs were relatively scarce at the time of the first European settlers, and little information is available on them prior to the 20th century. During the 20th century, there was an attempt to increase the value of this resource, and the Duxbury Town Reports state that quahogs were transplanted into the bay in 15 of the years between 1932 and 1969. In 1973, 50,000 seed quahogs were purchased and planted, and in 1982 the town purchased 80,000 quahog seed, cultured them, and broadcast them in spring 1983 in areas that were either fished out or ideal for propagation. In that same year, the Shellfish Department also purchased 200 bushels of contaminated quahogs from the Swansea area and seeded them in closed areas so that their spawn would repopulate other areas of the bay. Although no further relay programs were reported from subsequent years, quahog propagation efforts were apparently successful. In 1986, it was reported that the quahog resource had grown to a point where a small, strictly regulated commercial fishery could be instituted (Table 4). In more recent years, the recreational harvest of quahogs has consistently exceeded that of soft-shell clams, with higher yields for quahogs in every year when the numbers for each species were reported separately between 1990 and 1996 (Table 4).

In the 1974 DMF report on Plymouth, Kingston, and Duxbury Bay, the only quahog beds in the three town area are shown in Duxbury along the shore south of Powder Point and on a flat just inside Duxbury Beach, to the southeast of Powder Point. In 2003, a map provided to applicants for shellfish licenses in the Town Hall showed quahog existence along the western shore of the bay from south of the mooring basin to the Bluefish River, and south of Powder

Point, further offshore than the steamers.

Mussels (*Mytilus edulis*)

Blue mussels have always been one of the most abundant shellfish in Duxbury Bay, and during the late 20th century went from being regarded as a pest requiring eradication to being a sought after commercial species. Throughout most of Duxbury's history, there was little if any market for mussels and, because their spread over clam beds that coked out the softshell clams, there was an active campaign to get rid of them. Local fishermen would rake mussels into piles on the beach, pour oil on them, and burn them. As late as 1963, the shellfish constable's annual report stated that "Thousands of bushels of mussels have been removed from the bay in the past two years but they still remain a problem."⁹ By 1971, however, a market for mussels had apparently developed, as 2,250 bushels of mussels were harvested that year by four commercial permit holders. By 1984, the commercial harvest of mussels had increased by over 16 times, to 37,037 bushels. In 1985, however, the mussel beds were hit by a hurricane and a hard freeze, both occurring at low tide, which devastated the resource. The harvest declined to 7,213 bushels in 1986, and the commercial mussel fishery was reported as being "almost non-existent" in 1987 and 1988. By 1992, however, the fishery had largely recovered, with 21,294 bushels harvested that year. In 1995, the harvest was reported as having been in decline for two years. The last estimate of mussel harvest available (1997) reported a commercial harvest of only 1,626 bushels¹⁰. Today the occurrence of mussels is highly cyclical, with their abundance being controlled primarily by natural events and possibly fishing pressure. There are restrictions on the number of commercial mussel licenses issued by the town. Only 10 commercial mussel licenses are issued annually at a cost of \$135 per license. When an opening for a license to mussel becomes available, a publicized lottery occurs to fill the opening. A waiting list is also maintained and presently 10 residents are on the list.

Razor clams (*Ensis directus*)

Razor clams have long sustained a commercial fishery for bait, with 4,813 bushels marketed in 1937, and 3,242 bushels in 1938. As with mussels, the harvest has fluctuated, declining to 823 bushels by 1953, and only 75 bushels in 1983. In the early 1980's, however, a domestic Asian market for razor clams developed, and the commercial harvest increased to 2,320 bushels by 1997, the last year for which data was available. The Shellfish Warden cites cuts in Mass Division of Marine Fisheries funding as the reason data is not available past 1997. As with mussels, the commercial harvesting of razor clams is strictly regulated, with only 15 permits per year being issued (at a cost of \$150 per license (2002)), to Duxbury residents only. There is also a waiting list for razor clam licenses.

Oysters (*Crassostrea virginica*)

As noted by Debora Katz in her series, *Bay in the Balance*, "oyster farming is not new to Duxbury. Its history traces to the early 1900s and, of course, Native Americans and early colonists relied on its cultivation as a primary food source". The first recorded commercial oyster grant dates to 1901 when seed from Narragansett Bay was planted along the beach channel south of the Powder Point Bridge. Repeated freezing throughout the harvest season,

⁹ Annual Reports, Town of Duxbury

¹⁰ Division of Marine Fisheries Shellfish Landing Data, Neil Churchill, DMF, Personal communication

however, caused the project to be abandoned. From 1986 through 1990, 200 to 250 bushels of oysters were imported from the cape and Mattapoisett, planted and allowed to cleanse for 30 to 60 days, then opened for recreational harvest. After 1990, this program could not be continued because of disease in other areas which could have spread into Duxbury Bay. In recent years, with improved techniques aquaculture of oysters on granted areas has become a successful enterprise and is discussed further in Section 4.3.

4.1.2 Current Bay Management

Shellfish in Duxbury Bay are managed through the Town's regulation of recreational and commercial shellfishing, discussed in Section 4.2. State and Federal Regulations includes the following:

- Clean Water Act, s. 401, U.S. Army Corps Rivers and Harbors Act;
- 310 CMR 10 Mass Wetland Protection Act Regulations;
- 314 CMR 9, (s.401 compliance) Mass Water Quality Certification; and,
- Town of Duxbury Wetlands Protection Bylaw, Ch. 9, Conservation Commission.

4.1.3 Harbor and Bay Preservation and Restoration Efforts

Title 5 septic system reforms and the Town's Shared Septic Systems are cited as efforts that helped restore shellfish beds. The current Snug Harbor storm drain discharge mitigation project is another example of mitigation projects that restore shellfish bed water quality.

4.2 Shellfishing

4.2.1 Existing Conditions and Trends

Current Conditions

Shellfishing is one of the most important activities associated with Duxbury Bay, and maintaining and developing this activity should be one of the primary goals of a bay management plan because of its value and because it is a good indicator of the Bay's ecological health. All persons engaging in shellfishing within the town are required to have a town permit, and these are divided into two broad categories: recreational and commercial. A recreational permit, also known as a family permit, allows the digger to harvest shellfish for personal/family use and prohibits the selling of the catch. Recreational permits are open to both residents and non-residents of Duxbury. In recent years approximately 1400 to 1500 recreational permits per year have been issued. Commercial permits are restricted to Duxbury residents only, and about 40 to 60 permits per year have been issued in recent years. Ten permits per year are issued to harvest mussels and 15 for razor clams (closed fisheries). There is a waiting list for both.

Shellfish taken in Duxbury Bay are soft-shell clams, oysters, quahogs, and razor clams. The

harvest of surf or sea clams is included in some town reports, but these are taken on the ocean side of Duxbury Beach. Oysters were seeded in Duxbury in 1933, 1943, and 1951, but the only oyster harvest reported prior to the 1970's was 9 bushels in 1936. Between 1985 and 1990, annual oyster harvests ranged from 49 to 165 bushels. Oyster harvests have not been reported since 1990, although they continue to be the mainstay of the aquaculture operations (see Section 4.3). A fishery for bay scallops existed briefly in the 1950's.

Table 3 indicates the estimated recreational harvest of shellfish in Duxbury Bay from 1983 through 1997, and for ten-year intervals before that. Specific estimates of harvests were not included in the annual town reports after 1995, and were not submitted to the DMF after 1997 due to Mass Division of Marine Fisheries budget cuts according to the Shellfish Warden. Estimates are based on a Catch Per Unit of Effort (CPUE) basis; that is, the amount caught is an estimate based on the number of fishermen.

Trends observable in recreational shellfishing include the steady rise in permits granted each year after a decline in the early 1980's, the dominance of the fishery by quahogs and soft-shell clams, and the steady rise in clam harvests, with a large jump in 1997, although the yield did not nearly reach the levels in the 1930's, with a peak of 77,975 bushels in 1936¹¹.

The commercial data indicate the surge in mussel harvests in the 1980s (Table 4) after they became more popular for human consumption, and the devastating effect on the entire commercial fishery, dominated by mussels, of Hurricane Gloria and a hard, below-zero freeze, both occurring in 1985 at low tide when the beds were exposed. It took several years for the fishery to recover from these impacts, and by 1997, mussel harvests had declined precipitously again, illustrating the cyclical nature of this resource. As of 2000, the shellfish constable reported that "Again the commercial landing of mussels and razor clam was low", attributing the reduction to natural events and cycles. The decline in mussels and razor clams is in contrast to the recent relative abundance of quahogs and soft-shell clams, enabling extended seasons and an increase in the commercial fishery for these species.

Table 3. Estimated Recreational Shellfish Harvest, in Bushels, in Duxbury Bay for Selected Years

YEAR	QUAHOGS	MUSSELS	RAZOR CLAMS	OYSTERS	SOFT-SHELL	PERMITS ISSUED
1953						1032
1963						1275
1971	280	20	42	7	225	1715
1973	200	110	15	10	290	1900
1983	1000	75	10		250	934
1984	1063	104	173		278	884
1985	1262	68	135	24	482	924

¹¹ source: D. Katz, *Bay in Balance*, published in the *Duxbury Clipper*

Table 3. Estimated Recreational Shellfish Harvest, in Bushels, in Duxbury Bay for Selected Years (cont.)

YEAR	QUAHOGS	MUSSELS	RAZOR CLAMS	OYSTERS	SOFT-SHELL	PERMITS ISSUED
1986	1280	67	135	90	505	952
1987	1872	0	104	119	530	1136
1988	1882	0	120	49	558	1093
1989	1954	15	137	0	632	1122
1990	2088	47	154	165	716	1103
1991	2243	92	177	0	864	1223
1992	2464	136	191	0	980	1250
1993	n/a	n/a	n/a	0	1005	1223
1994	2938	51	82	0	1200	1350
1995	2478	48	70	0	1412	1400
1996	1400	50	110	0	1640	1000
1997	2500	50	50	0	12,000	1400
2001						1989
2002						1566
2003						1505

Source: Duxbury Annual Town Reports, except 1971 data from Iwanowicz *et al.* (1974), 1996-1997 from Division of Marine Fisheries, and 2001-2003 from Town Clerk's office.

Table 4. Commercial Shellfish Harvests, in Bushels, and Value from Duxbury Bay for Selected Years

YEAR	QUAHOGS	MUSSELS	RAZOR CLAMS	SOFT-SHELL	TOTAL	WHOLESALE VALUE
1953	1,097	98	823	38	2,056	\$7,023
1963	1,453	0	63	0	1,516	\$8,005
1971	455	2,250	0	0	2,705	\$9,013
1983	0	16,000	75	0	16,075	\$98,000
1984	0	37,037	82	0	37,119	\$212,050
1985	0	28,452	82	0	28,534	\$208,050
1986	38	7,213	55	0	7,268	\$44,910
1987	71	143	165	0	379	n/a
1988	40	23	659	7	729	\$26,920
1989	11	7,767	2,692	2	10,470	\$154,943
1990	111	16,203	4,980	28	21,316	\$285,605
1991	88	13,730	4,152	38	18,008	\$225,990
1992	95	21,294	3,133	42	24,564	\$283,591
1993	n/a	n/a	n/a	n/a	44,931	\$328,615

Table 4. Commercial Shellfish Harvests, in Bushels, and Value from Duxbury Bay for Selected Years (cont.)

YEAR	QUAHOGS	MUSSELS	RAZOR CLAMS	SOFT-SHELL	TOTAL	WHOLESALE VALUE
1994	5,665	18,884	0	9,442	33,992	\$305,833
1995	28	7,014	2,176	282	9,500	
1996	250	8,050	2,300	1,400	12,000	
1997	0	1,626	2,320	2,941	6,887	

Source: Duxbury Annual Town Reports, except 1971 data from Iwanowicz *et al.* (1974), and 1996-1997 from Division of Marine Fisheries.

4.2.2 Current Bay Management

Shellfisheries are regulated by both the state Division of Marine Fisheries through Chapter 130 of the Massachusetts General Laws and Title 322 of the Code of Massachusetts Regulations, and by the Town of Duxbury, through Section 7.5 of the Town by-laws. The state sets size limits and samples water quality to determine when beds should be approved, conditionally approved, or prohibited for shellfishing. As with other coastal towns, the Town of Duxbury sells licenses, determines the fees, sets catch limits and determines the open and closed seasons. For species fished in Duxbury Bay, minimum size limits are 3" longest shell diameter for oyster, 1" shell thickness (and 2" longest shell diameter in the town regulations) for quahog, 2" longest shell diameter for soft-shell clam, and 5" longest shell diameter for sea clam. There are no size limits on razor clams or mussels.

Shellfishing is regulated through Town By-Laws Section 7.5 of the Town Rules and Regulations, last revised in 2001. The program is administered by the harbormaster, who also serves as the shellfish warden, with the guidance of the Town's Shellfish Advisory Committee, which meets on an as-needed basis. In 2000-2001, the committee met 15 times to rewrite the regulations, and met 6 times in 2004 and 8 times so far in 2005. Some of the main provisions of the shellfish regulations are provided in the following sections.

Commercial Shellfish Licenses

Holders of commercial shellfish licenses must be residents of the Town of Duxbury. The fee for a commercial mussel license is \$135.00. Only ten licenses are issued annually (a closed fishery). Those already holding a license may renew it. Applicants for licenses may make application to the selectmen and have their names placed on a waiting list. When a license becomes available, names are drawn from the list in an order established by a lottery.

The fee for a commercial razor license is \$150.00. Fifteen licenses are issued annually, and when a license becomes available, names are drawn from a list established in the same manner as for mussel licenses.

The third category of commercial license is the combination commercial shellfish license. The fee for this license is \$80.00, and it allows the holder to take eels and sea worms as well as

other shellfish which may be included within the license. In recent years, the taking and marketing of quahogs and soft-shell clams has been permitted under this license. (Although the regulations define “shellfish” as soft-shell clams, quahogs, razor clams, sea clams, oysters, mussels, and scallops, “shellfish harvesting” includes the taking of sea worms and eels as well as shellfish.)

Commercial harvesting is prohibited within 750 feet of the mean high water line, and holders of commercial permits must turn in shellfish reports on the last day of every month.

Recreational Shellfish Permits

The fees for recreational permits (also known as family consumption permits) in 2004 were \$100.00 for non-residents, \$20.00 for Duxbury residents, and free for Duxbury residents over 65 years of age.

Quahogs, mussels, and razors are limited to 12 quarts per week per family. Soft-shell clams and oysters are limited to six qts. per week per family.

Soft-shell clams may only be taken during April, May, September, and October on Wednesdays and Saturdays. The season may be extended in years when the size of the resource is enough to warrant it. The 2004 season for soft-shell clams was extended through the end of January 2005, on Wednesdays only.

No shellfish taken on a recreational permit may be sold or bartered in any way.

4.2.3 Harbor and Bay Preservation and Restoration Efforts

The shellfish resource is widely regarded as very valuable within Duxbury, and the Town shellfish regulations state that:

1. The flats of Duxbury are a valuable shellfish resource;
2. The flats are an exhaustible resource and must be managed in order to remain viable; and,
3. As part of the management process it is necessary to regulate the fishery by establishing rigid guidelines governing the size and quantities of resources which may be harvested, by restricting areas which may be harvested, and by taking other measures outlined in these rules and regulations.

The town shellfish regulations and their interpretation and enforcement by the Shellfish Warden and the Selectmen therefore constitute an ongoing effort to preserve this resource.

Shellfishing is now considered to be self-regulating in that when the number of “keepers” (legal size) diminishes to a point when fishermen no longer consider the yield worth the effort, they move on to another location. The present perspective is that shellfish population fluxuations are attributed to natural cycles beyond management control.

Preservation and restoration of the resource has been the goal of the transplanting and relay

programs that have been implemented through the years. These efforts have included:

- In 1973, 50,000 seed quahogs and 10,000 oyster seed were purchased and planted;
- In 1983, 80,000 seed quahog were purchased and cultured, and 200 bushels of contaminated oysters were planted on closed areas for their spawn;
- In 1985, 100 bushels of clean oysters from the Cape were relayed and broadcast; and,
- From 1986-1990, 200 to 250 bushels of contaminated oysters were imported from the Cape and from Mattapoisett, allowed to cleanse for 30 to 60 days, and opened to recreational harvesting.

The relay of contaminated oysters had to be abandoned after 1990 because of disease in other areas which could have spread into Duxbury Bay.

In 1997, the town purchased 70,000 oyster seed, which were grown on trays within the Bay and sown them into the bay during 1998. The outcome of that effort is unknown. An active program of propagation may require additional commitment of Town staff and resources. It is unclear whether the return to the Town justifies increased expenditure.

4.2.4 Management Recommendations for Shellfishing

There has been considerable fluctuation in the abundance and yield of most Duxbury Bay shellfish species over the years. This is partly due to natural causes, but there are management measures which can be undertaken to help ensure the health and productivity of the shellfish resource; these include:

1. Implement the management recommendations in Section 3.3 to preserve Bay water quality;
2. Improve record keeping to more closely track trends in shellfishing yields;
3. Publish the total aggregate number of shellfish harvested by species harvested, both recreationally and commercially (on a catch per unit basis), in the annual Town Report.
4. Explore use of Schools and Scouts to survey shellfish resources and habitats to further support management decisions. Survey extent and type of shellfish beds.
5. Produce a map of shellfish areas and determine if certain activities detrimental to the health of the shellfish resource should be excluded from these areas.
6. Update comprehensive shellfish management plan, including monitoring and proactive restoration (Shellfish Committee).

Implement the Management Recommendations for Preserving Water Quality

Since shellfish cannot be harvested and consumed unless water quality is up to certain standards, the water quality management recommendations in Section 3.3 should be implemented and considered part of the shellfish recommendations as well. These recommendations include a proactive approach to resolving water quality problems now causing conditional and total closures of shellfish beds, including a water quality monitoring program to identify pollution sources and development of Best Management Practices to address these pollution sources where possible.

Improve Record Keeping to More Closely Track Trends in Shellfishing Yields

Before definite recommendations can be made as to management of shellfish species, more must be known about recent trends in shellfish abundance and their causes. Very little or no data has apparently been compiled or submitted to the Division of Marine Fisheries since 1997. The yield of soft-shell clams apparently jumped more than sevenfold from 1996 to 1997, but no explanation has been given for this much higher yield or any indication as to whether it was sustained. The commercial harvest of mussels declined precipitously from 1994 to 1997, but it is unknown from the records what the condition of the resource has been in the past six years, although it was reported as “low” in 2000.

Although a program to purchase 70,000 juvenile oyster seed, grow them on trays, and then seed them in tidal area was reported in the 1997 Town Report, it is unknown what the ultimate success of this program was. This information is essential to determine whether it is worthwhile for the town to pursue such programs in the future.

The recommendation for the shellfish program, therefore, is to implement thorough and consistent record keeping. Commercial license holders are required to submit a monthly report. The shellfish constable’s office must see that this is done, and make timely and complete record keeping a condition of renewal of a license. Random checks should be made of catches to make sure the reports are accurate. Recreational permit holders are not required to submit reports, but estimates should be made of numbers of recreational diggers through daily observations, and enough random checks of their catches should be made to compile a statistically significant estimate of harvests.

The record of the total number of each species harvested, both recreationally and commercially, should be published in the Town Report each year, with an assessment of the reasons for trends in the data, especially of any large fluctuations. These reports are the most readily accessible source of data for anyone seeking information on the shellfish resource.

Produce a Map of Shellfish Areas

It should be determined whether the maps of the distribution of shellfish species which have been developed should be released and used as a basis for determining whether certain activities which may be detrimental to shellfish should be banned from these areas. The negative aspects of possible conflicts with commercial fishermen and exploitation of the resource must be balanced with the advantage of greater resource protection.

4.3 Aquaculture

4.3.1 Existing Conditions and Trends

Physical Condition

Aquaculture in Duxbury Bay primarily consists of oyster farming, in which an individual secures the right to grow oysters over a specific area of bay bottom, consisting of one to three

acres. To secure an aquaculture grant, an individual, who must be a Duxbury resident, must pick a site and submit an application to the Selectmen with a fee of \$100 and a description of how he intends to conduct his operation. After a public hearing and an inspection of the site by the Division of Marine Fisheries, the individual may be granted permission to conduct aquaculture on the site for a period of three years. The process is very long and involved, and as a result many applicants drop out before obtaining a grant.

Successful applicants buy oyster seed or take oysters to a hatchery to obtain larvae. When young oysters are a quarter inch in size, they are ready to be placed on the oyster flats. Oysters are grown to marketable size on trays or in mesh bags, and are placed on the flats for the final stage of growth. It takes approximately two years to grow an oyster to marketable size (3" longest shell diameter), and the number of bags must constantly be increased and the mesh size increased as the oysters grow, a very labor-intensive process. Some farmers may grow other species, such as bay scallops, with the oysters.

In 2001, 16 aquaculture grants were granted by the selectmen, covering 25.5 acres. As of early 2003, 21 grants were in effect. As of June 2005, there are 27 grants totaling 56 acres. Resource Map 3 indicates the location of Duxbury aquaculture grants, scattered throughout the bay so as to avoid the nearshore shellfish beds, the navigation channel, and the eelgrass beds [this Map will have to be updated].

4.3.2 Current Bay Management

Aquaculture is regulated by Massachusetts General Laws Chapter 130, Section 57. The state law simply authorizes cities and towns to grant shellfish aquaculture licenses and requires the Director of the Division of Marine Fisheries, after inspection of the intended project area, to certify that the project will cause no substantial adverse effect on shellfish or other natural resources. If existing shellfish are below a density of 1 quahog/ft², 3 soft-shell clams/ft², or 3 oysters/ft² at the site, the DMF determines that the project will have no substantial adverse effect on shellfish.

Aquaculture facilities are regarded as Category II (reporting) under the U.S. Army Corps of Engineers Programmatic General Permit for Massachusetts, which requires written approval from the Corps.

The Town of Duxbury regulates aquaculture under by-law Section 7.3, Shellfish Aquaculture Grant Program. Applicants must also file a Request for Determination of Applicability with the Duxbury Conservation Commission.

4.3.3 Harbor and Bay Preservation and Restoration Efforts

Current regulations are intended to preserve the environment and uses of the bay. These include the requirement to be at least 750 feet from shore so as not to interfere with public shellfishing areas, the requirement to keep 75 feet between grants to preserve natural populations there, and the restriction against grants in areas containing eelgrass or shellfish. The Town Regulations set an application fee of \$100 and require an applicant to submit with his application a plan of the proposed project area and a shellfish development plan describing

how he will conduct the operation. The proposed grant area must be at least 750' from the mean high tide line, 75' from the next aquaculture grant, 25' from any eelgrass bed, and unproductive of shellfish. The maximum size of a site is three acres. A public hearing must be held with notice given to all property owners and licensees within 700 feet of the project, and a representative of the Division of Marine Fisheries must inspect the site. A license is granted initially for a period of three years, with a compulsory two-year review, to determine whether a reasonable amount of shellfish has been planted and produced on the licensed area during the preceding year. An annual review is also required to determine whether the licensee can demonstrate substantial use of the project during the preceding year, defined as spending \$1,500 per acre for gear and seed stock. A license will be forfeited if a licensee cannot show substantial use for three consecutive years. The Harbormaster/Shellfish Warden reports he has fifteen questions he asks each grant applicant.

In 2000, the Duxbury Growers Association proposed that there be 200 feet between each grant to leave more undisturbed area for shorebirds, but this proposal was not accepted.

Existing Plans

Currently there is no aquaculture plan other than the regulations and procedures for grant approval and operations. Because of increasing demand for grants and the lack of an overall plan the Board of Selectmen have declared a moratorium on any new grants until a plan has been developed. Development of a plan is a recommendation of this Draft Duxbury Bay Management Plan.

4.3.4 Management Recommendations for Aquaculture

It appears that the greatest limiting factor for aquaculture is conflicts with other uses including boating and scenic views. The consensus is that because of this factor the acreage available for aquaculture is at or nearing its capacity. Existing and future areas of conflict need to be further reviewed and guidance regarding these conflicts incorporated into the recommended Aquaculture Management Plan. For instance, the Harbormaster asks each grant applicant what landings he/she will use to access his/her grant. The implication is that access through landings for aquaculture could be restricted and in turn restrict access to the Bay for other uses. The Shellfish Advisory Committee has also been addressing the use of "nursery racks", which are hard cages, and buoy and pole grant boundary markers, all of which can cause conflicts with vessels. The Committee is seeking to eliminate their use near navigation channels and high vessel use areas where there is the highest probability of conflict with vessels (of all types including boards).

There is a tradeoff between the desire to put currently unproductive flats to productive use and at the same time provide income and employment for Duxbury residents, while preserving flats in their natural state, where their invertebrate populations provide food for shorebirds. It has also been pointed out that the oysters themselves help to clean the waters of the bay, as they filter the water and absorb nutrients such as nitrogen.

Some of the questions to be answered to determine aquaculture's place in the bay and the need

for further management are as follows:

- Could the area of sandy and muddy tidal flats of the Bay that are used for private aquaculture displace or disrupt habitats or feeding areas for migratory birds and other species?
- Could the use of significant amounts of seed grown in other waters have the potential to introduce disease? (Yes, and the Shellfish Advisory Committee is addressing the issue by requiring that seed come from approved growers north of Cape Cod Bay.)
- What impacts could bottom culture aquaculture have on benthic invertebrates?

There are also possible environmentally positive aspects of aquaculture such as:

1. The release of shellfish spat into the wild shellfishery;
2. The creation of nursery areas and havens for species of marine invertebrates, finfish, shellfish, lobsters and vegetation provided by netting and bottom boxes; and,
3. Water quality benefits because shellfish are plankton and detritus filter feeders.

Management measures concerning aquaculture included:

1. Create and maintain an Aquaculture Management Plan; and,
2. Conduct a study relevant to the future potential for aquaculture in Duxbury Bay.

Create and Maintain an Aquaculture Management Plan

Create and maintain Aquaculture Management Plan including a determination of the potential for aquaculture in the Bay and how it is limited by use conflicts and environmental impacts. This plan should also include guidelines for grant siting.

Conduct a Study Relevant to the Future Potential for Aquaculture in Duxbury Bay

A study of issues relevant to the future potential for aquaculture in Duxbury Bay should be undertaken in two phases. This information would augment information and analysis now being generated in accordance with DMF regulations. Phase I would assess siting issues and identify any unused areas of the Bay that may be suitable for aquaculture. Phase II would develop guidelines for the Town to use in making decisions concerning aquaculture in the Bay. Issues relevant to aquaculture that would be evaluated in Phase I include:

1. Areas of naturally occurring shellfish stocks and shellfish habitats;
2. Impacts of aquaculture on a range of habitat conditions, such as the potential encroachment on feeding areas for migratory bird species;
3. Impacts of aquaculture on boating and navigation;
4. Visual and noise impacts on habitats and species;
5. Potential propagation benefits to the natural shellfishery; and,
6. Impacts or benefits to water quality.

Based on the evaluation of these issues, Phase II would develop guidelines for the

Town to use in siting and administering grants in the study area. Specifically, the guidelines would:

1. Identify areas of the Bay that may be suitable for private aquaculture;
2. Assess the cumulative impacts on the Bay's habitats and feeding areas resulting from the use of areas deemed suitable; and,
3. Encourage the town to develop and adopt best management practices and minimum performance standards for all grant areas, which may or may not, depending on the result of the assessment, result in additions to the current regulations. At a minimum, the management practices and standards should ensure the sustainability of the Bay's resources.

4.4 Summary of Recommendations for Shellfish, Shellfishing, and Aquaculture

Table 5 provides a summary of recommendations and prioritizes for shellfish, shellfishing, and aquaculture.

Table 5. Summary of Prioritized Management Plan Recommendations for Shellfish, Shellfishing, and Aquaculture

TOPIC AREA	PRIORITY	RECOMMENDATIONS
II. Shellfish, Shellfishing, and Aquaculture	1	Implement thorough and consistent recordkeeping for the shellfish program as a basis for management decisions. Analyze related staffing needs.
	1	Each year publish the total aggregate number of shellfish harvested by species harvested, both recreationally and commercially (on a catch per unit basis), in the Town Report Assess the reasons for trends in the data, monitor growth rates and health.
	1	Create and maintain an Aquaculture Management Plan Determine the potential for aquaculture in the bay, and develop guidelines for grant siting and administration including use conflict analysis.
	2	Update comprehensive shellfish management plan, including monitoring and proactive restoration (Shellfish Committee).
	3	Explore use of Schools and Scouts to survey shellfish resources and habitats to further support management decisions. Survey extent and type of shellfish beds.

5.0 BOATING, SAFETY, AND NAVIGATION

5.1 Existing Conditions and Trends

Recreational boating is one of the most popular uses of Duxbury Bay. The level of boating activity has steadily increased in recent years, as demonstrated the increase in moorings discussed in the chapter on Moorings, the founding of the Duxbury Bay Maritime School (DBMS) in 1998, the growth of sailing programs at the Duxbury Yacht Club, and increased use of dry vessel storage including at Bayside Marine, and by private boaters using public boat ramp facilities.

In general, commercial fishing vessel use of the Bay appears to have had little effect on boating and safety in the Bay. The connection between the availability of commercial launch service and the number of vessels in the Bay needs to be further examined. The impact of aquaculture grants and the use of mesh cages and marker buoys on other boating activities has been a topic of discussion in the Public Access work group workshops.

The impact of increased boating on swimming has also been cited as a safety issue to be addressed in the plan. It is not only the quantity of vessels in the Bay but how they are used that needs to be evaluated in order to protect existing uses of the Bay. For example, Optimist sailboat races for juniors have different spatial needs than individual recreational fishermen. However, with planning both groups can use the Bay harmoniously and safely.

In addition, boating has ecological impacts that must be analyzed and managed so that the Bay's ecology is protected and restored where appropriate. The impact of boating on other uses and the ecology are cyclical, based on tides and time of year. These cycles should be considered in the ongoing management of the Bay.

The large tidal range of the bay relative to its depth leaves extensive areas of exposed flats intersected by narrow channels at low tide. As a result, navigating the Bay is a challenge and limits activity mainly to small and medium size craft. The presence of extensive eelgrass and shellfish beds increases the possibility of environmental damage from boating activity.

Continued growth in boating activity poses significant management challenges for the Bay. The goal is to maintain a balance between providing access for those who wish to enjoy the bay and protecting sensitive resources and the quality of recreational uses.

Physical Condition

As reported in the chapter on Moorings, the number of moorings in the Bay has increased over the years. For example, moorings on the flats in the Snug Harbor area grew from 151 in 1981 to 401 in 2003. The Duxbury Bay Maritime School (DBMS) has about 120 boats stored on floats, at its docks or on land. DBMS programs have been very successful and serve young and old and special populations such as inner city youth and sailors with disabilities. The

school has also resulted in a sailing team and rowing club at Duxbury High School. DBMS estimates that its programs currently provide 45,000 hours of on the water time for participants. Bayside Marine stores 125 vessels in rack storage that are available for use at any time. In addition, there are 16 Town landings around the Bay.

The following topics have been identified as areas of concern relative to boating safety, Bay ecology, and Bay uses:

1. Excessive vessel speed and operation in close proximity to swimming areas;
2. Excessive vessel speed and wake impacts on other vessel types (power boat wakes impact power, sail and rowing craft);
3. Unmarked boat launching areas that are causing conflicts between swimmers and vessels;
4. Proliferation of moorings has impinged on dock and float access, impediments to navigation, re-routing of vessels into areas of heavy vessel traffic in the inner harbor, and constriction of fairways to Snug Harbor docking facilities;
5. Aquaculture buoys in some locations that impact recreational navigation;
6. Lack of sufficient vessel storage space and hauling capacity in times of emergency; and,
7. Sail training locations and special sail regattas that impact other boating activities.

Environmental Impacts from Boating

Boating activity raises several environmental concerns. These include pollution from hydrocarbons and marine sanitary waste, turbidity, damage to eelgrass, and bank and salt marsh erosion. Most environmental issues relate to the use of motorized craft. A substantial proportion of the vessels on the bay are motorized, and many sailboats have auxiliary power and require the use powered launches or dinghies for access.

The Massachusetts Office of Coastal Zone Management has identified seven types of air and water pollutants emitted by recreational marine engines. These include BTEX (benzene, toluene, ethyl benzene, and xylene), MTBE (methyl-tertiary-butyl-ether), PAH's, (polycyclic aromatic hydrocarbons), carbon monoxide, nitrogen oxides, particulate matter, and saturated hydrocarbons. With regard to water quality impacts, most concern is focused on BTEX (the primary constituents of gasoline), MBTE (a combustion-enhancing fuel additive), and PAH's. Several studies have shown that these compounds increase during boating season in the vicinity of boating activity. Although they do not appear in sufficient concentrations or for long enough periods of time to significantly degrade water quality, these compounds can adversely affect fish growth and zooplankton survival and reproduction. They also can impact the ecologically important surface layers found at the air-water and sediment-water interfaces. Nevertheless, emissions from marine engines are relatively minor compared to other sources such as underground storage tanks, storm water runoff, and automobile exhaust, and studies indicate that at present levels they pose little threat to marine ecosystems.

The extent of eelgrass in Duxbury Bay has declined in recent years as it has elsewhere along the coast. The specific cause of the decline is unknown. Causes may include naturally occurring disease, increases in nutrients causing phytoplankton and epiphytes to block sunlight to the plants, and physical damage from boating activity. Studies have shown the boating

related nutrient increases are usually insignificant compared to land-based sources such as septic systems and storm water runoff. Motorboat activity in shallow water can stir up sediments causing increased turbidity that has been linked to decreased photosynthesis. However, natural turbidity sources such as wind and wave activities usually outweigh vessel-induced turbidity, especially in Duxbury Bay with its large tidal range where waves are often close to the sediment surface.

Direct impacts to eelgrass by motorboats are probably of the greatest concern. Studies have demonstrated that outboard motorboats are principal causes of SAV (submerged aquatic vegetation) damage. Motorboats have been linked to extensive sea grass scarring in Florida, Maryland, and elsewhere. Personal watercraft (PWC, commonly called “jet skis”), are less likely to directly harm eelgrass because they have shallow drafts and no propellers. Moreover, they do not perform well in sea grass beds or extremely shallow areas, where their intakes are likely to clog. However, they can kick up sediments if operated in shallow water.

5.2 Current Bay Management

At this time, there is no “plan” for the management of boats on Duxbury Bay. Instead boating activity is controlled through laws and regulations at the federal, state, and local levels. Existing regulations are aimed principally at boating safety.

The United States Coast Guard is the principal federal agency that regulates boating. Boating is regulated through safety standards that govern the construction of boats and require safety equipment. The Coast Guard also has rules that control navigation. Coast Guard regulations are authorized by the Federal Boat Safety Act of 1971.

Federal safety standards found in Title 46 of the Code of Federal Regulations set standards for construction, safe loading, flotation, fuel systems, navigation lights, the use of personal flotation devices etc.

Coast Guard Navigational Rules govern the operation of vessels and define which vessel has right of way when two vessels meet. There are specific rules applicable to sail boats and “vessels under oars.”

Massachusetts laws and regulations require the titling and registration of boats, regulate certain aspects of boating, and grant harbor masters authority over boat operators.

Chapter 90B requires that boats equipped with motors be registered with the state. Details concerning boat titling and registration are spelled out at Title 323 of the Code of Massachusetts Regulations (CMR). Chapter 40B also requires motorboats to be equipped with specified safety equipment and prohibits the operation of any vessel while under the influence of liquor or drugs. Detailed regulations addressing vessel safety equipment and operation appear at Title 323 of CMR. For example, 323 CMR 2.07 prohibits motor boats from being operated “within 150 feet of shoreline which is being used as a swimming area.” 323 CMR 2.08 requires that children who are at least 12 but under 16 years of age must complete a safe boating course and obtain a certificate before operating a motorboat. Chapter 90B, section 12

empowers harbor masters to enforce state regulations applicable to boating safety and operations. Additional harbor master authority comes from Chapters 91 and 102. Some authority is outdated. For example, under Chapter 102, section 23, the harbor master is authorized to order any vessel lying in a harbor to “cockbill the lower yards, brace the topsail yards fore and aft and rig in the jib-boom.”

Boating is regulated at the local level by the Duxbury Harbor Rules and regulations that are enforced by that department. The regulations are adopted and may be amended by the Board of Selectmen. Although the Town has had a Waterfront Advisory Committee for many years, that committee has been inactive in recent years.

Harbormaster regulations govern the location and use of moorings and use of the Town pier and floats. The rules also establish reduced speed zones and define areas where water skiing is prohibited. The Harbormaster has authority to levy non-criminal penalties for violations.

The following areas have speed limitations: The Snug Harbor basin, the main channel south to Nun #18, Bluefish River, the Cove Street landing, Howland’s Landing, and Powder Point Bridge.

Water skiing is prohibited in these areas: Within 150 feet of bathers and bathing beaches, Bluefish River, the Back Marsh, the Cove Street landing, Howland’s Landing, and the Snug Harbor basin and the main channel south to Nun #18.

The regulations forbid the discharge of various pollutants in the “Harbor”. This prohibition apparently applies only in the Snug Harbor basin and is not bay wide.

The regulations include detailed specifications for moorings for deep water and flats throughout the bay. There is a requirement that all moorings located on the flats above mean low water be buried within three days of being set. This requirement is not enforced.

The regulations do not include any provisions specifying how the deep water mooring waiting list is administered. At the present, the waiting time for a deep water mooring in the basin is approximately 15 years and there are well over 100 names on the waiting list.

Boating safety on the bay is enhanced by programs at the Duxbury Bay Maritime School (DBMS) and the Duxbury Yacht Club (DYC). Each summer, DBMS provides sailing instruction for about 600 children and 175 adults and the DYC provides a junior sailing program for about 100 children. DBMS also offers a one-day class for women called “Women Underway” and classes in the winter on boating safety and coastal navigation. In addition, DBMS provides a series of safe boating classes for children that include the test for the certificate required by the state for children under the age of 16.

5.3 Management Recommendations for Boating and Safety

With regard to emission of pollutants, the contribution of boating activity appears to be minor compared to other sources and more knowledge is needed before recommendations for specific

management measures are made. Massachusetts CZM suggests that the following points be measured and evaluated:

- The relative exposure (use) rates of various vessel types;
- The relative emission rates of different engine and vessel types;
- The relative solubility, transfer, and fate of exhausted pollutants; and,
- The potential risk of these pollutants to human health, aquatic life, and water quality.

With respect to SAV impacts, CZM suggests that the following data gaps and scientific uncertainties need to be addressed:

- The amount of sediment suspension and turbidity attributed to vessel use and how it varies with vessel type or operation, water depth, and sediment characteristics;
- The effect of vessel-induced sediment suspension and turbidity on biological factors such as primary production rates, SAV health, and habitat quality; and,
- The effectiveness of updated navigational charts and markers at restricting vessel use in shallow water areas that are subject to erosion and/or turbidity impacts.

The above recommendations concern mainly turbidity effects. It should be noted that the potential for harm to eelgrass beds from propeller-driven vessels by directly cutting or uprooting the plants has the potential to be significant. Accordingly, measures should be taken to keep boats away from these areas.

The failure to enforce the requirement that moorings located on flats be buried also should be addressed. Unburied moorings present several problems: (1) the holding power of the moorings is greatly reduced; (2) the likelihood of boats dragging and being damaged or causing damage to other boats is increased; (3) the risks of a boat underway hitting an unburied mooring or a boat sitting on a mooring at low tide is increased.

The following recommendations are for minimizing the impacts of boating on other boats:

1. Study the need and feasibility of additional speed controls and “no wake zones” in additional areas throughout the Bay to increase safety and protect resources particularly around existing sensitive use areas (swimming, sail training) and sensitive environmental receptors (eel grass). As part of this study examine alternative sail training and race course locations.
2. Designate all swimming areas with regulatory floats.
3. Identify authorized activities at Town Landings and Ways to the Water and post all boat launch areas not presently marked.
4. Identify specific aquaculture buoys that impact navigation and/or means to reduce the impact of aquaculture on navigation (see Section 4.3).
5. Establish a boating safety course as part of elective high school curriculum.
6. Establish temporary alternative storage areas and identify need for additional hauling capacity and facilities for vessel hauling during emergencies.
7. Explore the use of water sheet zoning to establish specific areas of the Bay for specific uses based on environment impacts and existing uses. Water skiing, mooring areas and

- swimming areas are to an extent already established.
8. Explore the need to develop a Bay-wide personal water craft (PWC) Management Program.
 9. Review appropriateness of sail training and racing courses in terms of other Bay uses and impacts to Bay ecology.
 10. Long term, study impacts of vessels on eelgrass and aquaculture.

The following recommendations are for minimizing environmental impacts from boating.

1. Buoys and better education should be considered to direct vessels away from SAV beds and other sensitive shallow-water areas.
2. Public education should be used to inform operators about water quality issues and the need to avoid sensitive areas.
3. Stricter law enforcement may be needed protect sensitive areas.
4. Support the designation of the Bay as a *No Discharge Area* (see Section 3.0).
5. Encourage environmentally-compatible boat maintenance and management practices.
6. Study areas where wakes may be causing erosion to salt marshes.

Table 6 provides a summary of recommendations and priorities for boating and safety.

Table 6. Summary of Prioritized Management Plan Recommendations for Boating and Safety

TOPIC AREA	PRIORITY	RECOMMENDATIONS
III. Boating and Safety	1	Review adequacy of vessel speed posting in Bay and add speed and swimming warnings where necessary.
	1	Improve boater education regarding safety, impacts to other Bay uses and requirements for planned events.
	1	Support established emergency storm procedure including: <ol style="list-style-type: none"> 1. determining need for vessel storage space and alternative locations 2. use of automated emergency calling system to notify vessel owners
	2	Determine appropriateness of existing vessel launch areas and provide signage where necessary.
	2	Investigate the possibility of identifying appropriate areas for marine activities such as sail training and racing, use of personal watercraft etc.

5.4 Navigational Dredging and Beneficial Use of Dredge Spoils

5.4.1 Existing Conditions and Trends

Navigation channels are the highways of the Bay. Without dredging there would be no deep water mooring areas or safe navigational channels. The impact to existing commercial and recreational boating and public safety would be devastating. Dredging is a complex and very

costly endeavor but a necessary one to maintain current and historic uses in the Bay. Duxbury Bay was formed by a retreating glacier. The Bay is shaped by its barrier beaches, extensive shoals, sand, clay, cobble and boulders all left behind by the glacier. These soils and geologic structures are extremely dynamic with channels filling in and shoals moving on a daily and seasonal cycle. As a result of this geological setting dredging is a reoccurring need in the Bay.

Dredging to create or maintain anchorages and navigational channels can destroy shellfish, vegetation and bottom habitats important to Bay ecology. As a result these projects undergo a thorough regulatory review involving all levels of government. However, the environmental impacts and maintenance costs can be minimized if dredging occurs at proper design depths, follows natural channels as much as possible and there is beneficial re-use of dredged material. Two examples of beneficial re-use of dredged and excavated material have resulted from recent dredging projects: pier project dredging material went to Duxbury beach and the school project excavated material went to build dune.

5.4.2 Current Bay Management

Historically, the Harbormaster has taken the lead responsibility of maintaining mooring area and channel navigational depths. The Harbormaster appreciates the substantial volunteer help he has had in getting these complex and extremely costly projects completed.

The importance of creating and maintaining dredge depths in harbors and channels is recognized by the U.S. Congress which authorized the U.S. Army Corps (Corps) to conduct and then maintain specific dredge projects around the country. Under the Rivers and Harbors Act the Corps is authorized to maintain the harbor basin and its entrance channel. The U.S. Army Corps of Engineers was authorized in 1836 to conduct improvement dredging. This project was completed in 1908 and consisted of a -6 ft MLW channel to South Duxbury Wharfs. In 1945 the Corps was authorized to expand this project to a 100 ft. wide channel a depth of 8 feet, from the Two Rock Channel to the Town Wharf, where a 21-acre anchorage basin, 8 ft. deep was dredged. Thus the area of this deep water anchorage at Snug Harbor (referred to as the Yacht Basin in Town Regulations) was established and it has changed little over the years. Maintenance dredging of this project was conducted in 1993. Six “piggyback” dredging projects occurred at this time for the following entities:

- Town;
- Duxbury Yacht Club;
- Duxbury Bay Maritime School;
- Bayside Marine;
- Battelle; and,
- Office of Waterways, Department of Conservation and Recreation (DCR, formerly the Department of Environmental Management).

The Office of Waterways, Department of Conservation and Recreation is the State equivalent of the Corps and has the lead responsibility to provide funding and technical assistance to maintain and improve the harbors and channels throughout the State. They often act as the Corps “local” partner in projects involving congressionally authorized dredge projects. In

addition, the DCR provides matching funds for dredging projects not on the Corps project list. Both the State and Federal programs require some level of local match in funding these projects. All levels of government are usually involved due to the difficulty and costs of permitting and constructing these projects.

U.S. Army Corps is going to conduct a condition survey in spring/summer of 2005 of Snug Harbor and the federal channel (Figure 2). Two examples of beneficial re-use of dredged and excavated material have resulted from recent dredging projects: pier project dredging material went to Duxbury beach and the school project excavated material went to build dune.

5.4.3 Management Recommendations for Navigational Dredging

Once the US Army Corps completes its initial survey and sets a timetable for the next dredging project, the newly created Duxbury Bay Management Commission needs to become involved in reviewing and providing comments on the disposal of the dredged materials, for example, can the dredged material be used to assist in the beach restoration efforts or support the construction of a wet land.

Table 7 provides a summary of recommendations for navigational dredging.

Table 7. Summary of Prioritized Management Plan Recommendations for Navigational Dredging

TOPIC AREA	PRIORITY	RECOMMENDATIONS
Navigational Dredging	3	Assess present and future dredging needs and develop dredge management plan to maintain existing navigation channels and anchorages and provide multiple benefits from sediment disposal including habitat creation and storm and flood control.

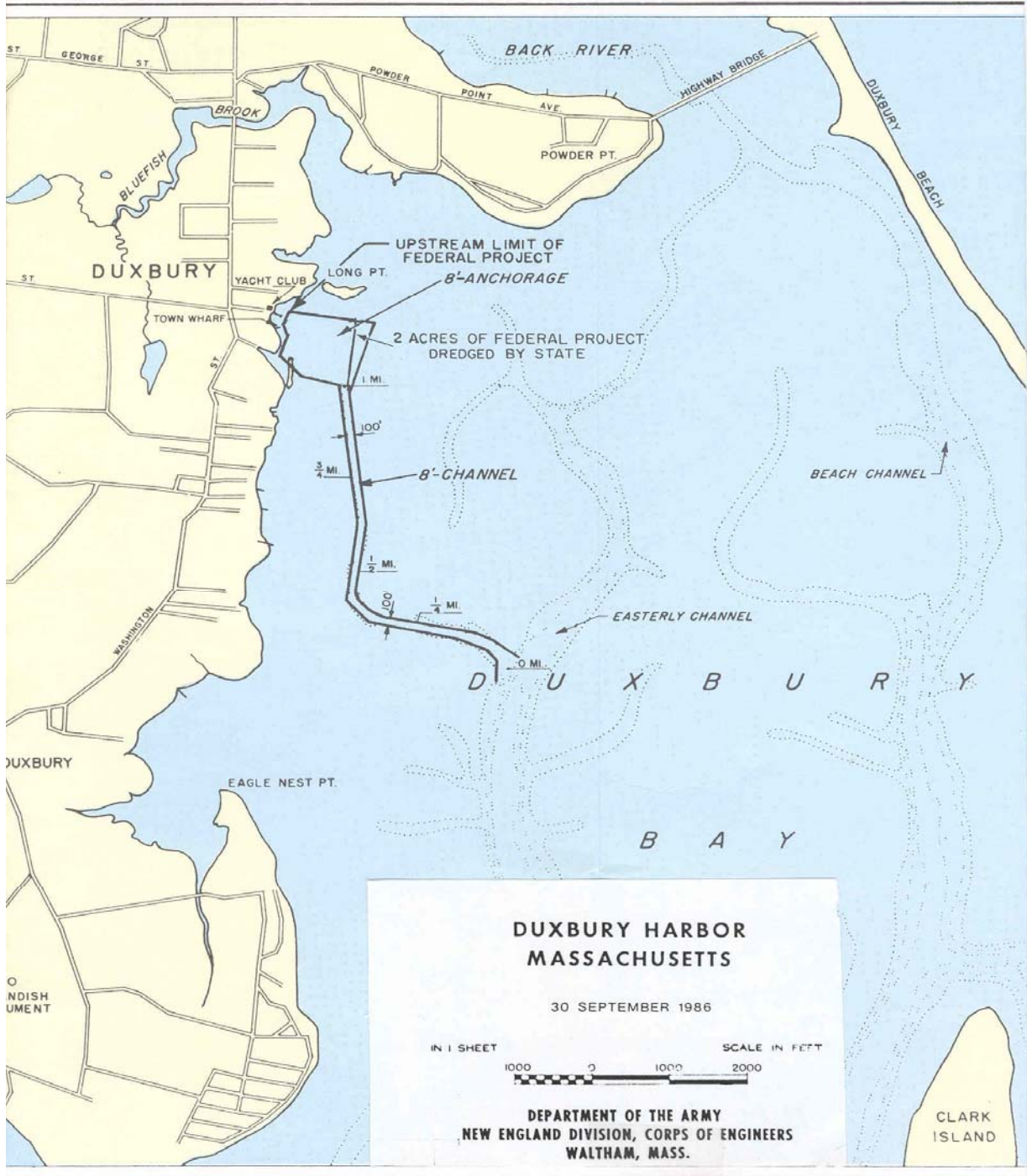


Figure 2. Federal Navigation Channel in Duxbury Bay

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6.0 MOORINGS

6.1 Definitions

Moorings have been identified by the Duxbury Bay Management Study Committee and by participants in several public workshops as an important topic for this Plan. Duxbury's *Rules and Regulations for Moorings, Permits and Waiting Lists*, section 7.6 § 2002, DEFINITIONS, defines "mooring" as the equipment and/or process prescribed by the Town of Duxbury used to temporarily secure a vessel to the bed of a body of water by means other than anchoring. Moorings in Duxbury waters are permitted by the Duxbury Harbormaster's Office under 310 CMR 9.07 (1) and (2) Annual Permits for Moorings, Floats and Rafts, and under local bylaw 7.6, *Rules and Regulations for Moorings, Permits and Waiting Lists*.

6.2. Existing Trends & Conditions

Moorings are traditionally grouped into areas with deep water and in other areas that provide public parking and access. The vast majority of moorings are located off of the Town Pier in the Snug Harbor area and at other town landings. These access points offer limited parking for boaters' cars and trailers and very limited storage areas for dinghies. The present size, location, and condition of these landside access points serve as a natural control of the number of vessels that can conveniently access the Bay.

The dramatic growth of boating activities, including recreational and competitive sailing, recreational and commercial power boating, and recreational and competitive rowing, underscores the need for more proactive management of the Bay, moorings, and landside support facilities.

If the current trend of increasing the quantity of active moorings continues, pressure to provide more vehicle and trailer parking, launch services, dinghy storage and dock space will also increase. Further, vehicular traffic congestion will increase, particularly in Mattakeesett Court and along Washington Street.

Current public perception is that traffic congestion and parking shortages already create problems during periods of high use. These issues must be considered as a fundamental component of the comprehensive management plan.

To date, there have been no specific studies to examine the environmental impact of enlarged mooring fields and increases in boat traffic. However, it is reasonable to suspect that the environmental problems affecting the Bay are linked in part to increases in boating activity.

The deterioration of water quality can be traced back to sewage discharge, excessive nutrient levels, hydrocarbons, and other toxic emissions. Fecal coliform counts increase along with increased vessel use when appropriate measures are not implemented to avoid direct discharge

into Bay waters. Further, the physical deterioration of habitat results in displacement, disruption and mortality of essential organisms in all phases of life.

One does not need to look far to see that the overall healthy balance in the Bay is a delicate proposition. The most visible marine ecological health indicators lie in the eelgrass beds and shellfish beds. Unfortunately, the eelgrass beds continue to shrink in size, and shellfish beds experience periodic closures.

At this time a connection between these trends and current Bay uses has not been made. And at this time specific evaluation of those impacts is difficult due to a lack of monitoring of relevant ecological health indicators. However, enough is known about the general ecological impacts of boating to plan to limit those impacts as much as possible.

This section of the Duxbury Bay Management Plan addresses the impacts caused by moorings and vessels at rest on the moorings. The Boating section addresses potential impacts from increasing boat traffic from a variety of sources throughout the Bay.

6.2.1 General Summary of Mooring Field Areas

The mooring fields of Duxbury Bay have grown steadily during the last decade. Currently there are 854 moorings in town waters, with the most recent growth in inter-tidal areas, including the Basin Flats (totaling 401 in 2003 with 432 locations available) and a variety of other inter-tidal locations (with a cumulative total of 166 moorings). Dennis M. Pearce, Executive Officer, Harbormaster/Coastal Natural Resources Department, submitted a report on Town moorings and that report is included in this Bay Management Plan in its entirety.

Basin Deep Water: The anchorage was engineered for 176 deep water mooring locations. As of August 22, 2002, 166 were being used, and the remaining 10 have been voided due to location conflicts. Of the 166 deep water moorings in use, 134 are being used by Duxbury residents, 26 are being used by non-residents, and 6 are of “unknown residence.”¹¹

Basin deep water moorings are located at Mattakeeset Court / Snug Harbor. The waiting list for deep water moorings is estimated to be 12-15 years. Deep water moorings cost \$4.50 per foot.

Basin Flats: The anchorage has 432 mooring locations on the flats. As of August 22, 2002, 51 were not yet assigned. Of the 381 assigned flats moorings, 257 are being used by Duxbury Residents, 55 are being used by non-residents, and 69 are of “unknown residence.”*

Basin flats moorings are located at Mattakeeset Court / Snug Harbor. Currently, there is no waiting list for these moorings. Basin flats moorings cost \$4.50 per foot.

Howland’s Landing: There are 86 deep water moorings at Howland’s Landing. As of August 22, 2002, all 86 moorings at Howland’s Landing were being used. Of the 86 moorings assigned, 50 are being used by Duxbury Residents, 35 are being used by non-residents, and 1 is of “unknown residence.”¹²

¹²These residencies are unknown for a number of reasons, i.e.: change of address or payment failure at

Howland's Landing is a deep water anchorage that also has a waiting list. The waiting list was established in the spring of 2002 and currently has 7 names on it. The cost for moorings at Howland's Landing is \$3.50 per foot.

Tidal Flats: As of August 22, 2002, there were 166 tidal flats moorings registered with the Harbormaster Department. Of the 166 tidal flats moorings, 149 are being used by Duxbury residents and 17 are being used by non-residents.

Tidal flats moorings are located all over the Town's waterways, including the Back River, King Caesar Beach, Bluefish River, Winsor St., Water St., Josselyn Ave., Shipyard Lane, Eagle's Nest, Standish Shore, Bay Road, and Clark's Island. The cost for a tidal flats mooring \$6.00 flat rate.

Two Rock: In 2003, the Harbormaster Department worked with local boatyards to design an anchorage with set locations at Two Rock. Estimates were that 35 vessels could be safely moored there. This number was to be reviewed before the 2004 boating season to determine if 35 vessels are too few or too many. Based on available data, 5 of these moorings are being used.

North of Clark's Island: In 2003, the Harbormaster Department created 35 deep water moorings north of Clark's Island. Based on available data, 20 of these moorings are being used. A wait list for this mooring area was established February 2005. Presently, no new moorings are being assigned from this area. Table 8 contains data from the Harbormaster's Department. Table 9 contains data from the Log Book at Town Hall. There are apparent discrepancies between the number of moorings reported by the Harbormaster's Department and those reported on the Log Book at Town Hall. These discrepancies need to be reconciled.

Table 8. Total Number of Moorings Assigned

MOORING FIELD AREAS	2000	2001	2002	2003
Basin Deep Water	165	165	166 ^a	171 ^a
Basin Flats	398	424	381 ^b	401
Howland's Landing	85	85	86	86
Tidal Flats	97	125	166	130
Two Rock				35
North of Clark's Island				20
Total Moorings	745	799	799	858

Source: Harbormaster's Department, December 11, 2003. These figures were compiled using the best available data from the Harbormaster's Department.

^a In 2002 and 2003 Deep Water moorings that had been "VOIDS" in previous years were assigned.

^b In 2002 the Basin Flats # is significantly lower than in previous years because locations were dropped for non-payment.

Table 9. Total Moorings as of 2003

MOORING FIELD AREAS	NUMBER OF MOORINGS
Basin Deep Water	174
Basin Flats	430
Howland's Landing	87
Tidal Flats	163
Total Moorings	854

Source: Town Hall Log Book

The Town received \$56,069 in mooring fees in 2003. The fee structure has recently been increased in the basin and basin flats from \$4.50 per foot to \$6 per foot for residents and \$9 per foot for non-residents. Howland's Landings will increase to \$5 per foot for residents and \$7 for non-residents from \$4.50 a foot. The Town supports marine sewage pump out with a dockside pump and a pump-out boat. The current capacity for sewage is a 2000 gallon holding tank.

The number of new moorings and the size of boat the mooring fields will accommodate are dictated by the characteristically shallow water depths of the Bay. There is little room for expansion of "deep water" moorings in locations reasonably (although the definition of reasonable is subjective) reached by launch without further dredging of the Basin area. The U.S. Army Corps of Engineers was authorized in 1836 to conduct its first "improvement" dredging project. This project was completed in 1908 and consisted of a -6 MLW channel to South Duxbury Wharfs. In 1945 the Corps was authorized to expand this project to a 100 ft. wide channel -8 deep from the Two Rock Channel to the Town Wharf, where a 21-acre anchorage basin -8 ft. deep was dredged. Thus the area of this deep water anchorage at Snug Harbor (referred to as the Yacht Basin in Town Regulations) was established, and it has changed little over the years.

As Debora Katz wrote in her series on the Bay, "From her vantage point at Battelle, Joan Sundstrom, Director of Human Resources, has had a first-hand look at the push for more mooring space, "Look at the number of boats today; when I first started at Battelle in 1977 and looked out the conference window in the summer, the boats ended up by Jack Kent's. Now they go all the way past that and come down beyond Water Street."¹³ This is an estimated 1,000 ft. expansion of the mooring field. Katz also reports that 21 years ago there were only 151 basin flats moorings. Today there are 432 basin flats mooring locations available, with 401 permitted, which if these numbers are correct, represent an increase of 165% since 1981. At this time the Harbormaster's Department reports it has no desire to increase the number of flats moorings available in the Town.

Katz reports that in 1981 there were 160 deep water moorings in the basin. Today the Harbormaster's Office reports there are 171, a modest increase of 6.87%. In addition the Harbormaster's Office reports that 35 deep water moorings have been created at Two Rock

¹³ Katz Debora, "Special Series: Bay in the Balance, Bay Buildout: The Next Wave", 2002, Duxbury Clipper, Duxbury Mass

Channel and another 20 deep water moorings were created north of Clark's Island in 2003. If we assume the number of deep water moorings at Howland's Landing (86) is constant and we assume there were five moorings each at Two Rock and north of Clark's Island in 1981, there has been an estimated increase in deep water moorings in the Bay from 256 to 327 today. This represents an estimated 27% increase from 1981 to 2003.

6.2.2 Landside Infrastructure

Dennis Pearse, Executive Officer for the Harbormaster's Office, estimates that the current wait period for a deep water mooring is 12 to 15 years. There is no wait period for flats moorings. Local marina owners agree that the number of boats, their size, and the demand for mooring space is growing. The demand for moorings is placing increasing pressure on the harbormaster to increase the number of moorings. As stated above, there are concerns that an increase in the number of moorings in the Bay could damage natural resources and add to boating congestion. In addition, although local marinas feel they can service more moorings, they also admit they would not be able to provide emergency services for more vessels outside of their regular vessel customer lists.

The direct impacts from moorings would be those resulting from the physical placement and use of the moorings. Direct ecological impacts can include displacement of benthic organisms of recreational and commercial value (shellfish) and impacts to the food chains that are built on benthic invertebrates and the animals that depend on them, especially migratory shorebirds. Direct impacts can also include mortality and behavioral impacts from toxic chemicals and heavy metals from internal combustion engines and antifouling paints and cleansers.

The indirect impacts from moorings would be those resulting from the use of moored vessels throughout the Bay.

6.3 Current Bay Management

6.3.1 Permitting Regulations and Structure

The number of mooring permits issued is determined by each local harbormaster in accordance with the following regulations:

1. Town By-Law 7.6, Harbor Rules and Regulations, II. Mooring Regulations
 - a. I. General Regulation, B. Berthing, 3. Boat Moorings Can Not Be Rented And Are Assignable When Not In Use Only By The Harbormaster And His Assistants.
 - b. I. C. Guest Moorings – This regulates guest vessels on moorings.
 - c. I. K. Abandonment – Addresses the abandonment of moorings
 - d. II. Mooring Regulations, Requirements and Fees – This section includes application process, ground tackle requirements and fees among other regulations.
2. Under Section 10A of M.G.L. Ch. 91 and its regulations, 310 Code of Massachusetts Regulations 9.00 (the Waterways Regulations) at section 9.07 Activities Subject to Annual

Permit and 9.07

Section (1) General, states: “A written application for an annual permit must be submitted to the harbormaster of a city or town . . . , for the placement on a temporary basis of moorings, floats or rafts held by bottom-anchor, and ramps associated thereto, which are located within the territorial jurisdiction of the municipality. Within 9.07 there are additional stipulations regarding transfer of moorings, wait list and assignment requirements, etc. Under these regulations (9.07(1)) moorings can not be limited to residents and residents can not receive preferential treatment in mooring assignment.” These regulations, at 9.07(2) (b) 2.d., allow transfer of mooring permits to immediate family. However, this regulation contradicts Army Corps, *Open To All On Equal Terms Policy*, which only allows transfer of a mooring to a spouse.

3. Under the Rivers and Harbors Act of 1899, Section 10, Department of the Army Programmatic General Permit Commonwealth of Massachusetts, there are three levels of review depending on the mooring ownership, use, and location. Category I, non-reporting, applies to private, non-commercial, non-rental single-boat moorings authorized by the local harbormaster (not associated with any boating facility, not located in a Federal Navigation Project other than a Federal Anchorage, and not located in vegetated shallows). Category II, reporting, applies to moorings that do not meet the terms of Category I. Individual permits are required for moorings within the horizontal limits or with moored vessels that extend within the limits of a Federal Navigation Project, except those in Federal Anchorages authorized under Category I. Transfer of mooring permits is only allowed to spouse under the *Open To All On Equal Terms Policy*. The Corps has various guidance documents for the location of moorings in relation to Federal Projects. For private structures, including moorings, this means a set-back of three times the depth of the project unless the project is an anchorage or the mooring is municipally owned and complies with the open to all policy.

In general, individual moorings are permitted by the local harbormaster on an annual basis, although a renewal process is allowed. Municipal, commercial, or privately owned mooring fields must be approved by the harbormaster and the Army Corps of Engineers.

6.3.2 Harbor and Bay Preservation and Restoration Efforts

There are no known efforts to manage moorings to preserve and restore the Bay. The shallowness of the Bay serves as a natural barrier to expanding deep water moorings while also providing the opportunity to expand inter-tidal flats moorings.

The Harbormaster’s Department presently uses the following criteria to evaluate expanding the number and/or location of moorings in the Bay:

1. Public Safety
2. Riparian Issues – Ch.91- inter-tidal owner can object to the harbormaster approving a mooring in the inter-tidal zone. The harbormaster has letters from people who don’t want moorings within 1,000 lf of MHW.
3. Congestion

4. Navigational Conflicts
5. Access and Use Conflicts – Property owners have mooring rights off their property if they can produce a deed to the harbormaster (below MLW? Or above?). Thirty-eight miles of shoreline are 99% privately owned. Many people object to moorings on their property (rights of inter-tidal ownership).

The Board of Selectmen approved the launch service after soliciting opinions. The Two Rock mooring area expansion was reviewed by the Harbormaster.

6.3.3 Existing Engineering Plans

The Harbormaster's Department possesses and uses a plan (Figure 3) for basin deep water and basin flats designed by Amory Engineers (rev. 9/22/99).

6.4 Management Recommendations

The Duxbury Bay Management Study Committee found that there is a trade off between increasing the number of moorings and therefore boating access with increased congestion, threats to the ecology and existing uses and increased staffing needs. As a result the Committee is making the following preliminary management recommendations:

1. Establish permanent mooring-free areas; and,
2. Develop a Bay Mooring Program to reduce the environmental impacts of moorings.

Establish Permanent Mooring -Free Areas: Mooring-free areas should be identified and designated on a permanent basis for recreational and commercial access and for areas of critical marine habitat.

Open Area for Recreational and Commercial Access: A mooring-free area should be established to protect recreational and commercial uses in a manner that is consistent with the recommendations of the Bay Management Plan.

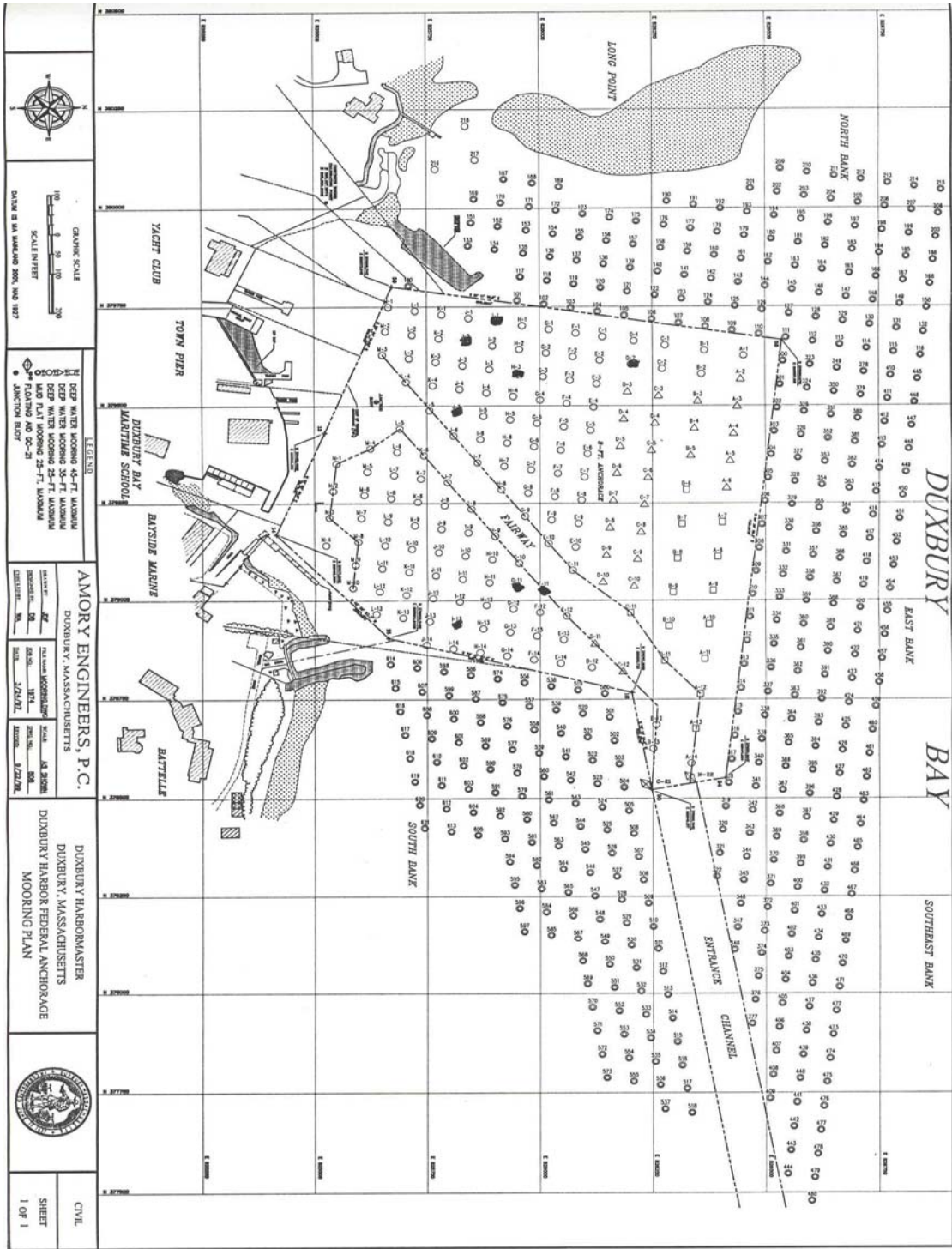


Figure 3. Snug Harbor Basin Deep Water Mooring Plan (Amory Engineers 1999)

Areas of Critical Marine Habitat: Prohibit the placement or relocation of additional moorings in areas identified as *Areas of Critical Marine Habitat*, or “resource sensitive” areas. Existing moorings should not be affected. A designated area can encompass several distinct types, including sandy tidal flats, muddy tidal flats, eelgrass beds, fringe marsh, and areas of freshwater upwelling among other areas of relatively unaltered shoreline. Some areas of Critical Marine Habitat will be selected because they are located adjacent to undisturbed uplands that are inhabited by species that rely on both land and water access for survival.

Areas of Critical Marine Habitat serve as habitats, feeding areas, nesting areas, spawning areas and nursery areas for hundreds of species of marine invertebrates and vegetation that provides a food sources for other species, as well as amphibians, shellfish, fin fish, migratory shorebirds, and some species of upland fauna. Pending the completion of the ecological inventory and monitoring program, protection of these areas may be necessary for the sustainability of these species.

Develop a Bay Mooring Program

A Bay Mooring Program should be developed to accommodate a level of demand that is consistent with the Bay Management Plan. This mooring program should:

1. Evaluate all mooring field changes in the last 10 years and any future proposed changes in terms of impacts to:
 - Public safety;
 - Ecology and sensitive receptors;
 - Existing uses;
 - Appropriateness of proposed use;
 - Scenic views;
 - Levels of public service; and,
 - Landside infrastructure.
2. Assess the applicability of a variety of mooring technologies, including helical screw type moorings, in terms of their ability to securely accommodate vessels and minimize negative impacts on natural resources;
3. Determine whether the current delineation of mooring areas overlays sensitive resources and whether the relocation of moorings or mooring areas is needed;
4. Assess the need to limit or control the number of moorings in the Bay, or to require certain mooring technologies in sensitive areas of the Bay;
5. Investigate any advantage of reorganizing deep water mooring fields based on boat size and type;
6. Investigate any advantage of utilizing slips rather than moorings; and,
7. Identify any changes in existing regulations needed to implement the mooring plan.

A summary of recommendations and prioritizes are provided in Table 10.

Table 10. Summary of Prioritized Management Plan Recommendations for Moorings

TOPIC AREA	PRIORITY	RECOMMENDATIONS
VI. Moorings	1	Identify and Establish Permanent Mooring -Free Areas <ul style="list-style-type: none"> • Open Area for Recreational and Commercial Access • Areas of Critical Marine Habitat(to be defined)
	3	Develop a Mooring Program to Reduce Environmental Impacts of Moorings.
	1	<u>Evaluate the following policies:</u> <ol style="list-style-type: none"> 1. Explore maintaining the number of mooring permits in the Duxbury Bay study area at appropriate management levels.
	2	2. Prohibit the placement or relocation of additional moorings in areas identified as <i>Areas of Critical Marine Habitat</i> , or “resource sensitive” areas.
	3	3. Work with the Management Steering Committee to develop testing protocols to monitor the use of new mooring technologies in terms of impacts on bottom vegetation, shellfish, boat security, and boating congestion.
	3	4. Through mooring attrition or mooring technique eliminate the intrusion of vessels into the fairway inside of “N”-22 and “C”-21.

7.0 BAY ACCESS

7.1 Background

Historically, public access to Duxbury Bay set a precedent for the entire northeastern coastline. During colonial times, public access was critical to the survival of early settlers who relied on the bay's abundant supply of shellfish and finfish. The bay also played an important role in transportation because it was a well-protected water body with direct access between Plymouth and eventually Green's Harbor and Marshfield through the Cut River. Public access for survival in colonial times gave way to access needed for shipbuilding and commercial fishing in the 1800s. In 1840, Ezra Weston ("King Caesar") of Duxbury was considered the "largest ship owner in America."

Today Duxbury Bay is primarily used for a wide range of recreational activity from strolling along a beach to bird watching, clamming, sailing, fishing, wind surfing, and water skiing. Commercial fishing survives on a small scale and aquaculture is a growing enterprise. What continues to change is the number of users who want or need access to the bay. This increase is concurrent with the increasing population and affluence of residents.

A number of factors limit public access, among them shoreline structures, limited publicly owned shoreline and access points, limited public safety services, and sensitive ecological receptors. Publicly owned "ways to the water" and town landings are residents' primary means of access to the bay. The perceived problems with these points of access include inappropriate use, lack of space to accommodate parking, lack of maintenance, encroachment by private abutters and lack of education and public awareness regarding public ways to the water.

The value of public access to the Bay was confirmed in the planning workshop the Duxbury Bay Management Study Committee held in December 02, 2003 when this topic received the highest number of votes as a topic to be explored in the Plan. The focus of bay access in this draft plan is thus based on feedback received from that public workshop. The topics discussed include:

- Rights to bay access;
- Scenic and visual access to the bay;
- Boat ramps/town landings/ways to the water;
- Parking related to bay access; and,
- Management recommendations.

Over the years the demand for public access to Duxbury bay has changed both in character and intensity from its original use for sustenance to maritime shipping and offshore fishing to ship building to its present use for recreational boating. The bay's commercial use for fishing has also diminished, and although aquaculture is increasing, it is not protected under the public trust doctrine in the way commercial fishing is. The Courts have held that aquaculture is similar to farming and is subject to private property rights.

With South Shore population growth among the highest in the state, residents and visitors alike are looking for access to Duxbury Bay. Evidence of the increase in demand for recreation in the bay can be found in the increase in boating activity, including the increase in flats moorings (those outside of the harbor in the basin flats) of 186 percent since 1980. The number of deep-water moorings located in the dredged areas of the harbor and in the deep water at Two Rock (Two Rock is approximately 1 mile on a line from the Town Pier to the north end of Clark's Island, heading 132.72° SE) has only increased 10 percent since 1980 due to lack of bay depth during low tides. The increase in basin flats moorings and in the deep-water moorings at Two Rock (and in an area north of Clark's Island) has been made possible by and resulted in a seasonal full-time launch service with two vessels. The launch service has made these distant moorings accessible, which in turn has contributed to the overall increase in vessels in the bay. (See Chapter 6.0 Moorings, for a complete discussion of moorings.)

An increase in private facilities for boating is also evidence of the increasing demand for access to the bay. The popular and award-winning Duxbury Bay Maritime School, with 120 sailboats and 20 instructor boats, and the increase in active rack storage of boats at Bayside Marine to 125 vessels since 1973 are examples of this increased demand. The Duxbury Yacht Club has also increased its fleet.

The increase in the number of permit requests to construct private docks and piers has paralleled Duxbury's increase in population. In 2001, Duxbury's Annual Town Meeting approved the appointment of the Pier Access and Shoreline Study Committee (PASS). The committee focused on public safety and visual access impacts of pier construction.

At a time when public and private demand for access to the bay is increasing, some private property owners are not aware of their responsibilities regarding public trust rights that allow others passage on their property. There is a perception that the growing tendency among private property owners is to limit public passage. Owners cite their desire for privacy, fears of liability, and loss of property rights as reasons for not allowing passage in areas that also provide public access. The following trends could impact public access to the bay:

- A proliferation of private docks and piers;
- New bay property owners who may not understand their obligations to preserve the public trust rights of access;
- Property owners who object to public moorings in tidelands;
- Construction of piers near town landings and ways to the water;
- Lack of maintenance of town landings (overgrown vegetation that threatens visual access);
- Inappropriate use of town landings;
- Lack of space to accommodate demand at town landings;
- Lack of publicly owned shoreline and access points (about 10 percent of the total number of access points are public or non-profit owned¹⁴);
- Increasing private land development along the waterfront;

¹⁴ Bay Management Committee, *PASS Proposed Bylaw Presentation*, Duxbury, 2003.

- Private encroachment on public access; and,
- Lack of landside facilities to accommodate demand, especially parking.

Today public access remains highly valued for recreational and commercial use and is protected for Commonwealth citizens regardless of residency, race, religion, sex, age disability or other illegal distinction under Massachusetts General Law c. 91.¹⁵

The historical public ownership of intertidal and subtidal coastal land dates back to the Roman Empire (Institutes of Justinian, 2.1.1 circa 550 A.D.) and on through English law to the Massachusetts Colonial Ordinances of 1641-1647¹⁶. This legal tradition recognizes the fundamental rights and interests of all citizens to clean air, water, the sea, and the shore. In addition, it establishes the government as the trustee of this public interest with a duty to conserve and restore these resources and the rights of the public to use them.

In colonial times the value of these resources was not only critical to the economy but to the very survival of the colonists. By the 1630s the colonies were cash poor and sought a way to stimulate marine trade and coastal development. To encourage the construction of wharves and development of maritime commerce the Massachusetts Bay Colony gave upland owners property rights to the tidal flats, with easements for the general public for fishing, fowling and navigation. This legacy of private ownership to low water survives in the United States only in Maine and Massachusetts, both of which once belonged to the same colony.

In 1866, the State of Massachusetts carried on the tradition of preserving the public's access rights on land between the historic high and historic low water lines (private tidelands), and lands extending from the historic low water line to the seaward 3 mile limit of State jurisdiction (submerged lands) by passing Massachusetts General Law (M.G.L), Ch. 91, The Waterways Act. This Act preserves the public's rights in the intertidal area and submerged lands while allowing private ownership of land above historic low water. Landowners in Massachusetts are presumed to own to the historic low water mark, unless their deeded property bounds exclude tidal flats. Because of this presumed private ownership the area between historic low and high water lines is called private tidelands in the State regulations, 310 CMR 9.00. By law private tidelands extend on flats exposed at low water for a maximum distance of 1,650 ft. (100 rods) from the historic high water mark. Exposed flats beyond 1,650 ft. seaward considered tidelands that are publicly owned. Ch.91's jurisdiction also extends to filled (developed) tidelands from the existing mean high water line to the historic high waterline, a minimum distance of 250 ft. from the mean high waterline and thereafter to the first public way or the historic high waterline, whichever comes first (see graphic). On filled (developed) tidelands, Ch.91 preserves the public's rights for fishing, fowling and navigation by requiring setbacks and access rights for the general public.

The Courts of Massachusetts assume that the tidal flats to the low water mark are privately owned unless they are presented with a document, usually a deed, which shows private property boundaries stopping short of the low water mark. Property owners who have bottom-

¹⁵ 310 CMR 9.07(1)General

¹⁶ Department of Environmental Protection, *Regulations to Implement MGL Chapter 91*, Boston, June 1990.

anchored moorings above the low water mark are subject to harbormaster approval under 310 CMR 9.07 (1) and (2) (Figure 4). Other moorings in private tidelands are subject to property owner and harbormaster approval. Private owners retain their property rights to the low water mark by openly allowing public use through posting or other written or official notice.

In general, private property owners have rights as owners but also obligations to allow fishing, fowling, and navigation. That means that their activities cannot inhibit “fishing, fowling, or navigation” by the general public. All structures in the area between the historic high water mark and the historic low water mark must be approved through the regulatory process, which ensures public rights of passage for protected purposes. All structures such as piers, seawalls, and revetments, must be built to accommodate the public’s ability to walk and therefore fish, fowl and navigate in the zone.

To allow public passage, Ch.91 regulations require 5 feet of clearance between the ground and the first structural member of a dock, pier, or walkway at low tide. Alternatively, the property owner can propose through the permitting process stairs up and over or around the structure to ensure public passage. In order to protect access, Ch.91 also requires that piers be set back a minimum of 25 ft. from property bounds, and in general they must not impact navigation to existing water-dependent structures or channels. In addition, Ch.91 often requires signage notifying the public of their passage rights at such private structures. These regulations may not ensure public passage in the bay, because this requirement for passage does not cover existing structures (pre 1984) and there is little enforcement of access conditions by the Department of Environmental Protection. A survey of existing license conditions in the field would gauge the degree to which this law is ensuring public access around private and public structures in the Bay.

Property owner liability related to public access is limited under existing law and should not be a reason to restrict legal access. As long as there is no charge for the use and no “willful, wanton or reckless conduct”¹⁷ on the part of the landowner, he or she is shielded from liability for injuries sustained during that use. In addition, the courts have found that property owners can avoid losing property rights through adverse possession if they post permission for the public to use the land. (Adverse possession refers to someone using your property for a sufficient amount of time such that that person may be able to claim some property interest in it.¹⁸).

¹⁷ Massachusetts Attorney General, Public Rights/Private Property: Answers to Frequently Asked Questions on Beach Access, 1995, Boston, Mass.

¹⁸ Ibid.

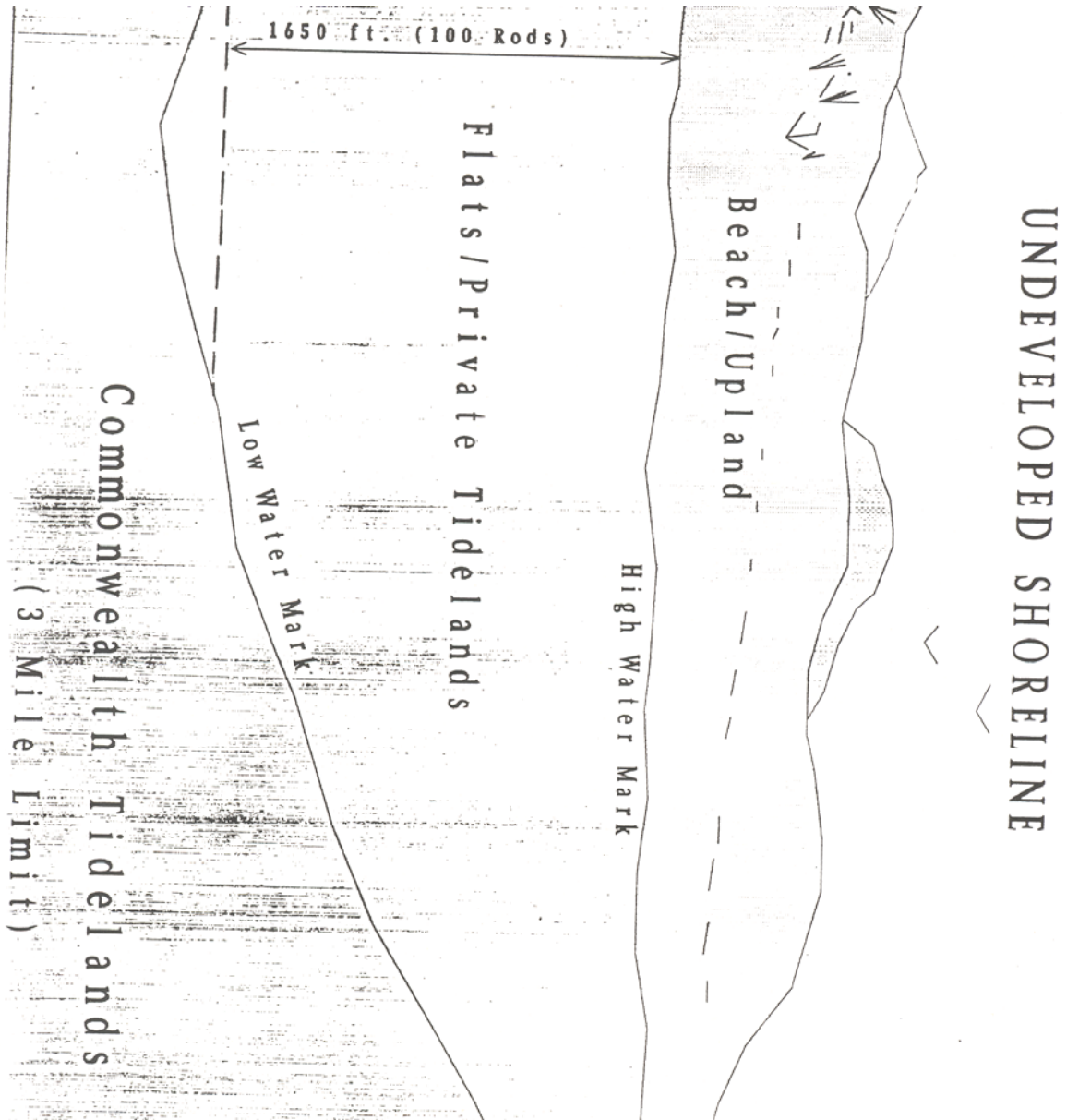


Figure 4. Summary of Private Property Boundaries and Regulations

7.2 Existing Conditions and Trends

7.2.1 Waterfront Access Points to Duxbury Bay

The majority of Duxbury Bay's 22 miles of shoreline is privately owned. There are 296 waterfront parcels, including streets. These parcels represent slightly less than 6 percent of the estimated 5,000 parcels in the town. Of the 95 waterfront access points, 16 are town landings, 10 are ways to the water, and 14 are non-profit access points. Duxbury Beach (which is leased to the Town of Duxbury by the not-for-profit Duxbury Beach Reservation, Inc.) offers over 4 miles of shoreline, but much of it is inaccessible without a four-wheel drive vehicle. The town sells both resident and non-resident permits but limits the number of vehicles allowed on the beach at a given time (250 resident and 250 non-resident vehicles). Access to Duxbury Beach is addressed in the Beach Management Plan and the Orders of Condition contained therein. The Duxbury Bay Management plan focuses on the town's boat ramps, town landings, and ways to the water.

Several of the town's access points are not well known to the public, offer no parking spaces, and are not maintained. The physical condition of public access points, including town landings and ways to the water, vary depending on use and demand for maintenance. In some cases, private use encroaches on public property and access rights due to inadequate boundary marking. Parking is inadequate at some locations. Overgrown vegetation at some locations obstructs public view sheds to the bay. All of these factors challenge the public's right to access the bay.

A number of factors could limit public access to the bay at boat ramps, town landings, and ways to the water. These include shoreline structures, objections to public access by private property owners, private encroachment on public access points, limited publicly owned shoreline and access points, limited education of the public concerning access issues, lack of maintenance, limited parking, limits to public safety services, and sensitive ecological receptors. A fundamental limitation to use of boat ramps is the tidal cycle of the Bay. Just as for all other uses of the bay, use of the ramps ebbs and flows with the tides. The nearly complete tidal flushing of the bay allows vessel access for a few hours around each high tide. In this way the bay naturally regulates its use. Parking further restricts use of the ramps as does their unimproved condition.

Town Landings and Ways to the Water

Town landings are defined by Protective Bylaw Article 300, Section 302 as "designated areas to which the Town has an undoubted right, which have been surveyed and recorded with the Plymouth County Registry of Deeds to the low water mark (mean) and including, in north to south orientation along the shoreline, these include:

1. Ford Stand Landing;
2. Old Cove Landing;
3. Drew Salt works Landing;
4. Simeon Soule's Landing;

5. Peterson's Landing;
6. Powder Point Bridge (at the west end on both north and south sides);
7. Anchorage Lane Landing;
8. Bluefish River Landing;
9. Mattakeeset Town Pier;
10. Winsor Street Landing;
11. Water Street Landing;
12. Jocelyn Lane Landing;
13. Harden Hill Road Landing;
14. Landing Road Landing; and.
15. Hicks Point Road Landing.

Ways to the water are defined by Protective Bylaw Article 300, Section 302 as “designated areas to which the Town has rights as public ways to the water, by gift, or otherwise which may or may not be restricted as to their usage and which have not been specifically laid out and surveyed to the low water mark and recorded as a Town Landings and including, in north to south orientation along the shoreline, (1) Shipyard Lane Ellison Beach, (2) Elder Brewster Road, (3) Samoset Road, (4) Sagamore Road, (5) Massasoit Road, (6) Miles Standish Home Site, (7) Longview Road, (8) Elderberry Lane, and (9) Bay Farm.” Included in this right are roads properly laid out, improved and extended to the water by funds raised and appropriated by the Town and designated as public highways, Island Creek Pond (10) was not included in the by-law, but it is a way to an anadromous fish run, a resource dependent on the Bay and therefore it is in the Duxbury Bay Management Plan.

Although the town by-law contains names of the landings and ways to the water, there may be several names for a specific public access point, which can create confusion for public emergency response. For instance, the by-law calls Anchorage Lane a town landing, but the deeded name refers to “St. George St. by Old Mill Pond”; Peterson's landing is called “Bumpus,” and Simeon Soules landing is called “Ellison's” by first responders. Multiple names for access points can lead to confusion between first responders and callers reporting the location of an emergency.

All town landings and ways to the water are open to parking for residents and nonresidents unless specifically restricted to residents by the Board of Selectmen.¹⁹ The only restrictions on parking are the time restrictions at Mattakeeset Court, Myles Standish Cellar Hole, Island Creek Pond, and Elder Brewster Rd. The resident-only restriction applies at Shipyard Lane (Ellison Beach), and there is a fire lane parking restriction at Massasoit Road. Shipyard Lane has conflicts between swimming and boats, particularly sailboats with limited maneuverability.

Encroachment of private landowners exists to varying degrees at town landings and ways to the water. In some cases it is severe, giving the appearance that the access is private property; in other cases, the encroachment is caused by invasive vegetation. At some access points, private abutters assist the town in caring for access points. Some encroachment is historic, only coming to light with increased demand; some is new due to newcomers being ignorant of

¹⁹ Tom Daly, Director, Department of Public Works (DPW), Duxbury Bay Management Study Committee information meeting, March, 25, 2004.

access points or purposefully ignoring their existence. In some of these cases, abutters have denied deeded access, resulting in legal action to preserve public access rights.

Changes in shellfish resources can impact the use of town landings and ways to the water. For example, several years ago the harbormaster planted oysters at Winsor Street, which resulted in a traffic jam once harvesting began. However, abutters' complaints due to shellfishing are not common²⁰.

Most town landings and ways to the water have no clearly marked bounds or regulations. Therefore, their existence and allowed uses are not well known in the town. In addition, unauthorized use or expansion of use can occur at these access points. For instance, although the boat launch area is marked at the west end of the Gurnet Bridge at Powder Point, people launching boats reportedly ignore it. Boats are also reportedly being launched at Shipyard Lane during the summer, which is not allowed because of swimming activity.

The Town's Department of Public Works (DPW) maintains the town landings and ways to the water. Maintenance consists of some trash removal and vegetation control. Although maintenance is routine at some landings, at others, maintenance occurs at the request of residents. The DPW keeps a record of this maintenance. As a result, all town landings and ways to the water have been maintained at one time or another. Abutting property owners and neighbors appear to want maintenance but not parking.

Boat Ramps and Boat Launch Areas

There are eleven landings and ways to the water where boats can be launched (see the Town Landings and Ways to the Water Table). Ten of these boat launch areas are to the bay itself, and one—Shipyard Lane—is used seasonally. There is also a launch area at Island Creek Pond, which is included here because it provides access to a bay resource, a herring run. The vast majority of these areas consist of sand or gravel approaches to the water, and over the decades there has been little improvement to them. Only Mattakeeset Court has been significantly modified to accommodate boat launching. An extension to the town ramp at Mattakeeset Court has been designed and is scheduled to be constructed in 2005.

Increased demand for the use of the Mattakeeset boat ramp has created increased demand for parking and apparent conflicts between some users including commercial and recreational users. State and Federal funding for this public ramp, as well as related pier and dredging projects, is partially based on commercial use of these facilities. However, the ramps and access points that were predominantly used by commercial fishermen are now used more often by recreational users. This shift from commercial to recreational use is evident at Peterson's Landing (Bumpus).

²⁰Donald Beers, Harbormaster/Shellfish Warden, Duxbury Bay Management Study Committee information meeting, March, 25, 2004

Vehicle Parking at Waterfront Access Points

There is limited parking at the waterfront access points to Duxbury Bay. The resident parking lots at Duxbury Beach offer the most vehicle spaces, with 388 spaces. Residents must purchase a resident parking permit from the town to use these lots. (Oversand parking on Duxbury Beach is covered in the Duxbury Beach Management Plan.) There are an additional 50 spaces in the parking lot at the west end of the Powder Point Bridge. These spaces are available to both residents and nonresidents and do not require a parking permit from the town. Mattakeeset Court has 60 car spaces, and an additional 30 spaces along Washington Street adjacent to Mattakeeset Court. None of these spaces require parking permits, although there are time limitations on some of the spaces at Mattakeeset Court. There are 27 spaces available at Shipyard Lane for residents only (town permit required) and 18 spaces at Howland's Landing. The only access point where parking is restricted to residents is Shipyard Lane. There are 6 handicapped access parking spaces among the designated parking spaces at the major waterfront access points.

Other town landings have minimal parking (3 or fewer spaces). These landings include Anchorage Lane, Bluefish River, Cove Street, Drew Salt Works (Bay Pond Road), Simeon Soule's Landing, Clark Peterson's Landing, Ford's Stand (Ocean Road North), Hick's Point, Landing Road, Hardin Hill, Josselyn Avenue, Winsor Street, and Water Street. Other public ways to the water with parking spaces include Bay Farm with about 25 spaces, and Miles Standish Cellar Hole (time restriction), Samoset Road, Sagamore Road, Elder Brewster Road (time restriction), and Massasoit Road, all with minimal parking (less than 2 or 3 spaces).

Only three (four if Shipyard Lane is included) of the ten boat ramps offer designated parking. There are a total of 180 vehicle parking spaces and 20 boat trailer spaces at these three places. This count does not include parking on Washington St. (40 spaces) or informally at the Nathaniel Winsor, Jr. House (12 spaces), which is owned by the Duxbury Rural & Historical Society. The remaining six boat ramps have no designated parking and also have no restrictions on parking, including residency requirements.

Table 11 identifies the town landings and ways to the water, including their location, whether they are also boat ramps, the availability of parking, and other information related to their accessibility and use.

Table 11. Summary of Landings and Ways to the Water

PUBLIC LANDING	RESIDENT ONLY	OVER SAND	CAR SPACES	TIME RESTRICTED CAR SPACE	HANDICAPPED CAR SPACES	TRAILER PARKING
Mattakeeset Ct.			60	13	4	12
Shipyards Lane	Yes (not enforced)		27		2	
Howland's Landing			18			3
Powder Point			50		2	
Washington St.			30			4
Duxbury Beach ^a		575	388		8	
Total		575	185	13	14	19

^aThere are 500 front road and 75 back road vehicles allowed

7.2.2 Scenic Access to Duxbury Bay

Duxbury's Open Space and Recreation Plan describes the Town's valuable bay views:

New England coastal towns are known worldwide for their scenic qualities. Duxbury is among the many South Shore towns which value their historic buildings, coastal character and scenic roadside views (Refer to Resource Map 6. Scenic Views of the Open Space Plan). Water views of Kingston Bay and Duxbury Bay are visible from many local streets, particularly Standish, Marshall, Crescent, Washington, Harrison, St. George Street, Bay and King Caesar Roads, and Powder Point Avenue. Many other smaller residential roads which connect to these feeder streets also offer exceptional harbor views. Mattakeeset Court, which leads to the Town Pier and the Duxbury Yacht Club, offers views of the boat basin and lively harbor activity.

The Duxbury Comprehensive Plan identifies threats to, "Duxbury's attractive landscape of forests, beaches, fields, wetlands...a unique semi-rural character." It states:

While some of Duxbury's special places ...are protected, many are subject to suburban development pressures. These pressures are likely to intensify as the new MBTA Old Colony Railroad facilitates daily commuting ...and makes Duxbury a more attractive place to live.

The Pier Access and Shoreline Study (PAAS) Committee, appointed in 2001, confirmed the importance of scenic views of the bay to residents. While focusing on the visual impacts of new pier construction and pier repairs, the PASS findings identified six areas where the scenic

view is affected by piers, “most notably the Blue Fish River/King Caesar Road area.” The PASS Committee proposed and after amendment received the approval of the 2004 Annual Town Meeting to create a Waterfront Scenic Area (WSA) overlay district in the town’s zoning by-law. The by-law defines the WSA district as “the abutting waterfront land viewed from a public road, along which there is an open, unobstructed view of the ocean, harbor, bay or estuary.” The WSA district is further defined with a map approved by town meeting. The committee also proposed and received approval for a by-law change that governs pier construction in the overlay district and throughout Duxbury Bay. The “pier by-law” addresses conflicts between public and private rights regarding pier construction and the public’s right for visual access. Private pier design now has to comply with these by-law changes in order to get Zoning Board of Appeal (ZBA) approval. The WSA districts require a 50-ft. setback for piers that abut town landings and ways to the water.

The Open Space and Recreation Plan, the Comprehensive Plan, and the Pier Access and Shoreline Study Committee all cite preserving visual access to the bay as being important to residents. The Duxbury Bay Management Study Committee also acknowledges that access to the scenic beauty of the bay may be the preferred way for some residents to enjoy the bay, and therefore preserving visual access is an important part of the Duxbury Bay Management Plan. In light of development trends cited earlier and encroaching vegetation, preserving visual access to the bay becomes more critical but difficult.

7.3 Current Bay Management

Currently, public/private access rights to Duxbury Bay are managed through local by-laws and state and federal laws and regulations. These regulations also protect the functions of various wetlands, including coastal wetlands. By protecting the wetlands these laws protect the natural resources that motivate people to seek access to the Bay. In addition, local and state laws protect access and use rights on tidal flats where both private and public access occur; the Bay below low water is owned by the Commonwealth for all citizens. The regulations protecting wetland resources are based on assumptions regarding impacts on the wetlands and public uses from specific activities. The federal interests in regulating activities in navigable waterways and wetlands include general environmental health, wetlands, fisheries, flood hazards, navigation, recreation, water quality, economics, aesthetics, and land use.

As stated above, the town-appointed Pier Access and Shoreline Study (PASS) Committee produced their recommendations, which, with an amendment, were approved at the Annual Town Meeting in 2004. The Conservation Commission also reviews new pier construction to protect wetland resources and to protect public rights of fishing, fowling, navigation, passage and public views and aesthetic values. In addition, the appointment in 2003 of the Duxbury Bay Management Study Committee (DBMSC) is evidence that the town values public access and seeks to resolve the potential conflict between property owners and public access rights along the shoreline.

Finally, the harbormaster under Mass General Law c.91, S10A approves annual permits for bottom-anchored floats in the interests of public access, navigation and public safety.

7.3.1 Regulations for Waterfront Access Points: Town landings, Ways to the Water, Boat Ramps

State and Federal Regulations

State and Federal Regulation concerning waterfront access include the following:

- Massachusetts General Law (M.G.L.) c. 131, S40, The Wetland Protection Act and its regulations at 310 CMR 10. This law and its regulations protect the natural functions of various coastal wetlands.
- M.G.L. c. 91, The Waterways Act, and its regulations at 310 CMR 9 and S.10A provides for harbormaster approval of annual permits for bottom-anchored floats. It is also the primary law and regulations to protect the public trust rights of fishing, fowling and navigation in tidelands out to the seaward limit of State jurisdiction, 3 miles.
- M.G.L. c. 111 s.17, Mass Environmental Policy Act, and its regulations at 310 CMR 15 (triggered if piers are >2,000 SF). This Act and its regulations ensure that necessary information is provided to regulatory agencies so they can evaluate a project's impacts on coastal wetlands and the public's rights of access.
- M.G.L. c. 90B, and Regulations 323 CMR 1, 2 and 4, Dept. Fisheries Wildlife and Environmental Law Enforcement. These are the States boating laws which govern registration and use.
- M.G.L. c. 131A, the Massachusetts Endangered species Act and its regulations at 321 CMR 10.00 particularly as it pertains to public access and protecting endangered species such as the piping plover.
- Federal Endangered Species Act S. 9 enforced by the U.S. Fish & Wildlife Service, specifically related to vehicle access in areas where Piping Plovers receive protection.
- Federal Coastal Zone Management Act and its regulations at 301 CMR 20, 21 and 15 CFR Part 930 (if pier project exceeds MEPA threshold trigger). The purpose of these regulations is to ensure that federal projects or projects requiring a federal permit beyond a certain size are consistent with Mass Coastal Zone Management policies which both protect coastal wetlands and public use and access.
- The Federal Rivers and Harbors Act, s. 9 & 10 structures, and its regulations at 33 CFR Parts 320-330 enforced by the U.S. Army Corps of Engineers. The state of Massachusetts is regulated under a Programmatic General Permit, with three levels of review for moorings, pile-supported structures, and floats. These levels of review are Category I, non-reporting; Category II, reporting-screening; and Category III, Individual Permit (see

Appendix for Definition of Categories). The goal of these regulations is again to protect wetlands resources and public access.

Duxbury Town By-Laws and Regulations

Town By-Laws and Regulations include the following:

- Ch. 9 Wetlands Protection (Duxbury Wetlands Bylaw) protects all wetland areas mirroring 310 CMR 10 with local changes. Of particular interest is s. 9.6.0 Piers;
- Protective Bylaw of the Town of Duxbury, Article 300, S. 302 Definitions, Waterfront Scenic Area (WSA), Article 404 Wetland Protection District Sections 404.10 through 404.40 (pier construction) and Article 900 S. 906.2 Special Permits, sub-section 3; and,
- Protective Bylaw Article 300, Section 302.

Harbormaster/Coastal Natural Resources Department, Town of Duxbury

The Harbormaster receives his authority from the following:

- Municipal: Board of Selectmen Manual Section 7.7 Beach Rules and Regulations, S. 7.3,4 and 5 Shellfish Rules and Regulations, S. 7.6 Harbor Rules and Regulations; and,
- Mass General Laws: Ch. 102, 90, 90b, 131, 88, 130.

7.3.2 Regulations for Scenic Access

State and Federal Regulations

Scenic and visual access is often preserved as a result of historic and open space preservation, as well as preservation of agricultural and horticultural use.

- Rivers and Harbors Act, Clean Water Act, 33 Code of Federal Regulations (CFR) Parts 320-330, U.S. Army Corps of Engineers requires project proponents receive sign-offs from the Mass Historic Preservation Officer and Tribal authorities under its Programmatic General and individual permits. This requirement can lead to the preservation of scenic and visual access;
- Historic Preservation Act, S. 106, projects must comply with this act to receive U.S. Army Corps of Engineers approval;
- National and State Registers of Historic Places, protects historic buildings, districts and sites;
- Open Space and Recreation Plan Requirements, Executive Office of Environmental Affairs, Division of Conservation Services;

- M.G.L. Chapters 61, 61A or 61B, Chapter 61 is land under forest management. Chapter 61A applies to agricultural or horticultural land. Chapter 61B applies to land designated for recreational use; and,
- Conservation restrictions. Property owners place deed restrictions on land for scenic, open, or natural values; administered by the Plymouth Conservation District.

The Massachusetts Office of Coastal Zone Management produced a handbook, *Preserving Historic Rights of way to the Sea*, which can assist towns in maintaining and acquiring physical access, which can also result in preserving visual access.

Duxbury Town By-Laws and Regulations

- Ch. 9 Wetlands Protection (Duxbury Wetlands By-Law) protects all wetland areas mirroring 310 CMR 10 with local changes. Of particular interest is s. 9.6.0 Piers. The Conservation Commission reviews new pier construction to protect wetland resources but also to protect public rights of fishing, fowling, navigation, passage and public views and aesthetic values;
- Protective Bylaw of the Town of Duxbury, Zoning Board, Design Review;
- Community Preservation Act (state legislation adopted by the Town of Duxbury in 2002), in which funds raised through a special tax of 3 percent are matched by the state for projects, implemented by the Town Community Preservation Committee, provides funds for community historic, recreation and conservation purposes. The Committee provided \$70,000 for the restoration of the Island Creek rainbow smelt and herring fish run; and,
- Protective Bylaw of the Town of Duxbury, Article 300, S. 302 Definitions, Waterfront Scenic Area (WSA), Article 404 Wetland Protection District Sections 404.10 through 404.40 (pier construction) and Article 900 S. 906.2 Special Permits, sub-section 3.

Harbormaster/Coastal Natural Resources Department, Town of Duxbury

- Municipal: Board of Selectmen Manual Section 7.7 Beach Rules and Regulations, S. 7.3,4and 5 Shellfish Rules and Regulations, S. 7.6 Harbor Rules and Regulations
- Mass General Laws: Ch. 102, 90, 90b, 131, 88, 130.

7.3.3 Existing Plans for Bay Access

Waterfront Access Points: Town landings, Ways to the Water, Boat Ramps

- Duxbury 2002, Open Space and Recreation Plan, Open Space and Recreation Committee, Duxbury, 2002. This plan identifies seven “Town Landings” and cites one Way to the Water as an historical site, Myles Standish Cellar Hole. The Elder Brewster lilacs are also cited as an historical site. The other end of Elder Brewster Rd. is a way to the water. This plan recommends the development of a Bay Management Plan to address public access to Duxbury’s coastal resources with minimum impact to the environment,” and in general, “Identify the recreational needs and resources available....Provide access to Duxbury’s

natural resources and recreational facilities to the physically challenged.”²¹ Duxbury Comprehensive Plan, December 6, 1999. In the Natural and Cultural Resources section, the plan has primary recommendations to purchase open space in accordance with the 1997 Open Space Plan, and develop a management plan for the Town’s open space. These goals could be seen as supporting plans for Landings and Ways. The only marine-related facility sited in the plan is the Harbormaster Shack and the Blue Fish River Storage Facility, and there are no recommendations regarding these facilities. (Boat ramps and landings and ways are not seen as public facilities in this plan.);

- Report of the Duxbury Town Landing Study Committee, R.S. Ramsey, Donald F. Corcoran, Robert Cooper, Duxbury, 1975. This report provides excellent documentation and history of Town Landings and Ways to the Water. The report also makes extensive recommendations for all sixteen town landings and five of the ways to the water. It appears that some of these recommendations were adopted and others were not;
- Duxbury Beach Management Plan, Duxbury Beach Reservation, Inc. November 2003. This plan states that marine access for a variety of vessels is managed on Duxbury Beach as is shore access;²²
- Town Committee, 1899/1900 Report on Town Landings, Duxbury 1900. Information from this report was cited in the 1975 Town Landing Study Committee Report; and,
- Mass Bays Comprehensive Conservation Management Plan, Mass Bays Program, Boston (1996).

Scenic Access the Bay

- Duxbury 2002, Open Space and Recreation Plan, Open Space and Recreation Committee, Duxbury, 2002.
- Duxbury Beach Management Plan, Duxbury Beach Reservation, Inc. November 2003.
- Mass Bays Comprehensive Conservation Management Plan, Mass Bays Program, Boston (1996).

7.4 Management Implications/Recommendations for Bay Access

Population growth in Duxbury far exceeded that of the state from 1960 to 1980. This growth was attributed to the completion of Rt.3. The *1999 Duxbury Comprehensive Plan* projects that dwelling units could reach 10,082 units which could mean an 80% increase in population with the completion of the restoration of the Old Colony Railroad. The growth in town and the increase in use of Duxbury Bay suggest that additional management steps may need to be taken to preserve public access. While the Duxbury Bay Management Study Committee seeks to preserve existing uses on the bay, it also recognizes that improving access could lead to ecological impacts and impacts to existing uses. Therefore, any changes in access must take into account these potential impacts and be evaluated through the proposed comprehensive review process described below. The committee thus recommends that for the near future

²¹ Open Space and Recreation Committee, Duxbury 2002 Open Space and Recreation Plan, Duxbury, July 2002. p.75, 76.

²² Beach Technical Committee of the Duxbury Beach Reservation, Inc., Duxbury Beach Management Plan, Duxbury, November 2003, p.4-9, 4-10

improvements to access points be limited to those that improve users' experience but do not increase the number of users until an analysis of the impacts of access improvements on ecology and existing use can be conducted.

The preliminary management recommendations outlined in this chapter are intended to preserve and enhance existing public access opportunities wherever there is a demand for such access and when the change is feasible and consistent with the mission of this plan. The management plan proposes a process for evaluating the consistency of proposed changes in bay access that is consistent with the plan's mission statement. This process is based on the assumption that changes in access, new access facilities and structures, or new services will have ecological and access-specific impacts. The evaluation process should review bay access changes based on an agreed-upon set of criteria. These criteria should include but not be limited to impacts to:

- Public safety, health and welfare;
- Ecology and sensitive receptors including wildlife;
- Uses and appropriateness of use and access;
- Scenic views and aesthetic issues;
- Levels of public and private services; and,
- Supporting landside infrastructure

All of these criteria affect public access. (See Chapter 9.0, Bay Management) for further discussion of this evaluation process.)

The motivation for this approach is the perception that recent changes in the intensity and character of bay uses appear not to have had sufficient evaluation regarding the above-cited areas of impact to be consistent with this plan's mission. Some changes have "fallen through the cracks" of the present regulatory and management structure. Recent changes include an increase in the number of moorings, active rack storage of vessels at Bayside Marine, the establishment of the Duxbury Bay Maritime School and its sailing and rowing programs as well as its landside facilities, expansion of the Duxbury Yacht Club fleet, and establishment of a private launch service. Because of the fragmentation of the existing regulatory structure, many of these changes were not evaluated for the impacts cited above. It appears the result is potential use conflicts on the bay and landside facilities as well as possible increased burdens on public services. Landside impacts of these changes include parking conflicts between traditional users of the bay and new users accessing private facilities and limits on private emergency vessel service due to lack of emergency vessel storage space. Bayside impacts of these changes include possible conflicts between vessel types and increased public service demands. At present there is no apparent evidence of ecological impacts, although further study is needed in this area.

The Duxbury Bay Management Commission will work with the Board of Selectmen, Town Meeting, Conservation Commission, Town Planner, Massachusetts Division of Waterways, Massachusetts Coastal Access Program, Community Preservation Committee, private open-space organizations, property owners, and any other interested parties to implement the various actions and recommendations.

Scenic Access to the Bay

Population growth, overgrown vegetation, and encroachment on public lands all could impact the community's goal to preserve its character by impairing scenic views and visual access to the bay. Scenic views of the bay and access to them define community character to many community members. Therefore, managing the preservation of scenic views and visual access to the bay preserves town character. Also, the Comprehensive Plan survey has shown single-mindedness on the part of residents to maintain a "rural, wooded community dedicated to environmental protection." Protection of scenic views and access to them can be achieved permanently through acquisition of view-shed properties and semi-permanently through regulations and temporary use restrictions. The Duxbury Bay Management Study Committee makes the following recommendations to protect and enhance public views of the bay after impact review, with the long-term goal of achieving permanent protection when possible:

- Coordinate with the Conservation Commission and Public Works Department to develop guidelines for maintaining vegetation on public lands along the shoreline so that invasive species and rampant vegetative growth do not block scenic vistas.
- Identify incentives to encourage private property owners to manage vegetation so as to allow views from public roadways.
- Educate property owners regarding the value of scenic access and view sheds to community character.
- Explore innovative ways to permanently preserve visual access on private lands, including purchase of easements.
- Coordinate with the Planning Board to include in development reviews consideration of how developments alter water views from public ways and encourage owners and developers to modify site plans to enhance and protect views.
- Support acquisition efforts by the Conservation Commission, the Community Preservation Act Committee, and non-profit organizations to preserve scenic views of the bay and its estuaries.

Funding

Funding for research, compliance education, and coordination activities would be included in the FY 2006 budget for the proposed Duxbury Bay Management Commission (see Chapter 9.0 Bay Management), and additional funds for enforcement of license provisions could be part of the permitting fee structure. Funds for education and other action items would be sought from various granting agencies and non-profits.

Time Frame

Regulatory language to require human lateral passage as a permitting requirement for rebuilding coastal engineered structures should be presented to the 2006 Annual Town Meeting (ATM). The funding of the DBMC will be proposed for the fall 2005 special town meeting. Town Meeting funding will be used to leverage grant and other funding to support the work of the Commission. Once established and funded, the Commission will prioritize public access activities and begin implementation of recommendations.

Table 12 provides a summary of recommendations and priorities for bay access.

Table 12. Summary of Prioritized Management Plan Recommendations for Bay Access

TOPIC AREA	PRIORITY	RECOMMENDATIONS
V. Bay Access	2	Conduct Bay use survey including assessment of increasing demand for public services.
	1	Identify and evaluate any obstructions to Ch.91 public passage right as for fishing fowling and navigation between historic high and historic low water along the shoreline through regulation, enforcement, and voluntary incentives to property owners.
	2	Investigate the need to improve transportation options and support facilities at public access points where demand is evident, include sanitation facilities.
	1	Develop management guidelines, and a program of regular maintenance based on need for the Bay's Town Landings and Ways to The Water to support existing uses.
	3	Parcel by parcel analysis to determine the exact extent of intertidal ownership within the Bay, prioritized to protect sensitive receptors and examine the appropriateness of enhancing public access.
<i>Scenic and Visual Access to the Bay</i>	2	Support the Open Space Plan actions for preserving Scenic and Visual Access to the Bay.
	1	Coordinate with the Conservation Commission, and public works department to develop guidelines for maintaining vegetation on public lands along the shoreline so that invasive species and rampant vegetative growth do not block scenic vistas.
<i>Boat Ramps, Town Landings, and Ways to the Water</i>	1	Identify and standardize the names of Town Landings and ways to the water across all Town Departments, particularly public safety departments.
<i>Waterfront Facilities at Snug Harbor</i>	1	Review pier and float system and maximize efficiency.

Table 12. Summary of Prioritized Management Plan Recommendations for Bay Access

TOPIC AREA	PRIORITY	RECOMMENDATIONS
<i>Waterfront Facilities at Snug Harbor</i>	1	Support Mattakeeset Ramp repair with available State and Town Funds.
	1	Evaluate the need to delineate and mark Town Landings Ways to the Water and related parking on priority basis of use and encroachment.
	1	Analyze sufficiency of emergency vessel access throughout Bay.
	3	Survey number of vessels using the Bay, from access points, moorings, slips, rack storage, trailers on a peak use day and to determine average use.
	2	Survey existing uses at Landings and Ways including number of boats and cars and their appropriateness given use and facility impact criteria to be developed.
	3	Analyze and evaluate potential alternative boat launch areas, including Cove St., Bay Farm, West End of Powder Point Bridge.
	2	Develop public access point management plan based on need, appropriate use, time of day, day of week and season.
<i>Parking</i>	1	Establish baseline of parking capacity at all public access points.
	3	Survey number of cars using access points.
	3	Evaluate Shuttle System/Satellite Parking i.e., at Duxbury Schools, Harden Hill, Churches.
	1	Evaluate installation of bike racks at Town Landings and Ways to the Water.
	2	Evaluate restricting parking to residents at public access points.
	2	Develop parking management plan related to needs, uses and time of day, week and season consistent with accepted change criteria.

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8.0 RESTORATION PROJECTS

Restoration of the Bay's ecology and related freshwater systems is fundamental to the Bay Management Study Committee's mission "To develop a management plan that will enhance and preserve the ecological health, pristine waters and natural beauty of Duxbury Bay for future generations". This Plan proposes an aggressive approach to preserving the Bay ecology through an integrated governmental team who identifies pollution sources and other threats to the Bay and then develops and implements projects to address these threats. This approach will also be used to restore the Bay's ecology where it presently fails to support healthy indigenous flora and fauna.

Presently, a variety of town, state and federal agencies have regulatory and stewardship responsibilities, which are fragmented by expertise and jurisdiction. To enhance and preserve the Bay's ecology we must recognize that the Bay and its related streams and rivers are a system. To be successful and efficient efforts to enhance the system must be organized at the scale of the system. The Plan proposes a cooperative integrated approach to restoring and preserving the Bay's ecology. To that end the proposed Bay Management Commission will be representative of the existing Town Boards and Committees with current responsibilities that affect the Bay. The existing staff of these Committees and Boards will contribute their expertise and efforts to restoration projects as they do now when and if their budgets and time permit. The proposed change is to institutionalize these relationships and add resources of staff, expertise and funding to handle restoration projects.

Staff could be added to an existing department or report directly to the Bay Management Commission. The staff's role will be to facilitate the cooperative integrated approach to restoration projects, provide direct staffing for restoration projects, act as a liaison to other governmental agencies and NGOs, seek project funding, and oversee implementation. The proposed Bay Management Commission would perform the following tasks related to restoration projects:

1. Provide technical support to existing restoration efforts including scientific support, grant writing, coordination and facilitation;
2. Identify possible projects through public participation and plan development;
3. Assess project feasibility, cost, and availability of outside funding, using Technical Subcommittees;
4. Make case for Town funding if necessary and apply for grants;
5. Obtain necessary approvals for project implementation;
6. Oversee pilot project when appropriate; and,
7. Oversee project implementation, when appropriate.

The Committee proposes to prioritize these projects by using the following criteria:

1. Early restore projects should focus on environmental health indicators (shellfish is an excellent indicator of water quality, and herring are a good indicator of a healthy

- connection between salt and fresh water);
2. Early projects should be high visibility to garner the greatest public benefit and should provide multiple benefits when possible;
 3. Projects should protect and/or restore the ecology where sensitive receptors or human uses are impacted;
 4. Projects should result in a measurable improvement in the ecology;
 5. Projects should be collaborative and participatory, include education, and management plans for continued stewardship; and,
 6. A variety of sources should be perused for project funding.

8.1 Existing Projects and Restoration Recommendations

Flora and Fauna Restoration

Shellfish Beds

In certain areas the Bay's water quality is now contaminated with fecal coliform bacteria to the level (200mg/ml) where the Mass Division of Marine Fisheries has placed restrictions on shellfishing in order to protect public health. These restrictions include an area prohibited from shellfishing in Snug Harbor (the site of the Snug Harbor Stormwater Management Project) and areas conditionally restricted (dependent on rainfall events washing pollution into the Bay) at the Back River, Blue Fish River, Snug Harbor and Bay Road. The Committee recommends restoring shellfish beds to unconditionally open where possible by creating a standing program to specifically identify potential pollution sources and recommend mitigation measures and take action using existing authorities and or develop Best Management Practices projects to address water quality problems in affected areas with shellfish areas classified, conditionally open, or prohibited (see Water Quality Recommendations also).

Eelgrass Beds

Because of the importance of the eelgrass habitat to so many species the Committee recommends the development of a program to protect and restore (if warranted) eelgrass beds. This program should include the following tasks:

- Investigate the cause of decline in eelgrass since 1951.
- Survey eelgrass beds;
- If appropriate use channel markers, other buoys, and tide gauges to direct vessels away from eelgrass beds and other sensitive shallow-water areas;
- Educate vessel operators about water quality issues and the need to avoid sensitive areas.; and,
- Enforce protection of sensitive areas.

Water Quality

The degradation of water quality causing shellfish bed and beach closures may likely be associated with "non-point source pollution". This type of pollution is not from a single source

but usually due to stormwater runoff which can contain pollution from a variety of sources. Presently the only proactive effort to address these problems is the Snug Harbor Stormwater Management Project. This Plan recommends the new Bay Commission assist water quality restoration projects by providing project management, grant writing assistance, agency coordination and scientific data. This Plan also proposes that a program should be established to prioritize storm drains for installation of Best Management Practices (BMPs) so that the Bay is protected from existing and future levels of non-point source pollution. As a first step in this program locate all storm drains and water quality data from drains. Storm drain mitigation projects will be prioritized based on existing areas of water quality degradation impacting Bay resources including shellfishing and swimming (Ellison Beach).

Fish Runs: Island Creek Rainbow Smelt and Herring Run Restoration Project

The Duxbury Bay Management Study Committee has started a demonstration project of this approach by working on the Island Creek Rainbow Smelt and Herring Run Restoration Project. Additional herring runs could be restored around the Bay including Stony Brook, Millbrook and the Blue Fish River.

]The purpose of this project is to restore an historic alewife and rainbow smelt fish run including Island Creek (2 miles long), Mill Pond (7 acres) and Island Creek Pond (a great pond of 35 acres) on behalf of the Conservation Commission in cooperation with the Duxbury Bay Management Study Committee. The project will optimize riverine habitat for rainbow smelt passage and spawning while restoring access for herring to existing spawning and nursery habitat in Mill Pond and Island Creek Pond. Historically, the Island Creek fish run predates European contact. It is likely that native peoples used the herring from Island Creek to fertilize their corn as they did from other fish runs in the area such as Stoney Brook.²³ Historical records show settlers valued the fish enough to manage and protect the run for the public even as they developed mills to harness its power.

The funds requested of the Community Preservation Committee (CPC) will restore the historic fish run by rebuilding two historic structures: the fish ladder on Island Creek at Mill Pond and the water control structure at Island Creek Pond. Both have decayed and need improvement to restore herring passage. The water control structure on Island Creek at Island Creek Pond will be rebuilt with natural granite, conserving the natural and historic beauty of the site. As a result of this funding, the Town will receive two restored historic structures on an historic herring run and restored natural functions of the Town's open space at the fish ladder site and Mill Pond and at Island Creek Pond. In addition, a long-term management plan will be developed and implemented with CPC participation.

This project completes Conservation Commission work to restore the historic Island Creek, Mill Pond and Island Creek Pond fish habitat corridor. Island Creek Pond, the only great pond (over 10 acres and therefore reserved for all under state law) in Duxbury and Mill Pond have public open space around them which will be enhanced with this restoration. The funds from this project will restore the historic fish run by restoring a Town-owned decayed fish ladder and water control structure. Once restored, the fish run will be a community resource,

²³ Fish Henry, Duxbury Historian, pp 95, 1924, Duxbury, MA

motivating the community to reestablish its historic relationship to the Ponds, Creek and Bay, while recognizing the importance of clean salt and fresh water. A management plan will be developed with participation from the many groups supporting this project, including the Community Preservation Committee. When the herring are restored, individuals will be allowed to take fish for recreational and commercial fishing. A community celebration of the herring's return will be established. This project meets the Community Preservation Act's goal of historic preservation by physically restoring a herring run that dates back to 1702 and by helping to restore the community's historic relationship to its ecology.

The Conservation Commission, DMF, USFWS, CPC, Battelle, CWRP, are all contributing and participating in the herring restoration project. Boy Scouts have initiated signage project with Battelle, construction companies have volunteered, and Mass Highway Department (MHD). is mitigating road runoff with Best Management Practices (sand filtration and infiltration systems) in partnership with the Conservation Commission on property at Mill Pond. Plans have been completed for the fish ladder and drainage projects by the MHD and the Town DPW. Construction is scheduled for summer 2005.

Table 13 provides a summary of the management recommendations and priorities for restoration.

Table 13. Summary of Prioritized Management Plan Recommendations for Restoration

TOPIC AREA	PRIORITY	RECOMMENDATIONS
VI. Restoration Projects	1	Continue to conduct Habitat Restoration Projects Such As: 1. Restore shellfish beds to unconditionally open where possible 2. Island Creek Rainbow Smelt and Herring Run Restoration Project 3. Other herring Runs, Blue Fish River
	1	Develop program to protect and restore (if warranted) eelgrass beds. 1. Determine cause of loss of eelgrass since 1951. Survey beds. 2. If appropriate use channel markers, other buoys, and tide gauges to direct vessels away from eelgrass beds and other sensitive shallow-water areas 3. Educate vessel operators about water quality issues and the need to avoid sensitive areas. 4. Strictly enforce protection of sensitive areas.

9.0 BAY MANAGEMENT

9.1 Background

The Duxbury Bay Management Study Committee reviewed the existing environmental conditions and management of the Bay and learned that the Bay is healthy compared to other South Shore bays. Yet, it has water quality problems causing shellfish bed closures and occasional beach closures. Because the type and origin of this pollution varies, several departments must be coordinated to fix the problems. For instance, several potential points of pollution were identified by the Mass Division of Marine Fisheries (DMF), but DMF needed the authority of the Board of Health to further investigate these sources. The Board of Health was unaware of the locations cited by DMF. Identifying and fixing apparent pollution problems requires collaborations like those needed to implement the Blue Fish River, Landing Road and Snug Harbor shared septic systems and the current storm water remediation project in Snug Harbor.

The Committee applauds existing Community restoration projects in the Bay and joint regulatory review of some development projects. The Committee seeks to continue these trends. These efforts show that the Town recognizes that the present management and regulatory structure is fragmented and must be coordinated and integrated to protect the Bay's ecology.

At present there isn't a comprehensive process for evaluating project impacts on the Bay prior to and after the projects have been approved. Some recent Bay developments had waterside use impacts which "fell through the cracks" under the present system. In addition efforts to restore the Bay and improve existing levels of use are currently carried out by various departments and committees when their staff has the time and funding. An integrated effort to evaluate, prioritize and implement projects would help get the most benefit from limited funds. Existing Committees and staff also seek scientific and policy direction to guide their decisions and recommendations.

The Duxbury Bay Management Study Committee recognizes the complexity and scale of the ecological and use issues facing the Bay now and in the future. Therefore it recommends a new organizational structure, the Duxbury Bay Management Commission, whose scale reflects the ecological system of the Bay and its uses. This new organizational structure will integrate interests in the Bay through a representative commission, which will help initiate and coordinate a restoration program and provide comprehensive review of projects affecting the Bay's ecology. In addition, the new Commission will support education of current Bay users and the next generation of Bay "keepers."

In this way the Commission builds on existing stewardship and regulation of the Bay. No new regulations or authorities are created; instead existing authority is used cooperatively. The proposed Commission and its advisory role to existing authorities were approved by Annual Town Meeting, 2005. Commission members will be appointed by the Board of Selectmen, and the new Commission is scheduled to begin work July 1, 2005.

9.2 Laws, Regulations and Planning Efforts Related to Bay Management

Table 14 summarizes the local town committees and town boards that have responsibilities for the Bay. Table 15 summarizes the laws and regulations related to management of Duxbury Bay.

Table 14. Summary of Town Committees and Boards with Bay Responsibilities

ORGANIZATION	CURRENT ROLE	VESTED AUTHORITY	NEW FOCUS AREAS	COORDINATION WITH PROPOSED COMMISSION
Conservation Commission	Regulate activities wetlands and aquaculture	MGL C.131 S 40 Bylaw C. 9, and related regulations.	Eelgrass	As needed based on topic
Beach Committee	<ul style="list-style-type: none"> • Liaison to Beach Reservation • Powder point bridge • Event planning • Disaster/oil spill 	<ul style="list-style-type: none"> • Advisory to Board of Selectmen • Bylaw • Rep. Town Interest 	Wildlife	Yes
Harbormaster's Department	<ul style="list-style-type: none"> • Public safety • Health and welfare • management of waterfront activities • Management of natural resources • Moorings • Shellfish Constable • Herring Warden 	<ul style="list-style-type: none"> • MGL C. 102,90,90B, 91, 131, 88, 130 • State Regulations • Board of Selectmen • employer 	Unregulated Activities and emergency evacuation	Yes
Shellfish Advisory Committee	<ul style="list-style-type: none"> • Assist Harbormaster • Advise Board of Selectmen • Review aquaculture grants • Shellfish Management Plan 	<ul style="list-style-type: none"> • Bylaw 7.5 Shellfish • Bylaw 7.3,7.4 Aquaculture • Advisory to Board of Selectmen • Appointed by Board of Selectmen 		

Table 14. Summary of Town Committees and Boards with Bay Responsibilities (cont.)

ORGANIZATION	CURRENT ROLE	VESTED AUTHORITY	NEW FOCUS AREAS	COORDINATION WITH PROPOSED COMMISSION
Waterfront Advisory Committee	<ul style="list-style-type: none"> • Advise Board of Selectmen • Assist Harbormaster • Review Fee structure, access/landings, rules and regulations 	<ul style="list-style-type: none"> • Advisory to Board of Selectmen • Appointed by Board of Selectmen 	Powder point bridge	
Board of Health	<ul style="list-style-type: none"> • Beach water quality • Septic systems 	<ul style="list-style-type: none"> • Title 5 • MGL c. 111 s.17 	Beach water quality monitoring	
Department of Public Works	<ul style="list-style-type: none"> • Landing maintenance • Landing projects 			
Zoning Board of Appeals	<ul style="list-style-type: none"> • Special permits 	Protective Bylaw	Piers, docks	
Board of Selectmen	<ul style="list-style-type: none"> • Shellfish rules and regulations • Approve aquaculture grants • Beach regulations • Harbor regulations and fees 	Various Bylaws		
Fire Department	<ul style="list-style-type: none"> • Emergency response • Parking restrictions 			

Table 15. Summary of State and Federal Laws and Regulations Related to Duxbury Bay

ORGANIZATION	CURRENT ROLE	VESTED AUTHORITY	COORDINATION WITH PROPOSED COMMISSION
Mass Coastal Zone Management Office	All activities affecting coastal resources as stated in Program Policies, regulatory and management interests	<ul style="list-style-type: none"> • FED CZM ACT • 301 CMR 21.00 • 301 CMR 20.00 • 301 CMR 22.00 • 301 CMR 23.00 • 301 CMR 25,26 • 15 CFR Par 930 	<ul style="list-style-type: none"> • Advisory when requested • Grants
Mass Environmental Policy Act Unit	Activities affecting coastal resources above stated thresholds, information gathering for regulatory process	M.G.L.C30, S.61-62H 301 CMR 11.00	No
Mass Department of Environmental Protection (DEP), Water Pollution Control	Surface and groundwater discharges, dredging, wetland filling, regulatory	MGL C. 21 S.26-53 314 CMR 9.00 314 CMR 3.00	No
DEP, Wetlands Protection Program	Protect the functions of the wetland resource areas (see Wetlands Protection Act), regulatory	M.G.L. C.131 S.40 310 CMR 10	No
DEP, Waterways Regulation Program	Protect public trust access rights of fishing, fowling and navigation, structural integrity, regulatory	M.G.L. C.91 310 CMR 9	No
Mass Division of Marine Fisheries	Protect and restore marine fisheries and related habitats	National Shellfish Sanitation Program M.G.L. C. 130 22 CMR 1 – 14	Advisory, grants, shellfish management
U.S. Food and Drug Administration	Human consumption of shellfish and shellfish sanitation	National Shellfish Sanitation Program	Regulates shellfish
U.S. Army Corps of Engineers	Wetlands resources, public access, historic assets, navigation, and flood hazards	<ul style="list-style-type: none"> • Rivers and Harbors Act • Clean Water Act 1977 • Marine Sanctuaries Act • 33 CFR 320-330 	Congressionally approved dredging and flood control projects
U.S. Environmental Protection Agency	Protection of water quality and wetlands resources, regulatory, grants	<ul style="list-style-type: none"> • Clean Water Act, S.301, 402 • 40 CFR Parts 12-125 	Grants

Table 15. Summary of State and Federal Laws and Regulations Related to Duxbury Bay

ORGANIZATION	CURRENT ROLE	VESTED AUTHORITY	COORDINATION WITH PROPOSED COMMISSION
U.S. Coast Guard	Navigation safety, bridge permits, boating safety education, Auxiliary	<ul style="list-style-type: none"> • General Bridge Act • Title 33 U.S. Code Parts 525-533 • 33 CFR Parts 62-66 	Advisory and education
National Marine Fisheries Service	Marine fisheries protection and habitat restoration, advisory to Corps Permits	<ul style="list-style-type: none"> • Rivers and Harbors Act • Clean Water Act 1977 • Marine Sanctuaries Act 	Advisory and grants
U.S. Department of Agriculture	Public health, shellfish cleanliness, habitat restoration, regulatory, restoration		Shellfish quality
National Oceanic and Atmospheric Administration.	Regulatory and restoration resources		Advisory and grants
U.S. Fish and Wildlife Service	Wildlife and habitat protection and restoration, includes fisheries		Advisory and grants

Existing Bay Management Plans

Presently the following Plans affect management of Duxbury Bay:

- Duxbury 2002 Open Space and Recreation Plan
- Duxbury Comprehensive Plan, 1999
- Pier Access and Shoreline Study Committee surveyed policies in 27 waterfront towns
- Report of the Duxbury Town Landing Study Committee, 1975

Existing Conditions and Trends in Bay Management

The Duxbury Bay Management Study Committee evaluated existing Bay management efforts based on their capacity to preserve, restore and enhance the Bays ecology and preserve harmony between its many existing uses. This evaluation was done by first looking at the outcomes of current management practices in terms of ecological health and use conflicts.

By looking at the Bay's present ecological condition the Committee learned that the Bay is healthy compared to other South Shore bays. This conclusion is based on a number of elements, with water quality being the most fundamental indicator of ecological health. Water quality testing data shows that the Bay in general has excellent water quality and meets or exceeds State requirements for shellfishing and swimming. However, the data also shows the Bay does have water pollution challenges causing shellfish bed and beach closures. These closures are often rain-event-related. Water quality is affected by pollution from humans and

other “natural” sources within the Bay and its watershed. Rain-event-related pollution can be expected to increase with population if corrective action is not taken.

The Duxbury Bay Management Study Committee found that restoration and regulatory efforts to eliminate or prevent Bay pollution are carried out by several Boards and Committees, a fragmented management structure. Management is fragmented because different agencies have different physical jurisdictions and different activities they regulate. For instance, the Mass Division of Marine Fisheries (DMF) regulates shellfishing by closing and opening beds for fishing based on their sampling and measuring of bacteria in marine waters. Fresh water tributaries may carry bacteria from failed septic systems to the Bay but DMF has no authority in fresh water tributaries or over septic systems which are under the jurisdiction of the Board of Health. To fix pollution problems these agencies and levels of government must be coordinated, because the type and origin of the pollution vary. This example illustrates the need for coordinating one agency’s information and authority with another’s to identify and fix water quality problems.

This type of coordination is well demonstrated by the Town’s implementation of the Blue Fish River, Snug Harbor and Landing Road shared septic systems projects and the current storm drain remediation project in Snug Harbor. All the Boards and staff involved in these projects are to be congratulated and supported in their efforts.

The Town is also making efforts to establish comprehensive regulatory review of residential and commercial developments in Town. These efforts include joint review of some development projects by the Development Review Team and referral for comment of Special Permit applications and Site Plan Review Procedures to a variety of Boards, Departments and Committees in Town. These efforts show that the Town recognizes that the present regulatory structure is fragmented and must be integrated to protect the Bay’s ecology. Existing Committees and staff also seek scientific and policy direction to guide their decisions and recommendations. Finally, efforts to restore the Bay and improve existing levels of use are carried out by various departments and committees when their staff has the time and funding.

Past management of the bay has been successfully accomplished by independent committees focused on specific management areas. Historically, no oversight or central agency or committee was needed because of the limited scale of these various bay activities. Recent growth in activities, as well as newer activities, has resulted in the likelihood of crowding and activity conflicts.

Education is seen as a key component of Bay management. Through education users learn their rights and responsibilities both in terms of other users and the Bay’s ecology. Presently, there are education efforts from the Harbormaster’s Office, the U.S. Coast Guard and the Duxbury Bay Maritime School regarding boating safety and Bay ecology.

Management trends show a growing and successful effort to coordinate and provide comprehensive Bay management. These efforts are primarily related to either project regulation or specific restoration projects. No particular group has a standing charge to coordinate Bay management efforts or provide a comprehensive view of Bay issues. Currently,

Bay management primarily consists of fragmented efforts to:

- Regulate Bay activities;
- Restore Bay ecology and use (projects);
- Conduct specialized planning (shellfish, beach);
- Develop policy (Board of Selectmen);
- Educate Bay users regarding use impacts on other users and the ecology; and,
- Conduct scientific inquiries (presently this is limited to support of projects).

In summary, Bay stewardship and regulation is strong but increasing population has led to increasing use pressures on the Bay and potential use conflicts. Today's Bay management is fragmented with more than eleven local departments and committees having some jurisdiction over the Bay and its' uses. No single group coordinates or integrates the expertise and resources of these groups. There is no comprehensive evaluation of project impacts to the Bay or evaluation of impacts after project construction, with some impacts "falling through the cracks". Scientific evaluation and policy guidance is needed by existing boards and committees. Boards and Committees may not have the staff to implement restoration projects for the Bay's ecology and use. Some committees are not as active as they might be and tend to respond to issues rather than follow a plan of activity.

Proposed Approach to Future Bay Management

The existing fragmented Bay management structure is typical of the first generation of environmental management efforts initiated from the late 1960's to the early 1980's. Increased population has led to increased Bay use which has put added pressure on and illustrated the weakness of the fragmented approach. The limitation of this structure to manage environmental systems has also become more apparent with growing understanding of ecological systems. These systems require management that reflects the scale of the natural system to be effective and efficient. The Town of Duxbury has recognized this need and initiated coordinated and cooperative management efforts in the realm of restoration projects and regulatory project review.

The Duxbury Bay Management Study Committee concluded that the Town's coordinated and cooperative Bay management trends could best be supported by a Commission with a standing charge to develop and implement a comprehensive effort to manage use and restore and maintain the Bays ecology on the scale of the Bay itself. A coordinated effort to manage the Bay will provide the most benefits at the lowest cost by taking a pre-emptive strategy on use management and potential sources of pollution. The three major components of such a management system include:

- New management system based on scale of natural system;
- Measurable maintenance and restoration of the Bay's ecology; and,
- Education of users and the next generation of Bay "Keepers".

The following sections of this Plan define the recommended Bay Commission, which was established when Town Meeting March 12, 2005 approved a new by-law establishing the

Commission and amendments to existing bylaws to require advisory regulatory review by the Commission.

The Duxbury Bay Management Commission

In developing a new organizational structure the Duxbury Bay Management Study Committee sought to be in touch with past environmental management efforts but up to date with what is new. To that end a number of existing and new management tools were discussed including, natural system-based management, watershed zoning, tiered regulatory review and impacts based regulatory review versus the current activity based regulations. A number of environmental management Plans were also discussed including:

- Pleasant Bay Resource Management Plan;
- Long-Range Natural Resource Management Plan for Sandy Neck Barrier Beach;
- Duxbury Beach Management Plan; and,
- Edgartown Harbor Plan.

These discussions, coupled with input from the general community and existing Town groups, through workshops and information meetings, were the basis for the Duxbury Bay Management Study Committee's proposed management tool, the Duxbury Bay Management Commission. The Commission and its membership, duties and responsibilities are defined by the following two proposed bylaws, which with minor language changes were approved by the Annual Town Meeting March 12, 2005. The final language of these bylaws is subject to approval by the Attorney General. As illustrated by the proposed bylaws and this plan, the Duxbury Bay Management Study Committee recommends that the Commission:

- Incorporate natural system-based management by evaluating projects impacting coastal wetlands and by implementing a program to maintain and restore Bay ecology;
- Provide comprehensive review and comment on proposed projects to existing regulatory bodies;
- Further study watershed zoning; and,
- Provide scientific monitoring and analysis as the basis for management policy, plans and regulations.

Article 23

DUXBURY BAY MANAGEMENT COMMISSION²⁴

Proposed Articles for Approval at the March 12, 2005 Town Meeting

Article 23

To see if the town will vote to amend the General By-Laws of The Town of Duxbury by adding a new Chapter 6.15 Duxbury Bay Management Commission (DBMC) to read as follows:

6.15. Duxbury Bay Management Commission

6.15.1 The Duxbury Bay Management Commission shall consist of nine members appointed by the Selectmen, to three year staggered terms. In appointing members, the selectmen shall consider individuals representing varied interests of the Bay including but not limited to aquaculture, boating,

²⁴ Minor changes were made to this article at Town Meeting

commercial and not for profit waterfront users, ecology, shellfish and finfish, and other residents at large whose experience will enhance the diversity of the commission.

6.15.2 The mission of the Duxbury Bay Management Commission is: *“To implement and maintain a management plan that will enhance and preserve the ecological health, pristine waters and natural beauty of Duxbury Bay for future generations while sustaining harmony among all its uses.”*

6.15.3 The Duxbury Bay Management Commission shall have the following powers and duties:

- a. Evaluate and review any proposed change in Bay use and access, inclusive of structures and all Bay related issues requiring the action of the Board of Selectman (BOS), Duxbury Conservation Commission (DCC), Zoning Board of Appeals (ZBA), Planning Board (PB), Harbormasters Office and Board of Health (BOH) involving Coastal Resource Areas as defined in M.G.L. c.131 S40 and the Town of Duxbury Wetlands Bylaw (Chapter 9 General By-Laws of the Town of Duxbury).
 1. Bay related issues and proposed changes will be evaluated at a minimum in terms of impacts on the following:
 - a) public safety, health and welfare
 - b) ecology and sensitive receptors including wildlife
 - c) uses and appropriateness of use and access
 - d) scenic views and aesthetic issues
 - e) levels of public and private services
 - f) supporting landside infrastructure
 2. Based on the above evaluation, the commission shall make recommendations and comments to the responsible regulatory or policy setting authorities.
- b. Recommend changes to regulations and policies. Submit recommendations and comments to the Board of Selectmen, Town Meeting and other regulatory authorities to change Town Bylaws, regulations and policies as needed to achieve the plan mission.
- c. Provide a forum for dispute resolution for projects and use impacts and conflicts on the Bay.
- d. Develop and implement a restoration, enhancement and management program to maintain and restore the Bay ecology and harmony among its uses by:
 1. Maintaining a central repository of environmental health indicators and uses.
 2. Providing ongoing monitoring of environmental health indicators.
 3. Convening integrated work groups to identify prioritize and address Bay ecology and use issues.
 4. Developing program to install best management practices for Town storm drain system and other non-point sources of pollution.
 5. Providing project management to supplement existing Town staff for ecological and other Bay related projects.
 6. Seeking funds and grants for implementation of projects.
 7. Supporting existing and developing new education and outreach programs to:
 - a. Educate the next generation of Bay stewards
 - b. Inform users of their impacts and responsibilities
 - c. Support Bay projects.
- e. Maintain the plan as a living document to guide the work of the DBMC by:
 1. Using the Plan as a guide in all the commission's recommendations, plan updates and activities.
 2. Reviewing and updating the Plan at a minimum every five years.
 3. Incorporating proposed Plan changes on an ongoing basis as needed.
 4. Appointing subcommittees or work groups to further study issues identified in original Plan and by the DBMC.

- f. Recognize the Bays' interdependence and explore cooperative Bay management with the towns of Kingston and Plymouth.
- 6.15.4 With the approval of Town Meeting the DBMC shall have the authority to hire staff and/or consultants using private and public grants and other appropriations.

And to see if the town will vote to amend Chapter 9 Wetlands Protection of the General By-Laws of The Town of Duxbury by inserting the following in 9.1.6., after the last sentence in this section:

“The Duxbury Conservation Commission shall within 3 days of receiving a request for a determination or a notice of intent for proposed activities within a coastal resource area, as defined in Chapter 131, section 40 of the Massachusetts General Laws or as determined by the Duxbury Conservation Commission, request that the Duxbury Bay Management Commission provide written comments and recommendations before taking final action on said request for determination or notice of intent.”

Article 24

DUXBURY BAY MANAGEMENT COMMISSION

Proposed Article Approved as Amended by the March 12, 2005 Town Meeting

Article 24

To see if the town will vote to amend the Duxbury Protective Bylaw, Section 404.8 Special Permit Procedures, item 1, by inserting the following language, **“the Duxbury Bay Management Commission,”** in the first sentence after “Duxbury Conservation Commission,” so the section reads:

*The Board of Appeals shall refer a special permit application to the Conservation Commission, **the Duxbury Bay Management Commission**, the Board of Health, and the Planning Board for written comments and recommendations before taking final action on said special permit application. In addition to the above noted boards, the Board of Appeals may refer a special permit application to any other Town agency/board/department for comments and recommendations if it so desires before taking final action on said special permit application.*

And amend Duxbury Protective Bylaw, Section 906.4 Referral, by inserting the following language, **“Duxbury Bay Management Commission,”** in the first sentence after “Duxbury Conservation Commission,” so the first sentence reads:

*In addition to those applications for a Special Permit which require site plan approval under Section 615, the Special Permit Granting Authority shall refer a Special Permit application to the Board of Appeals, Board of Health, Conservation Commission, **Duxbury Bay Management Commission**, Planning Board, Water Advisory Board and Design Review Board for written comments and recommendations before taking final action on said Special Permit application.*

And amend Duxbury Protective Bylaw, Section 615.7 Required Procedures for Site Plan Review, by inserting the following language, **“, the Duxbury Bay Management Commission,”** in 615.7 (2.) after “the Conservation Commission” so that 615.7 (2.) reads:

Within five (5) working days of receiving a Site Plan, the Planning Director or his/her designee shall distribute copies of the Site Plan to the Planning Board, the Department of Public Works, the Police Department, the Fire Department, Highway Safety Committee, the Conservation Commission, **the**

Duxbury Bay Management Commission and the Board of Health. If the proposed activity requires a special permit, the special permit granting authority shall receive a copy of the Site Plan.

9.3 Emergency Disaster Response Planning

Emergency disaster response planning includes natural disasters such as storms, hazardous materials response, nuclear accidents and terrorist attacks. The Town's response organization to these disasters is the Duxbury Emergency Management Agency (DEMA) which has a specific plan for each of these disasters. The DEMA is located in the Central Fire Station at 668 Tremont Street (Rte.3A) in Duxbury. The agency's role is defined to include man-made and natural disasters. The Duxbury Bay Management Study Committee felt that additional planning was needed to address the specific needs of the Bay when confronted with natural disasters such as hurricanes, northeasters and other major storm events.

Harbor Evacuation Planning

The Duxbury Bay Management Study Committee and Harbormaster are concerned about emergency response planning as it is a public health and safety issue. Given the present evacuation program there is concern that no new moorings should be issued until a program that can haul all moored vessels in a reasonable time is in place. The current storm preparedness program for the Harbor was developed in response to the storms of 1987 and 1991. This program includes marinas and vessel owners. The first component of the program is contact information. The Town's mooring application has emergency contact information for each moored vessel, including the owner's contact information and marina to contact in case of emergency. The owner and marina are contacted by the Harbormaster when vessels need to be hauled.

Hauling vessels in an emergency is the next step in the program. The elements in this step are hauling capacity and storage space. Hauling capacity is measured in terms of labor, equipment and sufficient hauling sites (ramps, travel lifts, etc.). Labor and equipment seems to be sufficient at this time with volunteer contributions of men and equipment from:

- Bayside Marine;
- Long Point Marine; and,
- Snug Harbor Marine.

Ramps and lifts suitable for hauling vessels at all tides are not now under the direct control of the Town.

Once the vessels are hauled, the next component of the response program is vessel storage. Currently vessels are hauled to harbor parking lots. Various commercial and non-profit use groups provide parking including:

- Bayside Marine;
- Duxbury Maritime School;
- Duxbury Yacht Club;

- Long Point Marine; and,
- Snug Harbor Marine.

Due to increases in the number of moored vessels, vessels in marina rack storage, and vessels at recreational facilities, there is not presently enough room to haul and store all vessels in parking lots and at marinas. Also, marinas' are obligated to first protect vessels that normally store with them, and vessels stored in racks must be brought to the ground to prepare for major storms. Consequently, Bayside Marine has space to store 220 vessels but an estimated 130 boats stored in its own racks occupy much of that space, leaving limited area to store other vessels.

The Duxbury Bay Management Study Committee recommends that the Board of Selectmen investigate the use of one lane of Harrison St. and the school parking lots as emergency storage areas. In addition the Town should identify responsible parties to haul vessels and store them. Related liability and insurance issues should also be investigated and settled prior to the need for evacuation.

The Committee recommends that a new storm preparedness plan be developed and distributed. This plan should include the following elements:

1. Command and control structure;
2. Preparations, identification of labor, equipment and hauling sites;
3. Notification to responders and vessel owners (consider using Town's emergency response automated calling system);
4. Hauling, operations and locations;
5. Storage, operations and locations; and,
6. Insurance and liability issues.

Oil Spill Response Planning

By federal and state law every oil spill must be reported to the proper agencies. This includes the U.S. Coast Guard national response center (800-424-8802), the Town Harbormaster (781-934-2866), and the Mass Department of Environmental Protection and the Environmental Police. The Harbormaster will notify the appropriate first responders in Town including the Duxbury Emergency Management Agency (DEMA) and Fire and Police Departments. Because the speed of containment is critical to limiting spill impacts on the Bay's ecology, the Town keeps a spill response equipment trailer at the Fire Station and the Harbormaster has been trained in the use and deployment of the equipment as has the Town's Hazardous Materials Team (HAZMAT). In addition the Town has maps of sensitive receptors in the Bay ("Sensitivity of Coastal Environments and Wildlife to Spilled Oil, National Oceanographic Atmospheric Administration (NOAA), Office of Response and Restoration, Hazardous Materials Response Division Seattle, Washington, Coastal Services Center, Charleston, South Carolina, MCZM, Maps, 3/1999"). The US Coast Guard will respond as will the DEP. After an evaluation of the spill, these agencies will direct private contractors to respond as needed endeavor to determine responsible parties, and evaluate impacts and determine required cleanup and loss compensation.

9.4 Education

Nearly every area of use and ecological preservation in the Bay cited education as an important component of Bay management. This included any type of vessel use, aquaculture, wildlife and habitat protection. The Duxbury Bay Management Study Committee agreed on the importance of education. It went on to establish education as a key component of Bay Management and has codified it in the bylaw establishing the Duxbury Bay Management Commission. As stated in the bylaw, the new Commission will support existing and develop new education and outreach programs to:

- Educate the next generation of Bay stewards;
- Inform users of their impacts and responsibilities; and,
- Support Bay projects.

The Duxbury Bay Management Study Committee feels it is important to establish education programs for the general public as well as more formal class room programs. Some of the recommendations for education include:

1. Public Education

- Gather and document the regulatory bodies and regulations regarding bay uses to serve as a "Users Guide"
- Prepare a public/private access rights brochure
- Develop a restoration and user project related education, including:
 1. signage
 2. brochures
 3. event displays
 4. volunteer field work and education
 5. greenscapes education
 6. green boating
 7. green marinas

2. School and Private Non-Profit "formal education" on topics such as:

- Boating
- General ecology
- Bay specific ecology
- Environmental protection and restoration project ecology
- Natural system based management
- Habitat restoration
 1. anadromous fish
 2. eelgrass beds
 3. salt marsh
 4. nonpoint source pollution
 5. invasive species

9.5 Future Studies

Future studies and ongoing monitoring are important to the effective management of the Bay as new ecological information and use impacts information are generated. Studies will be in the areas of management and natural sciences. The monitoring of the health of the Bay and use impacts is important as the basis of management decisions. Changes in use are now subject to the new Commission's evaluation, and therefore monitoring of use on a periodic or continual basis is needed. Specific activity-based studies will be identified by the Commission or can be referred to the Commission by existing boards and committees. The Commission will then appoint subcommittees or work groups to further study the issues identified in original Plan and by the DBMC. The new Commission will also maintain a central repository of environmental health indicators and uses and provide or support the provision of ongoing monitoring of environmental health indicators. Finally, the Commission will convene integrated work groups to identify, prioritize, and address Bay ecology and use issues. Some studies identified in the initial planning phase include:

1. Dredge disposal alternatives;
2. Bay wide organization (Kingston, Plymouth, Marshfield);
3. Eelgrass health and distribution;
4. Bacterial source identification for closed shellfish areas and periodically closed beaches; and,
5. Define and identify areas of Critical Marine Habitat such as eelgrass and shellfish beds.
6. Assist in the development of various plans as defined in the summary of recommendations (Table 1).
7. Explore need for and utility of "Watersheet Zoning"

9.6 Funding Program

A funding program is necessary to support the findings of the Duxbury Bay Management Study Committee including the functions of the Duxbury Bay Management Study Committee, and the existing Harbormaster/Coastal Resources Department. The Bay Commission will need staff to support its major functions of reviewing projects in coastal wetlands and its program to maintain and restore Bay ecology uses. Under the bylaw establishing the Commission, it is authorized, "With the approval of Town Meeting . . . to hire staff and/or consultants using private and public grants and other appropriations". Project-related hires supported by grants should also be authorized by the Town Manager and Board of Selectmen as long as any related Town commitments are in place. Presently, the Commission needs one-full time equivalent person, which could be a contract position, and additional funds related to specific Bay projects. It is hoped that funding of the DBMC will be proposed at a fall 2005 special town meeting.

The Duxbury Bay Management Study Committee found that the Harbormaster/Coastal Resources Department is in need of a consistent and reliable revenue stream and a plan for operations, maintenance and capital expenses. Currently, there is no dedicated waterways fund as required by law, to be funded with a minimum of one-half of boat excise taxes (MGL C

50B, S.2 (b), to support the Harbormaster/Coastal Resources Department functions. The rate of excise tax collection for trailered, moored or rack storage vessels is unknown.

The Harbormaster/Coastal Resources Department is funded out of the general fund. This Department generates significant funds from various fees, including fishing licenses and moorings. Current known Department capital restoration and improvement projects include repair of three Town dinghy floats, repair of launch float, replacement of hot water tank at rest room, storage for equipment and vessels, dredging and ramp repair. A comprehensive inventory of capital needs for this Department should be conducted and be matched with a revenue plan to meet those needs. This plan would identify all costs related to maintenance, operations, and capital projects of the Department. The plan would also show revenues generated from waterways activities for which the Department is responsible. The plan would be for a term of 5 to 10 years. This plan would support the Town's efforts to manage its budget and the functions of the Department. The revenue plan should include fee structure analysis and analysis for the need of a user fee for rack and otherwise stored vessels whose use requires Town services and infrastructure.

In general, the funding plan for the Bay could combine the Harbormaster/Coastal Natural Resources Department and the Duxbury Bay Management Commission. Whether or not a combined plan is developed both the Commission and the Department need a funding plan with the following components:

1. A 5 to 10 year Cash Flow Proforma plan including all maintenance, operations and capital project costs and revenues from waterways fees
2. Fee Structure analysis of current revenues generated from waterways activities and their uses within the Town for:
 - a. Compliance with tax law (boat excise taxes, MGL C 50B, S2(b))
 - b. Rates (sufficient to meet costs?), compliance, structure and equity (fair allocation of costs of services)
3. Multiple Resources for generating funds including:
 - a. Grants
 - b. Annual Town Meeting,
 - c. Fees, including special fees for Bay related activities,
 - d. Gifts and,
 - e. Other Government Funding, including the Community Preservation Act.

9.7 Management Recommendations for Bay Management

Table 16 provides a summary of the recommendations and priorities for implementing a management program for Duxbury Bay.

Table 16. Summary of Prioritized Management Plan Recommendations for Bay Management

TOPIC AREA	PRIORITY	RECOMMENDATIONS
VII. Bay Management	1	Request Annual Town Meeting 2005 Establish Duxbury Bay Management Commission. A representative body to provide comprehensive review of changes as well as programs to restore and protect the Bays ecology and uses. Evaluate changes in intensity of use in last ten years based on change criteria including: <ol style="list-style-type: none"> 1. public safety, health and welfare 2. ecology and sensitive receptors including wildlife 3. uses and appropriateness of use and access 4. scenic views and aesthetic issues 5. levels of public and private services 6. supporting landside infrastructure
	1	Complete the development of a baseline of uses and monitor uses.
	2	Conduct fee structure analysis in light of demands for service and capital needs of the Harbormaster/Coastal Natural Resource Dept. Include needs for new office and equipment, administrative. Support staff, new vessel (unit 16 years old), storage, replace hot water tank at showers, repair 3 dingy floats, replace launch float.
	2	Further Develop Bay Plan as per comprehensive table of contents.
	3	Explore need for and utility of "Watersheet Zoning".

APPENDICES

APPENDIX A: RESOURCES MAPS

APPENDIX B: WATERWAYS RULES AND REGULATIONS

APPENDIX C: MOORING RULES AND REGULATIONS

APPENDIX D: INPUT FROM PUBLIC WORK GROUPS

**APPENDIX E: CHARACTERISTICS OF TOWN LANDINGS
AND WAYS TO THE WATER, DUXBURY,
MASSACHUSETTS**

APPENDIX A: RESOURCE MAPS



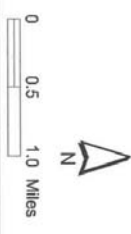
Robert L. Fitz & Associates
 Marshfield, MA 02050 (781) 337-4842
 100 Main Street
 Marshfield, MA 02051 (781) 558-7734
 7/ANZ004.3

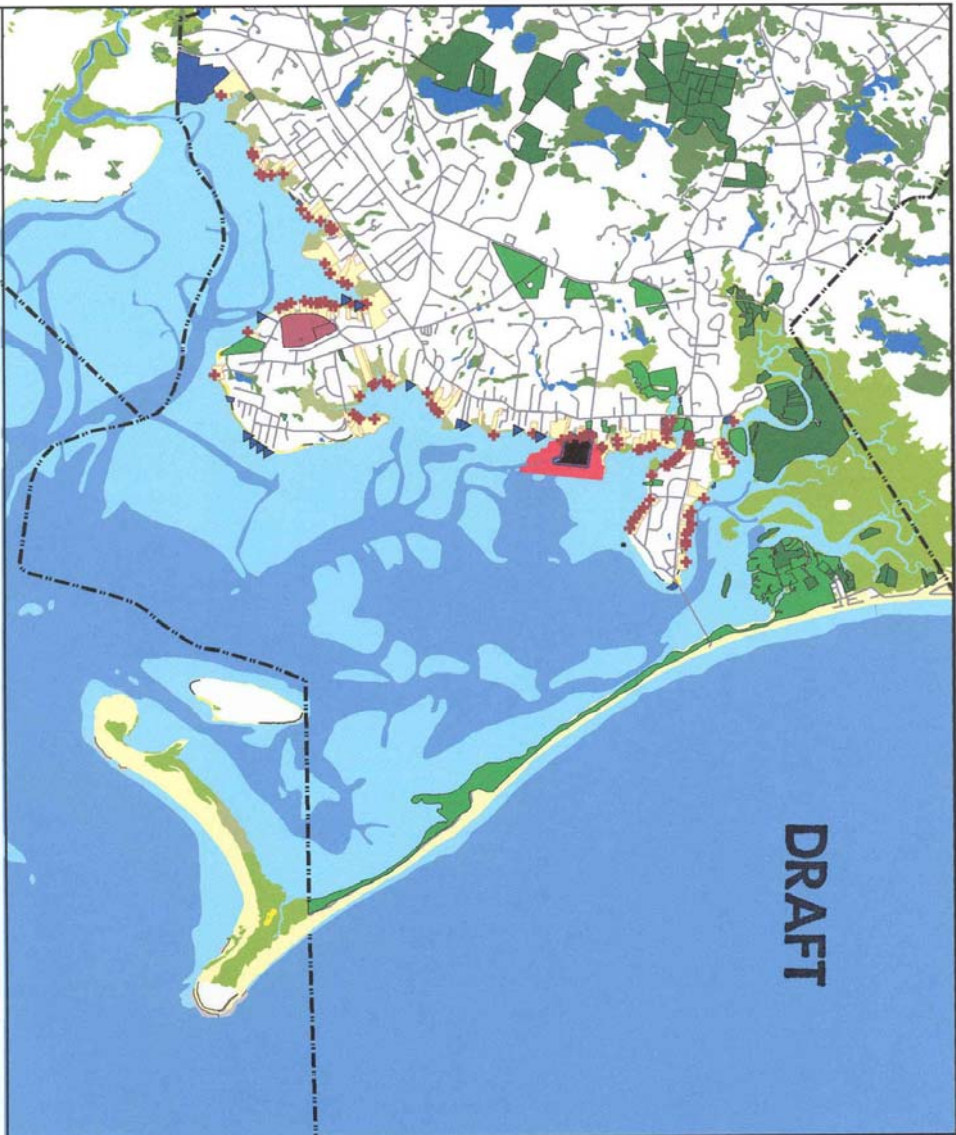
Duxbury Bay Management Plan

Map 1

Duxbury Bay Management Area

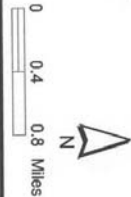
- Town Boundary
- Watershed Boundary
- Road
- Depth Contour
- Beach
- Dune
- Tidal Flat
- Salt Marsh
- Wetland
- Coastal Bank
- Rocky Shore
- Fairway
- Federal Channel
- Channel Marker





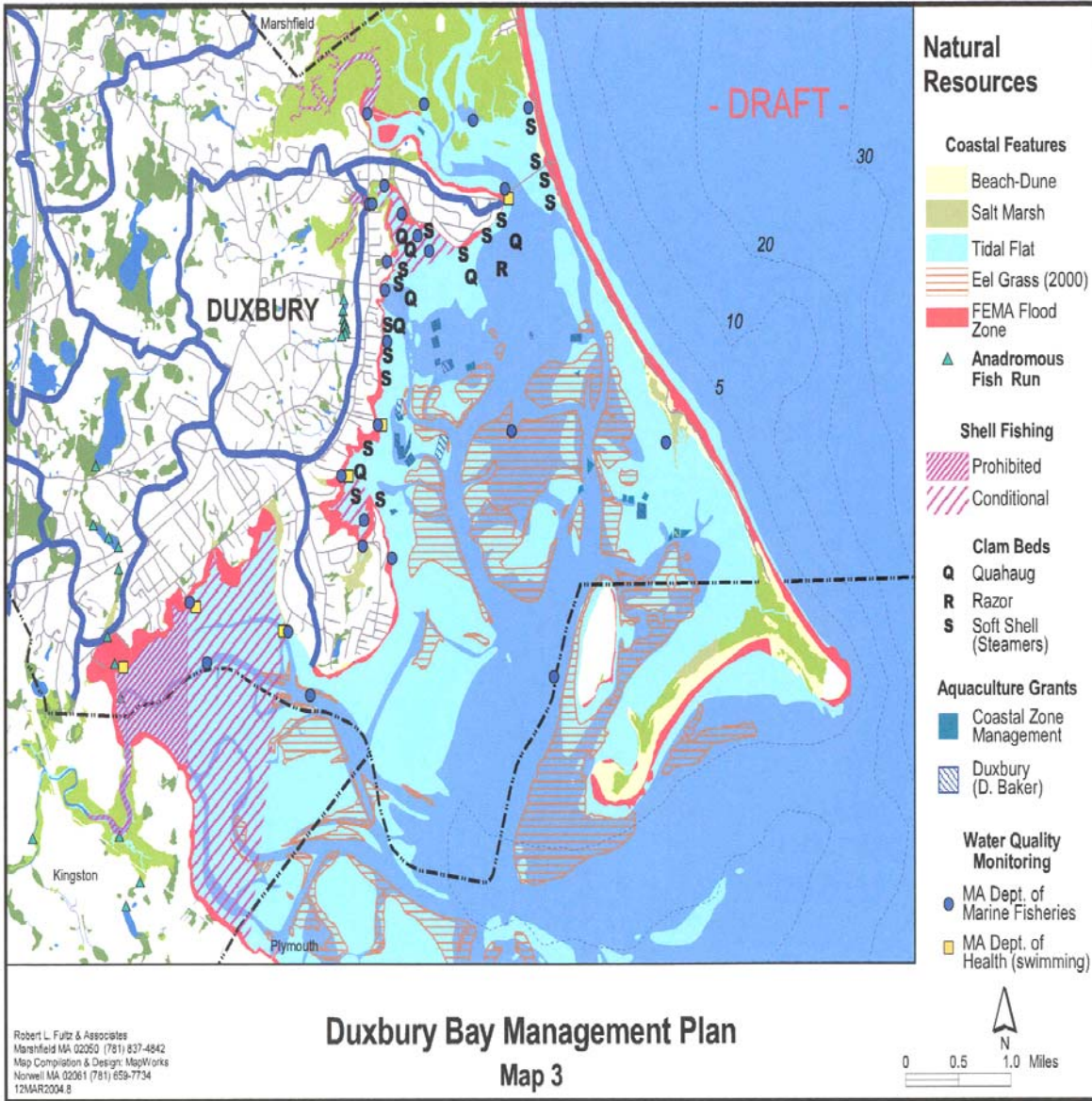
Existing Use

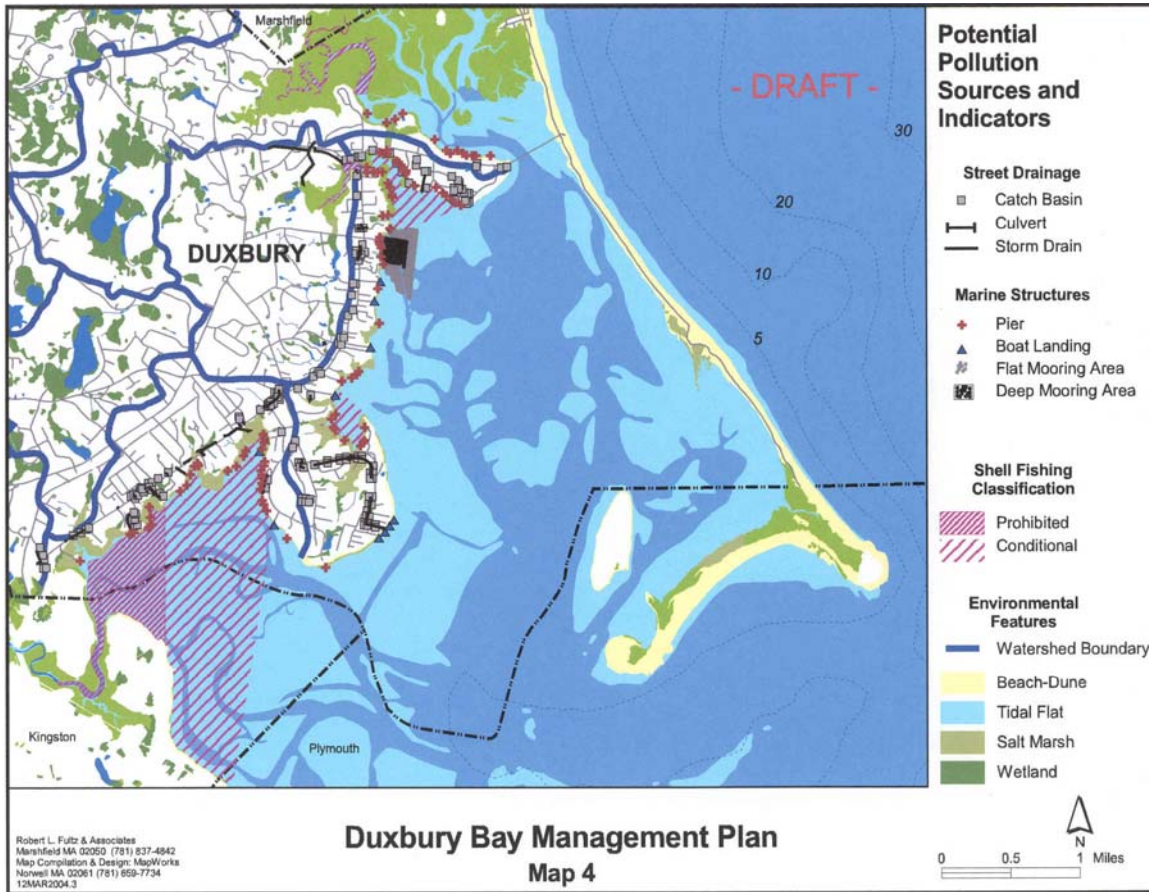
- ✦ Flat Mooring Area
- Federal Deep Mooring Area
- ▲ Town Landing
- Town Landing Parcel
- + Pier
- Parcel with Pier
- Conservation Land
- Land Trust or Non Profit
- State Park
- Tidal Flat



Robert L. Fultz & Associates
 Marshfield MA 02050 (781) 837-4942
 Map: Compilatin & Design: MapWorks
 Norwell MA 02061 (781) 859-7734
 7JAN2004.4

Duxbury Bay Management Plan
Map 2





APPENDIX B: WATERWAYS RULES AND REGULATIONS

**TOWN OF DUXBURY
HARBORMASTER**

**Rules and Regulations
for Duxbury Waterways
Effective date: 02 May 2005**

7.6 § 1001: AUTHORITY AND ENFORCEMENT

- (a) Under the authority of Massachusetts General Laws, Chapter 90B § 15B; Chapter 88 § 19; Chapter 102 § 19-26; Chapter 91; Chapter 40; 310 CMR 9.07 and all other applicable laws and regulations, the following rules and regulations are promulgated effective 02 May 2005.
- (b) The Harbormaster and Assistant Harbormasters have the authority to enforce all rules and regulations set forth herein.

7.6 § 1002: DEFINITIONS

The following words, for the purpose of these regulations, unless another meaning is clearly apparent for the way the word is used, shall have the following meanings:

- (a) “anchoring” means to secure a vessel for a short period of time, not to exceed twenty-four (24) consecutive hours, to the bottom of a body of water by dropping an anchor or anchors or other ground tackle from a vessel.
- (b) “berth” means any space wherein a vessel is confined by wet slip, float, mooring or any other type of docking facility.
- (c) “channel” means a navigable route for the passage of vessels, established by customary use or under the authority of federal, state or municipal law.
- (d) “designated anchorages” means established mooring fields at Snug Harbor Deep Water (dredged) Basin, Snug Harbor Basin Flats, Howland’s Landing, Two Rock Channel and Clark’s Island.
- (e) “Duxbury waterways” means all waters within the embayment, harbors, rivers and open waters within the boundaries and jurisdiction of the Town of Duxbury, over which the Town of Duxbury may exercise its powers and authority.
- (f) “down skier” means any person(s) in the water for whatever reason while being towed.
- (g) “fairway” means any locally designated and / or maintained water areas reserved for the unobstructed movement of vessels through mooring fields or designated anchorages.
- (h) “flag display” means a regulation flag held upright, above the spotter’s head, at a sufficient height to be visible to passing vessels.
- (i) “Harbormaster” means the duly appointed Harbormaster or any duly appointed Assistant Harbormaster.

- (j) “mooring” means the equipment and / or process used to secure a vessel, other than by anchoring, that consists with the gear as prescribed by the Town of Duxbury, which is placed on the bed of a body of water and attached to a buoy.
- (k) “other object” means any floating object, including but not limited to floats, rafts or barges, temporarily secured to the bed of any body of water by anchor or mooring.
- (l) “person” means any individual, partnership, trust, firm, corporation, association, commission, district, department, board, municipality, public or quasi-public agency or authority.
- (m) “race” means any scheduled competition of vessels, rowing sculls / gigs, wind surfers or other, organized to race within the waterways of Duxbury.
- (n) “regulation flag” means a 12” by 12” bright orange flag secured appropriately to 2 ½ foot dowel ½” in diameter used to advise surrounding vessels of a down skier.
- (o) “spotter” means as prescribed by M.G.L. Chapter 90B, a competent person at least twelve (12) years old, in addition to the operator, in a position to observe at all times the person(s) being towed.
- (p) “transient guest” means any vessel that does not have a valid mooring permit issued by the Town of Duxbury.
- (q) “vessel” means every description of watercraft, other than a seaplane on the water, used or capable of being used as a means of transportation on the water.
- (r) “water skiing” means the towing or manipulating of a surfboard, wake board, ski, tube or any similar device or person(s) whether or not on a device.

7.6 § 1003: GENERAL RULES AND REGULATIONS

- (a) All vessels entering Duxbury waterways are subject to these rules and regulations and to the direction of the Harbormaster, who shall be consulted before anchoring for over twenty-four (24) hours or tying up to any town facilities or moorings.
- (b) The Town of Duxbury shall not be responsible for any loss or damage to boats or vessels.
- (c) Boat owners / operators shall be held responsible for damage caused by them or their vessels to surrounding vessels, moorings, structures, pilings or related facilities owned privately or by the Town of Duxbury.
- (d) No unauthorized person shall board any boat within Duxbury waterways.
- (e) No person shall molest or damage any vessel, tender, etc., anywhere along the shoreline of Duxbury waterways.
- (f) No person shall use or borrow another's tender without first gaining permission from the owner or agent.

7.6 § 1004: TENDERS

- (a) All tenders stored on or at Town tender floats shall display name and phone number of owner and have annual tender permit adhered to port bow.
- (b) No tender over 10' in length shall be stored on its assigned tender spot. Tenders spots assigned to tenders over 10' before 21 March 2005 will be

grand fathered. No tender over 12' in length shall be tied to tender tie-up float.

- (c) All tenders assigned to a tender spot or to the tender tie up floats shall be free of debris and dewatered at all times.

7.6 § 1005: WATERFRONT ACCESS AND USE

- (a) The Town of Duxbury shall not be liable for any injury, damage or loss sustained during the use of any Town owned or controlled waterfront facilities. Facility users shall be responsible for any injury, damage or loss caused by them.
- (b) Vehicle access on the Mattakesett Court Town Pier will be allowed only with the permission of the Harbormaster.
- (c) Town Pier vehicular weight (2 axle) shall be limited to 4 ton.
- (d) Vehicle speed on pier shall not exceed 2 MPH.
- (e) Parking on the Pier shall be limited to fifteen (15) minutes only.
- (f) Placement of gear of any kind on the Town Pier, float(s) or waterfront facility will be allowed only with the permission of the Harbormaster. Gear so placed shall be neatly stacked and shall not hinder or obstruct access to the Town Pier, float(s) or waterfront facility at anytime.
- (g) The waterfront facility shall be free of any debris, trash, etc. at all times. It shall be the responsibility of the user to be in compliance at all times.
- (h) All pier barriers and gates shall remain closed and locked in place except during authorized access.
- (i) The use of marine engine power to assist in launching or hauling at any public launching / landing ramp is prohibited.
- (j) All trailers parked on the property of the Town of Duxbury shall be parked in designated trailer areas in a manner that does not block, restrict or inhibit access or traffic flow to a landing, facility, roadway, public way, parking lot or private property.
- (k) Trailers parked at Mattakesett Court shall be disconnected from the tow vehicle and be parked in designated trailer areas, seasonally from May 1st thru November 1st, unless authorized by the Harbormaster.
- (l) Trailer parking on the property of the Town of Duxbury for a period of time longer than twenty-four (24) hours without approval from the Harbormaster is strictly prohibited. Trailers violating this may be cited and removed at the owner's expense.
- (m) All trailers parked on the property of the Town of Duxbury shall be legally registered and be equipped with a valid license plate.
- (n) Any unauthorized access or use of any Town of Duxbury waterfront facility shall be strictly prohibited.
- (o) There shall be no parking of any motor vehicle at any Town of Duxbury waterfront facility after 12:00 A.M. (midnight) unless authorized by the Harbormaster.

7.6 § 1006: BERTHING

- (a) No vessel will be allowed to remain at the Town Floats or the Town Pier Facility for over thirty (30) minutes. There will be no overnight docking or tie-up allowed at the Town Floats or the Town Pier. Vessels with emergency or exigent circumstances will be limited at the discretion of the Harbormaster.
- (b) All transient guests entering Duxbury waterways shall receive the permission of the Harbormaster before anchoring for a period of more than twenty-four (24) hours.
- (c) All transient guests entering Duxbury waterways shall receive the permission of the Harbormaster before tying up to any Town of Duxbury waterfront facility.
- (d) All transient guests entering Duxbury waterways shall receive the permission of the Harbormaster before tying up to a mooring.
- (e) Mooring permit holders shall not rent out their assigned mooring. Any mooring not being used by its owner may be designated as a “guest mooring” and temporarily assigned at the discretion of the Harbormaster.

7.6 § 1007: SPEED

- (a) All vessel operators are responsible for their wakes at all times. M.G.L. Chapter 90B and 323 CMR 2.07 operation shall apply.
- (b) No vessel is to exceed any posted speed limits. Posted areas are as follows:
 - 1. Snug Harbor Deep Water (dredged) Basin and Snug Harbor Basin Flats as designated by regulation speed buoy – NO WAKE, headway speed only.
 - 2. Bluefish River as designated by regulation speed buoy, 6 MPH / NO WAKE.
 - 3. Duck Hill River as designated by regulation speed buoy, 6 MPH / NO WAKE.
 - 4. Howland's Landing as designated by regulation speed buoy – NO WAKE, headway speed only.
 - 5. Speeds in any anchorage not posted shall be NO WAKE, headway speed only.
 - 6. Under the Powder Point Bridge as posted, 6 MPH / NO WAKE.

7.6 § 1008: CONDUCT

- (a) Disorderly conduct is forbidden at all times anywhere on Duxbury waterways or at or on the Town Pier, waterfront facility or any other property of the Town of Duxbury.
- (b) Negligent operation is prohibited. No person shall operate any vessel in a reckless or negligent manner so as to endanger the life, safety or property of any person.

7.6 § 1009: WATER SKIING

- (a) Water skiing as hereinafter permitted is subject to all the provisions as set forth in M.G.L. Chapter 90B. Strict attention shall be made to M.G.L. Chapter 90B, Section 8 (A-D) and to the Rules and Regulations as adopted by the Commonwealth under the authority of M.G.L., Chapter 90B, Section 11, Chapter 275, Section 2, act of 1960 and / or other applicable law.
- (b) Water skiing is prohibited in the following areas:
 - 1. Within one hundred fifty (150) feet of bathers, bathing beach, shore, piers, bridges, floats and other boats including those anchored or underway, and of anchorages.
 - 2. The Bluefish River - inside of designated regulation speed buoy.
 - 3. Duck Hill River - inside of designated regulation speed buoy.
 - 4. Within one hundred fifty (150) feet of any designated anchorage or other mooring field.
- (c) Down Skier Flag Rule:

No persons shall operate or cause to be operated any motor boat on Duxbury waterways towing a person or persons on water skis, surfboard or any similar device, or a person or persons whether or not on such a device, unless there is in such motor boat a spotter in addition to the operator, whose responsibility and duties include, but not limited to, the following:

- 1. Relays - The signal and condition of the person or persons being towed to operator.
 - 2. Assists the skier when necessary and possible.
 - 3. Implements the DOWN SKIER FLAG RULE. The spotter is required to display the Regulation Flag whenever the person or persons being towed are down in the water. The Regulation Flag is only to be displayed at the start or immediate completion of a run, including all wipeouts or falls. When the Regulation flag is displayed it shall be visible to all vessels within the vicinity of the down skier.
 - 4. Whenever the operator's vision is obscured for whatever reason, i.e. (river bends, etc.) or the spotter's view of the skier is obscured for whatever reason, the towing shall be immediately terminated, at which time, proper operating procedures shall be followed M.G.L. Ch. 90B.
- (d) The Rules and Regulations / Operating Procedures and Rules of the Road as adopted by the Commonwealth shall be strictly abided by.

7.6 § 1010: SWIMMING / SCUBA DIVING

- (a) Swimming and / or scuba diving are prohibited in or across any marked channel except in emergency situations or as approved by the Harbormaster.

- (b) There will be no swimming or diving allowed from any pier, float or vessel within any designated anchorage.
- (c) Skin Diving or scuba diving within any designated anchorage shall be permitted only at the discretion of the Harbormaster. M.G.L. Ch. 90B shall apply, and or other applicable law.

7.6 § 1011: HARBOR POLLUTION

The follow are strictly prohibited within Duxbury waterways:

- (a) Pumping or dumping overboard any treated or untreated vessel sewage.
- (b) Dumping of refuse of any kind.
- (c) Dumping of fish or fish carcasses.
- (d) Pumping or dumping overboard of hazardous waste to include but not limited to gas, oil and anti-freeze.

7.6 § 1012: RACES

- (a) There will be no races held within the boundaries of any designated anchorage from May 1st through November 15th unless authorized by the Harbormaster.
- (b) The Harbormaster shall be notified in writing of all races at least forty-eight (48) hours in advance of the day of the race.
- (c) Race notification forms will be available at the Harbormaster's office.
- (d) The Harbormaster may impose terms and conditions, within twenty-four (24) hours of receipt of a race notification, based on but not limited to the following:
 - 1. Impacts on public safety.
 - 2. Impacts on Duxbury waterways.
 - 3. Impacts on any Town of Duxbury waterfront facility.
 - 4. Impacts on any Town service.
- (e) This does not relinquish the responsibility of the applicant to make applications to all appropriate agencies as required by federal and / or state law for comment and / or approval.
- (f) Organizations sponsoring races shall be responsible to provide crash boats and personal in sufficient quantities to assure the safety of the race participants.

7.6 § 1013: ABANDONMENT

- (a) No vessel, mooring or other object shall be abandoned, sunk or otherwise placed where it may constitute a danger or obstruction to navigation or a public nuisance.
- (b) Any vessel improperly secured, swamped, sunk or washed ashore may be removed or relocated by the direction of the Harbormaster if the owner does not take corrective action after appropriate notice or within 24 hours.
- (c) The expense of such removal or relocation, and any liability incurred, shall be the responsibility of the owner.

- (d) Nothing in the above shall be deemed to restrict earlier action by the Harbormaster with or without notice to the owner if, in their judgment, such action is necessary to protect life or property.

7.6 § 1014: RULES AND REGULATIONS OF THE HARBORMASTER

The Harbormaster may from time to time promulgate Rules and Regulations relating to matters within his powers and jurisdiction under Massachusetts General Laws Chapter 102 § 19 through 26, Chapter 90B, Chapter 91 and all other applicable laws and rules and regulations.

7.6 § 3001 NON CRIMINAL DISPOSITION PENALTIES

- (a) The penalty for violations of any of the Town of Duxbury Rules and Regulations for Duxbury Waterways and Town of Duxbury Rules and Regulations for Moorings, Permits and Waiting Lists shall be \$25.00 for the first offense; \$50.00 for the second offense; \$100.00 for the third offense and \$200.00 for the fourth and subsequent offenses.
- (b) Violations of the Town of Duxbury Rules and Regulations for Duxbury Waterways and Town of Duxbury Rules and Regulations for Moorings, Permits and Waiting Lists may be sufficient cause for the Harbormaster to refuse an individual or his vessel the use of town properties or any town waterfront facility for a period of time as determined by the Harbormaster and Board of Selectmen.
- (c) Offenders will be prosecuted by the Harbormaster and all other enforcement agents.
- (d) In the event that any provisions, sections or clauses of the Town of Duxbury Rules and Regulations for Duxbury Waterways and Town of Duxbury Rules and Regulations for Moorings, Permits and Waiting Lists are found to be invalid, such invalidity shall not affect the validity of the remaining portions of those Rules and Regulations.
- (e) The revenue from any said fines, after payment of fees and expenses, shall be paid to the Town of Duxbury, Massachusetts.
- (f) The Town of Duxbury Rules and Regulations for Duxbury Waterways and the Town of Duxbury Rules and Regulations for Moorings, Permits and Waiting Lists may be amended by the Board of Selectmen.

APPENDIX C: MOORING RULES AND REGULATIONS

**TOWN OF DUXBURY
HARBORMASTER**

**Rules and Regulations
for Moorings, Permits and Waiting Lists
Effective date: 02 May 2005**

7.6 § 2001: AUTHORITY AND ENFORCEMENT

- (c) Under the authority of Massachusetts General Laws, Chapter 90B § 15B; Chapter 88 § 19; Chapter 102 § 19-26; Chapter 91; 310 CMR 9.07 and all other applicable laws and regulations, the following rules and regulations are promulgated effective 02 May 2005.
- (d) The Harbormaster and Assistant Harbormasters have the authority to enforce all rules and regulations set forth herein.

7.6 § 2002: DEFINITIONS

The following words, for the purpose of these regulations, unless another meaning is clearly apparent for the way the word is used, shall have the following meanings:

- (s) “anchoring” means to secure a vessel for a short period of time, not to exceed twenty-four (24) consecutive hours, to the bottom of a body of water by dropping an anchor or anchors or other ground tackle from a vessel.
- (t) “Authorized Mooring Service” means a certified service approved by the Harbormaster for the commercial building, maintenance, repair (service), placement and hauling of mooring gear and equipment in designated anchorage areas.
- (u) “berth” means any space wherein a vessel is confined by wet slip, float, mooring or any other type of docking facility.
- (v) “boatyard” means a facility whose function is the construction, repair, sale, or maintenance of vessels, which may include provisions for vessel storage, launching, hauling and docking while awaiting service or use.
- (w) “designated anchorages” means established mooring fields at Snug Harbor Deep Water (dredged) Basin, Snug Harbor Basin Flats, Howland’s Landing, Two Rock Channel and Clark’s Island.
- (x) “draft” means the measurement from the water line to the deepest part of the hull.
- (y) “Duxbury waterways” means all waters within the embayment, harbors, rivers and open waters within the boundaries and jurisdiction of the Town of Duxbury, over which the Town of Duxbury may exercise its powers and authority.
- (z) “emergency boat yard” means a boatyard that a mooring permit holder prefers the Harbormaster contact first in the event that the permit holder cannot be reached to address an issue that may arise with their mooring or vessel. This shall not require the boat yard to act on behalf of the permit holder.
- (aa) “fairway” means any locally designated and / or maintained water areas reserved for the unobstructed movement of vessels through mooring fields or designated anchorages.

- (bb) “grace period” means that a permit holder of a mooring location shall be extended a one (1) year grace period (one boating season) to retain their designated mooring, if for whatever reason the ownership of their vessel has been terminated or is in a state of disrepair and / or extraordinary circumstances exist, at the discretion of the Harbormaster.
- (cc) “guest mooring” means any mooring that is not being used by the permit holder may be used as a berth for a transient or other vessel.
- (dd) “Harbormaster” means the duly appointed Harbormaster or any duly appointed Assistant Harbormaster.
- (ee) “length” means the straight line measurement of the overall length on deck from the bow to the stern, measured parallel to the centerline, including rudder, bumpkins, outboard motor brackets, engines, platforms, or any substantial object or gear that requires additional mooring space consideration.
- (ff) “mooring” means the equipment and / or process used to temporarily secure a vessel, other than by anchoring, that consists with the gear as prescribed by the Town of Duxbury, which is placed on the bed of a body of water attached to a buoy.
- (gg) “mooring buoy” means a buoy designed to float a mooring chain.
- (hh) “mooring location” means an assigned location where a buoyant vessel is secured other than a pier, float, wharf, bulkhead, pile or other.
- (ii) “other object” means any floating object, including but not limited to floats, rafts or barges, temporarily secured to the bed of any body of water by anchor or mooring.
- (jj) “pendant” means a length of thimble line attached to a mooring chain used to secure a vessel to the mooring.
- (kk) “permitted vessel” means any vessel with a valid mooring permit in Duxbury waterways issued by the Harbormaster.
- (ll) “person” means any individual, partnership, trust, firm, corporation, association, commission, district, department, board, municipality, public or quasi-public agency or authority.
- (mm) “pick-up buoy” means a buoy that is attached to a mooring pendant.
- (nn) “tidal flats” means all mooring fields located within Duxbury waterways, other than any designated anchorage.
- (oo) “transient guest” means any vessel requesting a guest mooring that does not have a valid mooring permit issued by the Town of Duxbury.
- (pp) “vessel” means every description of watercraft, other than a seaplane on the water, used or capable of being used as a means of transportation on the water.
- (qq) “winter buoy” means an unsinkable buoy that is attached to a mooring that is not hauled for the winter.
- (rr) “winter stick” means a block of wood not to exceed four feet (4’) in length and is attached to a mooring that is not hauled for the winter.

7.6 § 2002 APPLICABILITY

These rules and regulations apply to all of the following:

- (a) Mooring equipment and mooring locations within the waterways of the Town of Duxbury including all fresh water bodies of water.

- (b) Vessels or other objects anchored or moored within the waterways of the Town of Duxbury to include all fresh water bodies of water.

7.6 § 2003 MOORING PERMITS (General)

- (a) All mooring permits are numbered in a manner that designates location.
- (b) It shall be the responsibility of the mooring applicant to annually file a complete mooring application with the Harbormaster for each mooring location they are assigned.
- (c) All vessels moored within the waterways of Duxbury, with the exception of transient vessels, shall have a valid Duxbury mooring permit adhered to the port bow or another conspicuous location as approved by the Harbormaster.
- (d) All other objects shall have a valid Duxbury Mooring Permit or be actively licensed pursuant to M.G.L. Chapter 91.
- (e) All moorings shall have a valid “Mooring Tag”, issued by the Town of Duxbury, secured to it above the waterline in a clearly visible and easily accessible manner.
- (f) Mooring permits are not transferable except by the Harbormaster.
- (g) Mooring permits and locations are not transferable to a new owner if the vessel is sold.
- (h) Mooring permits shall not be “passed down” or transferred to another family member. The only exception of this rule is that if a permit holder is deceased, the mooring permit may be transferred to their legal spouse.
- (i) A mooring permit and location given up for any reason by any vessel owner immediately voids all rights and privileges to that mooring permit and location.
- (j) The Harbormaster may inspect all moorings periodically throughout the boating season to eliminate any hazardous conditions.
- (k) Mooring locations are subject to change at the discretion of the Harbormaster.
- (l) Mooring permit holders are prohibited to change the size of a vessel on their assigned mooring without the advanced approval of the Harbormaster.
- (m) It shall be the responsibility of the mooring permit holder to provide a minimum of twenty-four (24) hours advanced notice to the Harbormaster prior to launching their vessel and occupying their assigned mooring location.

7.6 § 2004 SCHEDULE FOR ISSUING MOORING PERMITS

- (a) All mooring permits issued annually shall expire on December 31st of the calendar year they were issued.
- (b) Mooring applications are available February 15th of each calendar year unless otherwise amended by the Harbormaster.
- (c) Renewal of an existing mooring permit shall be completed before April 15th of each calendar year, unless amended by the Harbormaster.
- (d) Mooring permits that are not renewed before May 15th of each calendar year may be voided and the location may be reassigned pursuant to these rules and regulations.

7.6 § 2005 APPLICATION PROCESS

(a) A person desiring assignment of a new mooring location and issuance of a new mooring permit shall:

1. Complete a valid “Town of Duxbury Mooring Application” provided by the Harbormaster Department.
2. Complete applications shall be submitted to the Harbormaster Department in person.
3. The accepting officer will date stamp and initial the application as received.
4. It is the responsibility of the applicant to contact the Harbormaster within seven (7) to fifteen (15) days of the date the application was received to check on the status of the application.
5. Any application not processed within fifteen (15) days of the date it was received by the Harbormaster shall be considered denied.
6. As mooring locations become available, mooring permits will be granted by the Harbormaster in the order that the application is processed.

(b) A person wishing to renew an existing mooring permit located in one of the Town of Duxbury’s designated anchorages shall:

1. Follow all written instructions of the Harbormaster.
2. Complete a valid mooring application and attachments they receive.
3. Return the completed valid mooring application, all attachments and payment to the Town of Duxbury as prescribed by the Harbormaster.
 - i. If the applicant chooses to return the completed mooring application and the attachments in person, they will receive a mooring permit at that time.
 - ii. If the applicant chooses to return the completed mooring application and the attachments by mail, they shall include a self addressed stamped envelope so the mooring permit can be mailed to them.

7.6 § 2006 WATERFRONT FEES

The waterfront fees for the Town of Duxbury shall be as followed:

- (a) Snug Harbor Deep Water (dredged) Basin Mooring Permit - \$7.00 per foot annually.
- (b) Snug Harbor Basin Flats Mooring Permit - \$7.00 per foot annually.
- (c) Howland’s Landing Mooring Permit - \$6.00 per foot annually.
- (d) Two Rock Channel Mooring Permit - \$15.00 annual administrative application registration fee.
- (e) Clark’s Island Mooring Permit - \$15.00 annual administrative application registration fee.
- (f) Tidal Flats Mooring Permit - \$15.00 annual administrative application registration fee.

- (g) Tender Float Spot Permit - \$110.00 annual administrative registration fee.
- (h) Tender Float Tie-Up Permit - \$90.00 annual administrative registration fee.
- (i) Waiting List Application - \$15.00 per application, initial one time administrative registration fee.
- (j) Permitted Vessel Guest Mooring - \$10.00 per vessel, per night administrative registration fee from 15 June through 15 September. Vessel owners shall complete and sign a Guest Mooring Invoice at the Harbormasters Office.
- (k) Transient Guest Mooring - \$30.00 per vessel, per night, administrative registration fee from 15 June through 15 September. Vessel owners shall complete and sign a Guest Mooring Invoice at the Harbormasters Office.
- (l) Transient Vessel Guest Mooring – no charge on or before 14 June and on or after 16 September if use of guest mooring is approved by the Harbormaster.
- (m) Any vessel while requesting and / or requiring (local) boat yard service may be exempt from said transient guest mooring administrative registration fee at the discretion of the Harbormaster.

7.6 § 2007 MOORING REQUIREMENTS

The following shall be considered as minimum requirements for mooring gear in the respective anchorage:

- (a) Snug Harbor Deep Water (dredged) Basin
 1. Boats under 25' - 300 lb. mushroom or 300 lb. Pyramid - 30' 1/2 chain - 12' of 5/8" rope to chock or (2) 1/2" lines as pendants.
 2. Boats 26' to 35' - 300 lb. Mushroom or 300 lb. Pyramid - 30' 1/2 chain - 12' of 3/4" rope to chock or (2) 5/8" lines as pendants.
 3. Boats 36' to 45' - 500 lb. mushroom or 500 lb. Pyramid - 35' 5/8 chain - 15' of 1" rope to chock or (2) 3/4" lines as a pendants.
- (b) Snug Harbor Basin Flats
 1. Under 16' - 50-75 lb. mushroom or 70 lb. Pyramid - 25' 5/16 chain 12' of 7/16" min. rope to chock or (2) 7/16" lines as pendants.
 2. 17' to 18' - 100 lb. Mushroom or 135 lb. Pyramid - 25' 3/8 chain 12' of 1/2" min. rope to chock or (2) 1/2" lines as pendants.
 3. 19' to 20' - 150 lb. Mushroom or 135 lb. Pyramid - 25' 3/8 chain 12' of 5/8" min rope to chock or (2) 1/2" lines as a pendants.
 4. 21' to 25' - 200 lb. Mushroom or 200 lb. Pyramid - 25' 1/2 chain 12' of 5/8" min rope to chock or (2) 1/2" lines as pendants.

26' to 30' - 300 lb. mushroom or 300 lb. Pyramid - 25' 1/2 chain 15' of 3/4" min rope to chock or (2) 5/8" lines as a pendent.

(c) Tidal Flats

1. Under 16' - 50 - 75 lb. mushroom or 70 lb. Pyramid - 15' 5/16" chain 7/16" min rope to chock.

2. 17' to 18' - 100 lb. mushroom or 135 lb. Pyramid - 15' 3/8" chain 15' 1/2" min. rope to chock.
 3. 19' to 20' - 150 lb. mushroom or 135 lb. Pyramid - 15' 3/8" chain 15' 5/8" min. rope to chock or (2) 1/2" lines as a pendants.
 4. 21' to 25' - 200 lb. Mushroom or 200 lb. Pyramid - 15' 1/2" chain 15' 5/8" min. rope to chock or (2) 1/2" lines as a pendants.
- (d) Howland's Landing, Cove Street, West end of the Powder Point Bridge, and the Back River (deepwater)
1. Under 16' - 50 - 100 lb. mushroom or 70 lb. Pyramid - 15' 5/16 chain 15' of 7/16 min rope to cleat.
 2. 17' to 25' - 200 lb. mushroom or 200 lb. Pyramid - 25' 1/2 chain 15' of 5/8" min rope to cleat or (2) 1/2" lines as pendants.
 3. 26' to 30' - 250 lb. mushroom or 270 lb. Pyramid - 25' 1/2 chain 15' of 3/4" min rope to chock or (2) 5/8" lines as pendants.
 4. 31' to 35' - 300 lb. mushroom or 270 lb. Pyramid - 25' 1/2 chain 15' of 3/4" min rope to chock or (2) 5/8" lines as pendants.
 5. 36' to 45' - 500 lb. mushroom or 500 lb. Pyramid - 25' 5/8 chain 20' of 1" min rope to chock or (2) 3/4" lines as pendants.
- (e) Two Rock Channel and Clark's Island
1. 20' to 30' - 250 lb. mushroom or 270 lb. Pyramid - 40' 1/2" chain 12' 3/4" min rope to chock or (2) 5/8" lines as pendants.
 2. 31' to 35' - 300 lb. mushroom or 270 lb. Pyramid - 40' 1/2" chain 12' 3/4" min rope to chock or (2) 5/8" lines as pendants.
 3. 36' to 40' - 500 lb. mushroom or 500 lb. Pyramid - 40' 5/8" chain 12' 1" min rope to chock or (2) 3/4" lines as pendants.
- (f) All moorings in designated anchorages shall have an approved non-sinkable chain float with a pendant directly connected to the chain above water.
- (g) All mooring chain shall be of the galvanized type; Black iron chain shall not be accepted.
- (h) All moorings in designated anchorages shall be in working order, rigged appropriately and placed in assigned locations by 15 June of each calendar year.
- (i) All moorings in designated anchorages shall be inspected, serviced and maintained by an Authorized Mooring Service unless otherwise authorized by the Harbormaster.
- (j) Cement block of approved type, if used, shall be six times the weight of mushroom required.
- (k) All moorings shall be inspected by the Harbormaster or authorized agent before being set.
- (l) All moorings shall be hauled at the expense of the owner and inspected by the Harbormaster or his authorized Agent every three years. Any mooring with three-eighths inch (3/8") chain shall be hauled at the expense of the owner and inspected by the Harbormaster or his authorized Agent every 2 years.

- (m) Chain size and mooring design are subject to change with or without notice based on the discretion of the Harbormaster for the purpose of public safety.
- (n) All moorings shall be equipped with properly positioned chafe gear, when applicable, as approved by the Harbormaster.
- (o) All mooring shackles shall be safe tied with stainless steel wire.
- (p) Only nylon rope of proper length and diameter shall be used.
- (q) All moorings above mean low water, utilizing mushroom anchors, shall be buried properly below the surface of the flats within three days of being set.
- (r) All mooring buoys shall be white with blue stripe as specified by statute.
- (s) All mooring buoys in any designated anchorage shall legibly designate mooring location and maximum boat size with three (3) to five (5) inch block lettering.
- (t) All pick up buoys shall legibly designate the owner's last name.
- (u) All chain flotation buoys shall be plainly and clearly visible above any tide level at all times.
- (v) Approved winter sticks and winter buoys shall:
 1. Be marked with the owner's name.
 2. Be marked with the mooring location.
 3. Not be installed before November 1st.
 4. Be removed on or before May 1st.
 5. If located within a designated anchorage, be removed or marked with unsinkable buoy to be visible at all tides on or before May 1st.
 6. All fairways be marked with unsinkable buoys to be visible at all tides between November 1st and May 15th.
 7. Inclusive of all Duxbury waterways, except designated anchorages, be marked with an unsinkable buoy to be visible at all tides between November 1st and May 15th.
 8. All Snug Harbor Deep Water (dredged) Basin float moorings, be marked with unsinkable buoys to be visible at all tides between November 1st and May 15th.

7.6 § 2008 DEFECTIVE MOORINGS

- (a) After appropriate notice, owners of defective moorings shall have seven (7) days to correct said mooring, after which time the mooring will be hauled at the direction of the Harbormaster.
- (b) The expense of such removal or hauling, and any liability incurred therefore, shall be the responsibility of the mooring owner.
- (c) Any defective mooring removed or hauled shall be positioned back in its designated location after completed repairs and inspections as soon as possible, or no later than seven (7) days.

7.6 § 2009 MOORING RECORDS

The Harbormaster will keep a detailed description of all moorings, their location, owner's name, contact numbers, home address, emergency boat yard and description of vessel, to

include length, rig and name for the purposes of identifying and addressing any issues that may arise with that mooring location or the vessel assigned to it.

7.6 § 2010 WAITING LIST POLICIES AND PROCEDURES

(a) Waiting Lists for mooring location assignment.

1. The Harbormaster will identify and determine those mooring fields that have received maximum mooring saturation and establish a waiting list for the issuance of mooring locations and permits for those areas. Each mooring field shall have a separate waiting list.
2. The Harbormaster shall also establish a waiting list for existing mooring owners that wish to be reassigned a different mooring location that would allow them the ability to either increase or decrease the size of their vessel.
3. Applicants shall completely fill out and submit a waiting list application and pay the waiting list application fee.
4. All applications shall be complete, signed, dated, and received by the Harbormaster. Received applications will be signed off by the officer in charge and added to the waiting list in the order it was received.
5. Applications shall not be “passed down” or transferred to another family member. The only exception of this rule is that if an applicant dies, the waiting list application may be transferred to their legal spouse.
6. The Town of Duxbury is not liable or responsible for incomplete or lost applications.
7. All complete applications and attached documents submitted to the Harbormaster Department become the property of the Town of Duxbury.
8. All official mooring waiting lists will be kept at the Duxbury Harbormaster’s office.
9. All mooring waiting lists will be periodically up-dated.
10. A copy of all updated waiting lists will be posted at the following locations: Duxbury Harbormaster’s office, Duxbury Free Library, Duxbury Town Clerk and the Duxbury Town Manager / Board of Selectmen’s office.

(b) Assignment of mooring locations within waiting list areas.

1. When a mooring location within a waiting list area becomes available, the Harbormaster will offer a mooring location to the first applicant on the waiting list.
2. The applicant shall respond to the Harbormaster within forty-eight (48) hours after has been received with an answer. If an answer is not given within that time frame, it will be considered a pass.
3. If the applicant chooses not to accept the location, the Harbormaster will offer a mooring location to the first applicant on the existing mooring list requesting a reassignment of their mooring location.
4. If the existing mooring applicant accepts the reassignment thereby still leaving an open mooring to be assigned, then the Harbormaster shall again offer a location to the first applicant on the waiting list.

5. Whenever a mooring location within a waiting list is available, the Harbormaster shall follow the procedures as outlined in 7.6 § 2010(b2, b3) alternating between the first applicant on the waiting list and the first applicant on the existing mooring list requesting a reassignment until all locations have been assigned.
6. Applicants will have three (3) opportunities to accept a mooring location.
7. If within a calendar year multiple mooring locations, in the same vessel size range become available in the same waiting list area and an applicant who is offered a location refuses that location, it is assumed that the applicant will not accept another location within that area. This shall only be counted as one pass for the applicant.
8. The Harbormaster may at his discretion reassign mooring locations to existing and new applicants based on the size of their vessel relative to the maximum length of the mooring location.

(c) Waiting list renewal and removal from list.

1. All waiting list applications shall be renewed annually within a time period of, two weeks before and two weeks after the anniversary date, of the applicant's initial active waiting list application date to be placed on a waiting list.
2. Renewals shall be done in person or in writing only by certified (return receipt) mail and will be date stamped and signed by the Harbormaster.
3. Annual mooring applications for any other mooring within the waters of the Town of Duxbury shall not be accepted as renewal on any waiting list.
4. Failure to renew the waiting list application shall result in the original application being voided and the applicant's name being removed from that waiting list.
5. If an applicant chooses not to accept a location on their third offer, the individual's application shall be voided and removed from that waiting list.

7.6 § 2011 GUEST MOORINGS

The following shall apply to mooring permit holders, permitted guests and transient guests:

- (a) Rules and Regulations for the Waterways of Duxbury Chapter 7.6 § 1006: Berthing, shall apply.
- (b) Moorings vacated by the permit holder for twenty-four (24) hours or longer, for any reason, shall be reported to the Harbormaster Department upon vacating the mooring.
- (c) It shall be the responsibility of the owner and / or their agent to report the status of said vessel and / or mooring to the Harbormaster.
- (d) Guests shall register with the Harbormaster prior to picking up a mooring. The guest shall provide the vessel's length, rig, and registration or documentation number if applicable and number of days they wish to use the mooring.
- (e) Guests shall accept any and all responsibility for loss or damage caused by them or their vessel.
- (f) Guests shall secure the vessel properly on a mooring designated by the Harbormaster with chafe gear in positioned correctly when applicable.
- (g) Local boat yards shall be responsible to ensure any vessel being serviced by them and moored in Duxbury as a registered guest has chafe gear positioned correctly. Rules and

Regulations for the Waterways of Duxbury Chapter 7.6 § 1006 shall apply to that boat yard where applicable and when not in conflict with existing law.

- (h) Transient guests may secure guest tender if used to the Town Tender Float at Town Pier.
- (i) Persons requesting a guest mooring for a period of less than six (6) hours may be exempt from being charged a guest mooring fee provided that they register with the Harbormaster. All other rules and regulations still apply.
- (j) Transient vessels or permitted vessels who use a mooring other than their own without authorization from the Harbormaster shall still be charged the applicable guest mooring fee and shall be cited.

7.6 § 2012 AUTHORIZED MOORING SERVICE POLICY

The following requirements shall apply to the application and approval of Authorized Mooring Service permits:

- (a) One (1) year mooring service experience. Applicant shall provide:
 - 1. Documented proof of knowledge and experience with Duxbury or similar mooring equipment.
 - 2. Local knowledge of the waterways of Duxbury.
 - 3. References as approved by the Harbormaster.
- (b) Utilize a proper mooring service vessel as approved by the Harbormaster.
- (c) Possess required federal, state and local licenses and permits.
- (d) Supply proof of proper liability insurance and workmen's compensation insurance.
- (e) Agrees to abide by all Federal, State, Local laws, rules and regulations, conditions, terms and the direction of the Harbormaster Department.
- (f) Provide twenty-four (24) hour on call status to respond to emergency or exigent circumstances regarding any mooring serviced by them.
- (g) Accepts any and all responsibility for damage or injury caused by them or their employees. The Town of Duxbury and its employees accept no responsibility or liability.
- (h) Existing services shall reapply for Mooring Service Authorization annually within the month of January on forms supplied by the Town of Duxbury. Approval or denial shall be determined within thirty (30) days.
- (i) Existing services shall inform the Harbormaster in writing that they do not want to reapply for Mooring Service Authorization by July 1st of their active permit.
- (j) New applications shall apply for Mooring Service Authorization on forms supplied by the Town of Duxbury. Approval or denial shall be determined within sixty (60) days.
- (k) Applications that are not complete will not be processed. Illegible applications will be considered incomplete. Applications submitted without the requested attachments will be considered incomplete. The Town of Duxbury assumes no responsibility or liability for lost, late or incomplete applications, attachments or documents.

- (l) Failure of the applicant to adhere to the set standards, terms, conditions, rules or regulations, law, or the direction of the Harbormaster may immediately void authorization.
- (m) Minimum standards and requirements may be amended as authorized by law, rule and regulation.
- (n) This authorization is non-transferable.
- (o) The Harbormaster will administer and enforce this policy.
- (p) The Town Manager shall rule on all appeals. Appeals shall be submitted in writing not later than thirty (30) days following a denial or termination of Mooring Service Authorization.

A valid list of authorized mooring services will be posted at the Harbormaster office

7.6 § 3001 NON CRIMINAL DISPOSITION PENALTIES

- (g) The penalty for violations of any of the Town of Duxbury Rules and Regulations for Duxbury Waterways and Town of Duxbury Rules and Regulations for Moorings, Permits and Waiting Lists shall be \$25.00 for the first offense; \$50.00 for the second offense; \$100.00 for the third offense and \$200.00 for the fourth and subsequent offenses.
- (h) Violations of the Town of Duxbury Rules and Regulations for Duxbury Waterways and Town of Duxbury Rules and Regulations for Moorings, Permits and Waiting Lists may be sufficient cause for the Harbormaster to refuse an individual or his vessel the use of town properties or any town waterfront facility for a period of time as determined by the Harbormaster and Board of Selectmen.
- (i) Offenders may be prosecuted by the Harbormaster and all other enforcement agents.
- (j) In the event that any provisions, sections or clauses of the Town of Duxbury Rules and Regulations for Duxbury Waterways and Town of Duxbury Rules and Regulations for Moorings, Permits and Waiting Lists are found to be invalid, such invalidity shall not affect the validity of the remaining portions of those Rules and Regulations.
- (k) The revenue from any said fines, after payment of fees and expenses, shall be paid to the Town of Duxbury, Massachusetts.
- (l) The Town of Duxbury Rules and Regulations for Duxbury Waterways and the Town of Duxbury Rules and Regulations for Moorings, Permits and Waiting Lists may be amended by the Board of Selectmen.

APPENDIX D: INPUT FROM PUBLIC WORK GROUPS

AQUACULTURE

Implementation Action Plan

Objectives: Develop baseline of existing sites and potential sites. Develop Master Plan. Resolve conflict with boaters (existing complaints successful?). Are there aesthetic conflicts with heavy public use? Depth of Bay and height of cages creates conflicts. Identify non-point source pollution sources. Limit aquaculture grants.

Table 1. Summary of Aquaculture Master Plan

What (will be done)	Where (will it be done)	When (will it be done)	Who (will do it)	How (will it be done)
Develop Master Plan	Duxbury Bay	ASAP	Shellfish Advisory Comm.	Determine existing sites (est. 21 now)
				Identify potential sites
				Document degree of success
				Document degree of public use conflicts (based on complaints, tide)
				Limit to protect navigation safety
				Limit in other reasonable form
				Application. Process ensure the grant will be actively used
				Study other limits to expansion

Management Plan and Recommendations Summary

Summary Implementation Action (Work) Plans (table)

- Investigate causes of closure of shellfish beds
- Investigate causes of closure of beaches
- Investigate causes of loss of eelgrass
- Investigate condition of Sensitive receptors – beaches, eelgrass beds, shellfish beds
- Investigate effect of storm drains and NPS pollution on sensitive receptors
- Investigate effects of boating activity on sensitive receptors

Duxbury Bay Management Goals (Measurable characteristics that would be monitored)

Water Quality

Bacteria

Acre-day shellfish harvest opportunities

Trends in dry/wet-weather bacteria indicators

Trends in beach closings

Nutrients and Eutrophication

Trends in nutrient concentrations (NO₃, NO₄, NH₄, PO₄)

Trends in particulate concentrations

Trends in biological oxygen demand (BOD)

Trends in dissolved oxygen (DO)

Toxic Contaminants

Trends in shellfish/benthic invertebrate tissue concentrations

Trends in sediment contaminant levels

Plant Species

. Eelgrass distribution

. Other salt marsh distribution

Animal Species

. Anadromous fish returns

. Abundance of wintering waterfowl

Abundance of shellfish harvest

Habitat Protection

. Conservation lands

. Shoreline development

Habitat Restoration

. Anadromous fish returns (e.g., Island Creek herring fish ladder)

. Shellfish grants

. Restored eelgrass beds ?

BOATING, SAFETY, AND NAVIGATION

Implementation Action Plan

Objective: Insure that the Bay is safe for all users

Table 2. Summary of Boating Master Plan

What (will be done)	Where (will it be done)	When (will it be done)	Who (will do it)	How (will it be done)
Speed posters where people swim	Town landings/ area before bridge	By May 31, 04	Town and harbormaster to enforce	Town Depts.
Mark swim areas warning?	Shipyards, Howlands			
Mark launch areas with signage	Landing Rd.			
Have smaller aquaculture cages and markers				
Better educate boating public				
Establish emergency storm procedure				

PUBLIC ACCESS

Summary Implementation Action (Work) Plans (table)

Topic: Parking and Access to the Bay

Objective: Reduce traffic congestion for Snug harbor to Powder Point and thereby increase safety.

Table 2. Summary of Bay Access

What (will be done)	Where (will it be done)	When (will it be done)	Who (will do it)	How (will it be done)
Investigate Shuttle System/Satellite Parking	High School parking lot to Snug Harbor	Summer 2004	Maritime School, Yacht Club, Bayside, DR and HS, Bay Rider Launch	Joint venture of Town and private entities
Install bike racks at Town Landings	Various landings	ASAP	Town	Town set up/Town Meeting
Survey town landings	All town landings and public ways	Start Summer 04	Town	Volunteers/Consultant

Characteristics of Town Landings and Ways to the Water, Duxbury, Massachusetts

Types of Public Access Properties	Date of Transfer or Acceptance by Town	1899/1900, Report on Town Landings	Contained in, 2002 Open Space and Recreation Plan	Contained in Conservation Land and Other Points of Interest 2000 (ConCom Map)	1893 Surveyed Plans	Acres	Registry of Deeds		Town of Duxbury		Existing Uses						Boat Ramp	Swimming	Picnic	
							Plan Book	Page	Plan Book	Page	Parking									
											Resident Only	Over Sand	Cars	Time Restrictions	Handicapped	Boat Trailer				
Town Landings^a																				
1. Blue Fish River, by Old Mill Dam	1883 and 1909	Yes	Yes	Yes, Blue Fish River Landing	Yes		2	6	1	5	No			No	No	No	No	Yes	Yes	
2. Cove Street, By Old Cove	1834	Designated #5	Yes	Yes, Old Cove Landing	Yes		2	6			No	recommended		No	No	Yes	Yes	Yes	Yes	
3. Drew Salt Works	1834	Designated #4	Yes	Yes	Yes		2	6			No	recommended		No	No	No	No	Yes	Yes	
4. Ford's Stand	1897		Yes	Yes							No	recommended		No	No	no	No	Yes	Yes	
5. Gurnet Bridge, At Powder Point End	1898, County 1870	Designated #1	yes (2)	Yes	Yes						No	recommended	50	No		2	Yes	Yes	Yes	Yes
6. Hardin Hill Road			Yes	Yes					1	17, 75 revised	No	recommended		No	No	Yes	Yes	Yes	Yes	
7. Hicks Point Road	1909			Yes								recommended		No	No	Yes	Yes	Yes	Yes	
8. Howlands Lane	1895		Yes	Yes							No	recommended	18	No	No	3	Yes	Yes	Yes	
9. Josselyn Avenue	1907		Yes	Yes							No			No	No	No	No	Yes	Yes	
10. Landing Road	1909		Yes	Yes		0.21					No	recommended		No	No	yes	Yes	Yes	Yes	
11. Mattakeeset Court	1902, 1916	1900	Yes	Yes		1.05			1	4	No	recommended	60	Yes	4	12	Yes	No	Yes	
12. Peterson's Landing	1898	Designated #3	Yes	Yes			2	6			No	recommended		No	No	Yes	Yes	Yes	Yes	
13. Soule's Landing	1898	Designated #3 (?)	Yes	Yes							No	recommended		No	No	Yes	Yes	Yes	Yes	
14. St. George St., by Old Mill Pond	1834	Designated #6	Yes	Yes, "Anchorage Lane"	Yes	0.21	2	6			No			No	No	No	No	Yes	Yes	
15. Water Street	1899		Yes	Yes							No			No	No	No	No	Yes	Yes	
16. Winsor Street	1919		Yes	Yes							No			No	No	No	No	Yes	Yes	
Ways to the Water^b																				
1. Shipyard Lane	1944		Yes	Yes, Shipyard Lane Beach		1.22	1859	374			√ (not enforced)			27	No	2		No	Yes	Yes
2. Bay Farm	1972		Yes								No					No	No	Yes	Yes	
3. Myles Standish Cellar Hole, Shore Way	1930		Yes	Yes, Myles Standish Homestead					2	144	No	No		Yes	No	No	No	Yes	Yes	
4. Samoset Rd.				No					1	70-71	No	No		No	No	No	No	Yes	Yes	
5. Sagamore Rd.				No					1	70-71	No	No		No	No	No	No	Yes	Yes	
6. Elder Brewster Rd.				No					1	70-71	No	No		No	No	No	No	Yes	Yes	
7. Massasoit Rd.				No					1	70-71	No	No		No	No	No	No	Yes	Yes	
8. Island Creek Pond			Yes	Yes							No	recommended		Yes		No	Yes	Yes	Yes	
9. Elderberry Ln																				

^aTown Landings are, "designated areas to which the Town has an undoubted right, which have been surveyed and recorded with the Plymouth County Registry of Deeds to the low water mark (mean).

^bWays to the Water are, "designated areas to which the Town has rights as public ways to the water, by gift, or otherwise which may or not be restricted as to their usage and which have not been specifically laid out and surveyed to the low water mark and recorded as Town Landings. I in this right are roads properly laid out, improved and extended to the water by funds raised and appropriated by the Town and designated as public highways (by Town Meeting acceptance?).

^cAs reported in, *Report of the Town Landing Study Committee, 1975, Duxbury.*

Characteristics of Town Landings and Ways to the Water, Duxbury, Massachusetts

Types of Public Access Properties	Viewing	Existing Uses			Ecologically Sensitive Receptors in Area				Comments
		Recreational Fishing, Fowling and Navigation Access	Commercial Fishing, Fowling and Navigation Access	Seasonal Uses	Shellfish Beds	Eelgrass Beds	Salt Marsh	Anadromous Fish Run	
Town Landings^a									
1. Blue Fish River, by Old Mil Dam	Yes	Yes	Yes	Yes	Yes		Yes		1975 Report says, Town Report 1904 Article to rescind ban on buildings at Town Landings allowing Engine House to be placed there.
2. Cove Street, By Old Cove	Yes	Yes	Yes	Yes	Yes		Yes		1975 Report says, "1924 Town Report shows land exchange with Clapp and Evans"
3. Drew Salt Works	Yes	Yes	Yes	Yes	Yes		Yes		End of Bay Pond Rd.
4. Ford's Stand	Yes	Yes	Yes	Yes	No		No		Off Gurnet Road on Cape Cod Bay, 1897,98 and 1931 TMA to extend this as highway
5. Gurnet Bridge, At Powder Point End	Yes	Yes	Yes	Yes	Yes		No		1975 Report says, Voted be recorded as a "Highway to the Sea" to conform to the layout of the County Commissioners (1901). Several other improvement votes.
6. Hardin Hill Road	Yes	Yes	Yes	Yes	Yes		Yes		At end of Hardin Hill Rd. named 1941
7. Hicks Point Road	Yes	Yes	Yes	Yes	Yes		Yes		Various TMA
8. Howlands Lane	Yes	Yes	Yes	Yes	Yes	n/a	Yes		1896 TM accepts the road and landing near Allen's Wharf.
9. Josselyn Avenue	Yes	Yes	Yes	Yes	Yes		Yes		1921 hard surfaced as far as possible
10. Landing Road	Yes	Yes	Yes	Yes	Yes		No		Mrs. Foote property?
11. Mattakeeset Court	Yes	Yes	Yes	Yes	No		No		1902 Town Builds Road, 1916 buy 100 feet of frontage Flagg land, 1921 landing bathing beach sea wall completed.
12. Peterson's Landing	Yes	Yes	Yes	Yes	Yes		Yes		
13. Soule's Landing	Yes	Yes	Yes	Yes	Yes		Yes		
14. St. George St., by Old Mill Pond	Yes	No	No	No	No		Yes		1715 Grant, 1902 enlarged settle question(?)
15. Water Street	Yes	Yes	Yes	Yes	Yes		Yes		1900 Accepted as Highway as an extension Water St. to the shore
16. Winsor Street	Yes	Yes	Yes	Yes	Yes		Yes		1922 Voted to widen eastern end for turnin
Ways to the Water^b									
1. Shipyard Lane	Yes	Yes	Yes	Yes	Yes		Yes		Gift of land at end of Shipyard Lane by Mr. Eben Ellison including strip of land 16 feet wide from Washington St. Restricted to Duxbury residents and guests for recreation, no pier shall be erected.
2. Bay Farm	Yes	no	no	yes	Yes		Yes		TMA, recreation purpose
3. Myles Standish Cellar Hole, Shore Way	Yes	Yes	Yes	Yes	Yes		Yes		Gift of Trustees of the Standish Monument Association.
4. Samoset Rd.	Yes	Yes	Yes	Yes	Yes				As public ways. Various years.
5. Sagamore Rd.	Yes	Yes	Yes	Yes	Yes				As public ways. Various years.
6. Elder Brewster Rd.	Yes	Yes	Yes	Yes	Yes		Yes		As public ways. Various years.
7. Massasoit Rd.	Yes	Yes	Yes	Yes	Yes				As public ways. Various years.
8. Island Creek Pond	Yes	Yes		Yes	no				As a public way to shore
9. Elderberry Ln									