

**NATURAL RESOURCES ADVISORY BOARD**

**TOWN OF WELLFLEET**

**WELLFLEET HARBOR  
MANAGEMENT PLAN**

**2006**

**January 2006**

## ACKNOWLEDGMENTS

The Harbor Management Plan developed by the Town of Wellfleet Natural Resources Advisory Board (NRAB) is the result of significant effort on the part of many people.

The NRAB completed this project over the course of more than two years notwithstanding the fact that it had little in the way of budget, and no assigned staff. What it did have was a very dedicated membership, and the assistance of many Wellfleetians (citizens and town employees) who were willing to share their concerns and perspectives over the course of numerous NRAB meetings.

The Natural Resources Advisory Board appreciates the assistance of the following: Emily Beebe, Carl Brievogel, Gail Ferguson, Michael Flanagan, Thomas Flynn, Abigail Franklin, Ben Gitlow, Bob Gross, Suzanne Grout-Thomas, Chick Holtkamp, Cynthia Hope, Tim Hughes, Jeff Hughes, Andy Koch, Eric Mitchell, Cindy Moe, Dennis Murley, Rex Peterson, John Portnoy, Robert Prescott, Robert Buchsbaum, Hillary Greenberg, the Shellfish Advisory Committee, the Open Space Committee, Lisa Berry Engler, Ed Rullman, Mary Von Kaesburg, Fred Young and Helen Miranda Wilson.

Photographs and charts were prepared by the Cape Cod Commission (contacted by Rex Peterson), Mark Adams and Krista Lee of the CCNS and Lezli Rowell (front cover).

The NRAB would like to thank all the citizens of Wellfleet who attended various meetings and discussions.

John W. Riehl, Chair 2005-  
Douglas E. Franklin, Chair 2003-2005  
William Knittle  
Lezli Rowell  
Glen Shields

Natural Resources Advisory Board  
Town of Wellfleet

January 2006

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## LETTER FROM CHAIR

The Town of Wellfleet Natural Resources Advisory Board was established by annual town meeting in 1987 for the purpose of creating a harbor plan, a shellfish plan and identifying and protecting other natural resources of the town. The board is composed of five members, appointed by the board of selectmen. The NRAB acts in an advisory capacity; it has no staff or regulatory authority to accomplish its mission. The Board's major value to the citizens of Wellfleet is to provide a direction for public policy and to identify priorities.

The last harbor plan was drafted in 1995. The citizens of Wellfleet were very active that year, as a local comprehensive plan was also created. Both documents shared major components. Both are available at the Wellfleet Library and on the town's website.

In 2002, a state-certified harbor plan effort was initiated. In 2003, it was obvious that the community needed to step back, re-strategize, and regroup. The Natural Resources Advisory Board proposed two actions: 1. Organize an annual Wellfleet Harbor Conference, focusing on science and "real life" knowledge coming out of the harbor (conferences were successfully held in November 2003, 2004 & 2005); 2) Update the 1995 Harbor Management Plan. The revised strategy involved a homegrown effort, minimal financial expenditure, no outside consultants, and entailed, in essence, a public conversation with Wellfleet citizens to determine if there was any consensus on harbor matters.

Starting in June, 2003, the NRAB met monthly, and often more frequently, to discuss with invited town officers and employees, committees and boards, and members of the public the condition of Wellfleet's harbor, estuarine water quality, natural and economic resources, tidal and sub tidal issues, marina and dredging, and shoreline land use issues. Valuable discussions were held with the beach administrator, harbormaster, health and conservation agent, assistant town administrator, marina advisory board, shellfish constable, public access committee, conservation commission, National Seashore staff, and representatives of Wellfleet Bay Audubon, among others.

The role of the NRAB was to listen to the history, concerns and comments, review all assumptions, and determine appropriate action. The challenge was to craft a path to a public consensus on what problems were truly important and how best to address them. As each chapter was written and reviewed, discussed and revised, copies were posted on the town's website. "Reality" constantly tested our best planning efforts, with QPX and red tide presenting important challenges to the community.

By June 2005, this preliminary draft was completed and presented to the Board of Selectmen. Open meetings were held in the summer of 2005 for public comment on the draft.

This Harbor Management Plan is the result of this process. It is issued in the hope that it will serve the needs of the citizens of the Town of Wellfleet.

John W. Riehl, Chair, 2005-  
Douglas E. Franklin, Chair, 2003-2005  
Natural Resources Advisory Board  
January 2006

## OVERVIEW SUMMARY

Wellfleet Harbor was designated an Area of Critical Environmental Concern (ACEC) in 1989. The state of Wellfleet Harbor has been generally sound now as it was then. There exists a balance amongst the many users of the harbor – the species who live there, boaters, shell and fin-fishers, lovers of nature, and those who enjoy simply the beauty of the harbor.

The sound state of the harbor is the result of many factors, both human and natural. There are many groups throughout the Town who consider themselves as custodians of the harbor and seek to protect it. Many useful actions have been taken since the last Harbor Management Plan (HMP) was issued in 1995:

Regulatory steps have been taken to protect the ACEC designation of the harbor, such as wetlands restrictions and reduction of coliform contamination (septic upgrades, a marina pump out program, installation of catchment basins near the harbor, control of animals on beaches). These must continue.

The Town of Wellfleet, through the Coastal and Pond Access Committee, is taking active steps to protect citizen access to the water, both ways to the water and beach facilities. We support this initiative.

There have been significant conservation purchases adjacent to the harbor, by the Town through the Open Space Committee, the Wellfleet Conservation Trust, and Wellfleet Bay Wildlife Sanctuary, Mass Audubon Society.

The harbor is also favored by its natural features: an open harbor with a ten-foot flushing tide.

However, there are many signals of concern, which require action:

- The last twenty-five years has seen explosive growth in the Town population, summer visitors, boaters, shellfish grants, etc. All of these lead to a more intensive use of the harbor. Closures of shellfish areas downstream of the Herring River dike are on-going.
- High levels of nutrient nitrogen have been found, especially in Duck Creek, the Marina area and Blackfish Creek. These have lead to high levels of Chlorophyll (an indicator of biological activity) and low level of dissolved oxygen. There is evidence for consequent losses in biological diversity. Shellfishermen have reported an increase in seaweeds and algal blooms.
- Eelgrass once existed in Wellfleet Harbor; it is not now present.
- Duck Creek, and the Marina, show a build-up of bottom sediments.
- Revetments and the armoring of the shoreline have gone from practically none to nearly 100% along Mayo Beach, Nauhaught Heights, south Indian Neck and west Lt Island.
- The growth in shoreline development has made harborside access more difficult for Town residents.

## **BASIC PRINCIPLES**

During the course of our harbor management review, we decided that there were several large themes we could all agree to:

- Water quality- maintaining good water quality is critical to all uses of the harbor.
- Ensuring multiple, traditional uses of the harbor, with opportunities for local employment.
- Maintaining the biological diversity of the harbor, with its many habitats and species.
- >Longer term perspective. Policies and actions should withstand the test of time. Therefore, we have favored wherever possible, the use of natural processes to keep a productive, healthy harbor.

## **KEY ACTION RECOMMENDATIONS**

Salt marshes are the critical biological drivers for harbor productivity. Tidal restrictions, especially at the Herring River, should be removed as part of a total plan to protect our salt marshes. Salt Marsh Protection Areas - Chipman's, Fox Island, east Blackfish Creek, Loagy Bay and the Run should be formally recognized and protected. Fortunately, conservation organizations have already taken the lead in these areas.

A plan is needed for remediating the inner harbor watersheds - Duck Creek and Chipmans Cove – by opening Mayo Creek and the old railroad dike, by use of shellfish and, possibly, by land based nitrogen removal technologies. A similar plan may also be needed for Blackfish Creek and Drummer's Cove.

We are woefully lacking of data to support management steps - water quality, finfish populations, salt marsh health, bottom types are examples. When the harbor was uncrowded, these details were not needed - they are now.

The Marina is a key center of Town life and an economic driver for the Town. A long-range plan is needed to guide development of the Marina without affecting the balance of uses in the harbor.

Shoreline development has limited ways to the water and beach uses guaranteed since colonial times. Traditional neighborhood access is fast disappearing. We must act to rebuild those rights.

Armoring of the harbor shorefront has had the consequence of causing major beach erosion. Each beach is different and needs its own recovery plan. Education about the consequences of armoring and alternate solutions is a good starting point.

Systems to insure that pollution does not enter Harbor (buffer zones, catchments, open space, septic design, and education programs).

We must act to ensure productive and sustainable use of all shellfish areas. The Shellfish Constable office should be strengthened with additional regulatory authority in emergencies.

Salt Marsh protection areas should be formally recognized and protected. Fortunately, conservation organizations have already taken the leading actions.

## RECOMMENDATIONS SUMMARY

### Chapter 2 – WATER QUALITY

**Recommendation.** Investigate the regulatory consequences, including by-law and local health regulation changes, in support of the mini-watershed concept. (NRAB, Board of Health (BoH), Conservation Officer)

#### **Recommendations:**

- adequately fund and staff the Town Departments of Health and Public Works (DPW) (Board of Selectmen, Town Administrator);
- continue and enforce regulations for dog-walking and provision of “pooper bags” at all Town beaches (Beach Administrator, DPW);
- complete the plan for storm water remediation along Commercial Street as soon as possible, including any special situations noted by the Division of Marine fisheries (DMF) that will require co-operation from abutters; Wellfleet’s DPW should continue regular maintenance and clean-out of existing catchments (DPW);
- continued education for boaters to use the harbor pump-out facility is important; a by-law to prohibit boat toilet flushing in Wellfleet Harbor is needed (Harbormaster)

#### **Recommendation:**

- establish a Town by-law to require pick-up of dog wastes at any harbor beach (private or public) during the swimming and shellfish growing seasons (NRAB, Beach Administrator);
- ensure that any construction or other project should result in no increase in run-off (Conservation Commission)
- provide toilet facilities at all town beaches. This is especially important at heavily used Mayo Beach: the only toilet is way down at the Harbormaster’s or at Baker Field (Beach Administrator, DPW)
- especially along Duck Creek, the Town should work with abutters to provide the maximum vegetated (upland or marsh) buffer between the roads and the estuary (NRAB, Conservation Officer, Open Space Committee)
- remediate the high coliform bacteria counts in the Herring River system by restoring tidal flushing above the current dike (Board of Selectmen);
- upgrade to at least Title V standard any septic or other system within a set-back distance (about 100 yards) of any water body, including the harbor, (Board of Health)
- refer any subdivision proposals with drainage in resource setback areas to the Conservation Commission for review of catch basin design, installation and maintenance plans (Planning Board)
- work with the state to ensure effective run-off control from Rt 6 (DPW)
- assign responsibility to the DPW for cleaning and inspection of all catch basins in

Town (Town Manager)

- establish a regular monitoring system in the mini-estuaries to track improvements in coliform levels resulting from investments in reduced run-off (NRAB, Conservation Officer)

**Recommendations:**

- Create an education program for citizens, board members and Town officials to increase knowledge about nitrogen overloads, the MEP process and likely outcomes. (Natural Resources Advisory Board, Conservation Officer, Board of Health, Wellfleet Forum)
- Create an education program to encourage a minimum use of fertilizers in Wellfleet (Natural Resources Advisory Board, Conservation Officer)
- Sponsor a broad public education program on modern denitrifying technology options and costs. Experiences with currently installed systems will be valuable references. (NRAB, Board of Health).

**Recommendation:** Coastal Zone Management (CZM) has published (April 2001) a Marina Best Practices Guide for environmental protection. The Harbormaster has implemented many of the provisions: full compliance is supported by NRAB. The same provisions should apply to any private business located on the harbor shoreline. For example, provision must be made to collect and safely dispose of any oils or other hydrocarbons. No activity which might chemically contaminate the harbor – such as power washing of boats – should be allowed along the harbor shoreline. (Harbormaster)

**Recommendation:** Many households accumulate wastes – pesticides, solvents, etc – which must not be disposed of into groundwater via septics. Currently, these materials can be taken to the Transfer Station twice a year. A more convenient system would help ensure proper disposal. We recommend that the Transfer Station devise a system so that wastes could be brought for proper disposal at any time that the Transfer Station is open. (DPW)

**Recommendation:** If a cyst field is confirmed in Cape Cod Bay, test Wellfleet Harbor sediments for “red tide” cysts. If found, then appropriate regulations on shellfish dragging and dredging should be enacted to reduce the risk of disturbing the cysts. (Shellfish Constable, Harbormaster)

**Recommendations:** A remediation plan is required for **Duck Creek**. There will be many components to a plan, as there is more than a single issue to consider. Some are listed here. We urge that a planning group be appointed to create a detailed program.

- investigate the effects of tidal restrictions (the railroad dike, the Mayo Creek Dike, the Marina pier) on sediment deposition in and tidal flushing in Duck and Mayo Creeks. (The original work by Geise, et al, was focused only on the Marina, not the tidal creeks.) In addition, a complete opening of the inlet to Mayo Creek was not modeled: the only change contemplated was to remove the flapper gate through the existing culvert. The effect of a combination of removals of more

than one tidal restriction at a time was not considered.

- the nature of the sediments in Duck Creek north of the marina needs study, to determine if these are a source of nutrients, of bacteria and of other pollutants (Duck Creek was the commercial center of the harbor for over two hundred years).
- opening Mayo Creek could reduce sedimentation in the north channel, provide additional flushing of water to the inner harbor and restore the degraded marsh. It is recognized that there may be some affected properties in the Mayo Creek flood plain. A mandatory first step would be to survey the topography of Mayo Creek to determine the volume of possible tidal inflows and the effect on flood plain properties. Simple protective diking may be required. It may also be the case that an above ground septic systems may be required: this should be seen as an opportunity to reduce nitrate flows into drinking water and the harbor. Many of the benefits of Mayo Creek restoration could still be achieved by using a self regulating tidal gate that would limit effects on the flood plain properties.
- complete the plan to establish catch basins along Duck Creek and at the Marina. Also, there is storm water discharge into upper Duck Creek directly from Rt 6: this is a state responsibility.
- natural processes are to be encouraged. Naturally vegetated borders can remove both nutrients and bacteria. There is not much room along the west side of Duck Creek. However, a plan to work with owners on a border (which could be salt marsh) should be considered. It is well known that shellfish remove nitrogen as they grow. Shellfish reefs can be established in Duck Creek. (Initially, these shellfish might have to be relayed out elsewhere in the harbor before harvesting and consumption.

The goal of these actions is to limit damage to Duck Creek and begin a process of full restoration. This is consistent with our philosophy of being proactive to limit and correct damage to our harbor environment before they become severe and costly.  
(NRAB, Board of Health, Conservation Officer)

**Chipman's Cove.** Chipman's Cove forms its own mini-watershed, which runs from the north section of Indian Neck east to Rt. 6. The waters of the Cove are immediately adjacent to the highly impacted area of the Marina and Duck Creek. The Cove is a critical shellfishing area in Town. Excessive seaweed growth and algal blooms have been seen in the Cove. We strongly urge the need for a special program of testing and prevention in the Cove's watershed. As no further natural flushing of Chipman's cove is possible, the requirement of denitrifying septic systems there should be given serious study. Land for siting of such systems needs to be identified. (Conservation Officer, Board of Health, Open Space Committee (OSC))

**Mayo Beach.** High levels of nutrient nitrogen are measured off Mayo Beach. Also, this is part of Town with elevated levels of nitrate in drinking water. There is no possibility of further natural flushing in this part of the harbor. Denitrifying systems may be required. (Board of Health, OSC)

**Blackfish Creek.** Blackfish Creek shows also high levels of nitrogen nutrient and signs of biological degradation. There are two tidal restrictions at the east end of Blackfish Creek (at Rt 6 and the bike path). Removal of these would create additional flushing of the creek and would also create additional 100 acres of salt marsh. Road-run off from Rt 6 must be eliminated. It has to be considered, though, that Blackfish Creek, like Chipman’s Cove, may eventually be a candidate for a local de-nitrifying septic upgrade program. This may be especially true in Drummer’s Cove. Identification of sites along Blackfish Creek for de-nitrifying systems should be undertaken. (Conservation Officer, DPW,OSC)

**Recommendation.** The Town of Wellfleet should urge support for and implementation of the recommendations of the Massachusetts Ocean Management Task Force. (Board of Selectmen, NRAB)

**Recommendation.** Initiate co-operative programs with other Cape Cod Bay towns to address common issues affecting the health of Cape Cod Bay. (This could make use of the Cape Cod Commission as a start.) Important initial projects would be monitoring of Cape Cod Bay for nutrients and “red tide” cysts. (Board of Selectmen, NRAB)

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### Chapter 3 – NATURAL RESOURCES

**Recommendation:** Expand the role of the Herring Warden, within the proposed Town Harbor Oversight Office (see Ch 8), to that of advocating for and managing healthy, sustainable stocks of finfish in Wellfleet Harbor. (Town Administrator, Herring Warden)

**Recommendation:** Undertake regular inventory of baitfish, squid and jellyfish in the harbor, as well as a survey of Alewives and Eels that run between the harbor and the ponds. The emphasis on baitfish is predicated on the idea that if baitfish are present, the larger sport fish will come. It may also be useful to monitor for specific larger finfish, such as Flounder, which may have a specific loss of bottom habitat. (Herring Warden)

**Recommendation:** Map the habitats required by finfish – such as salt marsh, eelgrass, and seabed bottom types – in Wellfleet Harbor. Where needed, habitat restoration projects (eg: salt marsh restoration, eelgrass planting) should be undertaken. (Herring Warden)

**Recommendation:** Undertake population studies on horseshoe crabs in Wellfleet Harbor in order to understand the risk to the population. (Shellfish Warden)

**Recommendation:** Prepare an informational campaign for shellfishermen and boaters to create an early warning system for invasives. As part of its Best Management Practices program, the Harbormaster should work with boaters to reduce the risk of invasive

species coming into Wellfleet Harbor on boat hulls, in bilge water or by any other mechanism. (Shellfish Constable, Harbormaster, NRAB)

**Recommendation:** NRAB is concerned about the long-term impacts of coastal armoring in Wellfleet and believes that there should be no new coastal armoring. At the same time, we recognize that finding the right strategy that preserves beaches while accounting for property owner concerns is difficult. We recommend that a “summit” of local boards and expertise to devise creative solutions to coastal erosion and sand transport in Wellfleet Harbor. Wellfleet should be a leader, rather than a passive observer, in seeking legal and environmental solutions to human efforts to control nature. (NRAB, ConsCom)

**Recommendation:** The beaches of Wellfleet must be restored. Strategies are needed that are appropriate to the risk and extent of armoring on each beach section of the harbor. In some cases, direct sand replenishment will be appropriate. Construction of "soft" revetments - either by new techniques or by retrofit to old structures – can also be used. These "soft" revetments mimic the action of natural dunes by periodically adding sand and plantings to the revetments so that they act as a dune. Any order of conditions for revetment, groin or seawall construction or replacement should include sufficient steps to avoid unnatural beach or dune loss. In some cases, however, the best strategy will be to remove groins and armoring, in whole or in part. (NRAB, Conservation Commission)

**Recommendation:** Support Open Space Committee proposal that the town begin a special program to restrict development on the (51) town-owned properties within the ACEC on or abutting coastal marshes, and prohibit the sale of these. (See Appx to Chapter 3). (NRAB, Open Space Committee)

**Recommendation:** Propose a town by-law that prohibits any revetments, seawalls or other new structures within 100 feet of any coastal salt marsh. (OSC)

**Recommendation:** Develop a detailed inventory atlas of Wellfleet’s salt marshes. This should include historical data, from aerial surveys (which go back to 1938) and/or older maps. (Conservation Officer)

**Recommendation:** Prepare a proposal for the restoration of Herring River, Mayo Creek, Blackfish Creek and Fresh Brook (Thimas Bog) tidal marshes and flats. The NRAB takes the position that restoration of these marshes is one of the most valuable steps that could be taken to maintain and enhance the quality of the natural resources in Wellfleet harbor. (NRAB, Conservation Officer)

**Recommendation:** As the tidal creeks are a key nursery habitat for the harbor, the biological health of these should be monitored. We propose an on-going sampling program to track the abundance of finfish and nursery species. (Herring Warden, DMF)

**Recommendation:** Some areas of the harbor are recognized as critical wildlife habitats (even above the ACEC designation of the whole harbor) ... for ducks, shorebirds, terrapins and shellfish. They deserve special protection. We propose that eight areas be

designated as "Salt Marsh Protection Areas". Much of the shore of these areas is already conservation land. The inland borders of the proposed areas follows the ACEC border, except where bordered by the Cape Cod National Seashore.

- East of a line running from the SW corner of Lt Island to South Sunken Meadow beach at the Eastham line;
- The north-west corner of Lt Island, from the revetments east to near the boathouse;
- Loagy Bay, including the marshes south and east of Old Wharf;
- Blackfish Creek, east of a line from Pleasant Point landing to the Old Wharf Point;
- North and east of Field Point, towards Fox island;
- Chipman's Cove, the ACEC part south and east of the mooring basin;
- The Herring River estuary, west of a line from the NE corner of Great Island to the salt marshes west of the Chequesett Country Club;
- An eelgrass restoration area, to be determined, on the west side near Smalley Bar (see below).

The following regulation should be established for these protection areas:

- Current moorings, wild shellfishing, aquaculture, fishing and hunting are allowed;
- No new moorings or new aquaculture grants in these areas;
- Shellfish dragging is not allowed;
- Boating in these areas to be on a no wake basis;
- No shoreline structures or armoring are allowed.

**Recommendation:** The intertidal flats in Wellfleet harbor have been little studied in the past. The research begun by the town, Wellfleet Bay Wildlife Sanctuary and the Massachusetts Estuaries Project should be continued and supported to ensure that biodiversity is maintained. (Shellfish Constable)

**Recommendation:** Loose aquacultural netting is a threat to wildlife (such as terrapins, birds and fish). All netting should be removed at harvest time. (This is part of a "Best Practices" for aquaculture.) Efforts should continue to clean up the shoreline each year, as is now done by the Shellfish community (Shellfishermen)

**Recommendation:** Map the subtidal bottoms in Wellfleet and inventory the basic fauna. Following this study, a program is needed to follow the health of this environment, including the effects of dragging. (Harbor Office)

**Recommendation:** A project should be undertaken to attempt eelgrass restoration in Wellfleet harbor. A firm sandy bottom is needed, which should not present a conflict with draggers. The restoration beds should also be marked as off limits to boaters and draggers. The area of Smalley Bar is a good candidate location, as is the sanctuary area south and south-west of Lt. Island. Success would give assurance of the health of the harbor system and would also encourage a bay scallop industry. Failure would require a

careful evaluation of the reasons for failure and possible consequences for the rest of the harbor. (Shellfish Constable)

**Recommendation:** Lands adjacent to the harbor, ideally back to 100', should be naturally vegetated to provide a buffer for the harbor. This is especially important behind salt marshes. Beach and dune systems should be protected by modified conditions on construction and maintenance of hardened structures. (NRAB, OSC)

**Recommendation:** Develop and implement strategy to protect - via purchase, by-law or other means - critical harborside conservation parcels. These include lands along Duck & Mayo Creeks, wetlands subject to tidal restoration and uplands fringing salt marshes. (OSC, Wellfleet Conservation Trust, NRAB)

**Recommendation:** Design and distribute NRAB produced "Natural Resources Protection" pamphlet through the Beach Sticker program, the Harbormasters' and Recreation departments and other Town venues in order to educate and inform the visiting public. (NRAB)

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### Chapter 3A – SHELLFISHING

**Recommendation:** Every three years, sample and report the size of the wild oyster population in Wellfleet Harbor (Division of Marine Fisheries (DMF), Shellfish Constable)

**Recommendation:** Support establishment of oyster bars in appropriate (non-productive, non-aquaculture) habitats of the harbor. (Shellfish Constable)

**Recommendation.** Continue and expand, as needed, clutching operations in Wellfleet Harbor. (Shellfish Constable)

**Recommendation.** Many visitors and summer residents in Wellfleet do not fully understand our shellfish industry and its importance. An on-going educational program (for example, informative plaques are already located at Mayo Beach and the Town Pier) should be expanded. As part of this a shellfish aquarium should be located in the Shellfish building. (NRAB, Shellfish Constable, Harbormaster)

**Recommendation.** A plan is needed to educate and devise remedies for invasive species in Wellfleet Harbor (Conservation Officer, Shellfish Constable, Harbormaster)

**Recommendation.** Research is needed to understand the effects of dragging on the sub-tidal environment. Dragging must be restricted from environmentally sensitive areas. (Shellfish Constable)

**Recommendation:** The Shellfish Constable, using the best available science, and with

the support of the shellfish community and the Board of Selectmen, should continue to take all necessary steps to control threats (such as QPX and other diseases) to both the wild and aquaculture populations of all shellfish. This may require controls on seed imports or on growing conditions. Support to continued development of resistant genetic strains of shellfish. (Shellfish Constable)

**Recommendations:**

- to prevent coliform contamination in the harbor, there must be useful provision of sanitary facilities for beachers and boaters; there must also be effective control of animal wastes on all beaches;
- road and marina storm water run-off must be controlled by completing a system of catchments and funding regular maintenance of these;
- steps must be taken to remediate nutrient (nitrate) overloads, especially in Duck Creek, the Cove, along Mayo Beach and in Blackfish creek;
- the Marina must have effective programs to avoid fuel and boat waste spills and also to avoid introduction of invasive species. (Beach Officer, Harbormaster, DPW, Conservation officer, By-law Committee)

**Recommendation.** Review and upgrade regulations for efficient lay-out and use of aquaculture areas. A process needs to be established for reclamation and re-assignment of license areas that are not being productively used. This process should include a set of priorities for assignment of licenses to new applicants. (Shellfish Advisory Committee)

**Recommendation:** Estimate and report costs to clarify titles of inter-tidal lands of Wellfleet. (Town assessor)

**Recommendation.** Support regulations and best management practices to manage aquaculture sites for healthy production, by controlling seed stock quality, by ensuring a genetically diverse population and by following best practices for site cultivation. The guide to best management practices for aquaculture, published by SEMAC (SouthEastern Massachusetts Aquaculture Center) is highly recommended. (Shellfish Constable)

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## Chapter 4 – SHORELINE LAND USE

**Recommendation:** Separately differentiate the ACEC area with its own permitting criteria, distinct from other districts: coordinate with regulatory boards to develop objectives, such as maintaining a naturally vegetated buffer between natural resource features and permitted structures and uses. Provide forum for regulatory boards to work out criteria to consider when permitting coastal development projects. (NRAB)

**Recommendations.** Because of the importance of Duck Creek, centrally located in the Town, several recommendations for its preservation are summarized here:

- Restore the Mayo Creek marshes
- Open the RR dike
- Plan for de-nitrifying septic systems in the Duck Creek mini-watershed
- Provide naturally vegetated buffers alongside Duck Creek
- Complete the process of preventing storm-water run-off along Commercial Street and its feeders; ensure that the catchment basins are regularly maintained
- Prevent storm-water run-off at the Marina

**Recommendation:** A 100-foot naturally vegetated buffer zone should be created for all municipally owned parcels along the shore. (There are benefits for any buffer zone, no matter how small.) Private landowners should be encouraged to follow suit through educational brochures. Americorps members should be enlisted to survey all parcels along the harbor shore to identify run-off problems. (NRAB)

**Recommendation:** NRAB is concerned about the long-term impacts of coastal armoring in Wellfleet and believes that there should be no new coastal armoring. At the same time, we recognize that finding the right strategy that preserves beaches while accounting for property owner concerns is difficult. We recommend that a “summit” of local boards and expertise to devise creative solutions to coastal erosion and sand transport in Wellfleet Harbor. Wellfleet should be a leader, rather than a passive observer, in seeking legal and environmental solutions to human efforts to control nature. (NRAB, Conservation Commission)

**Recommendation:** The beaches of Wellfleet must be restored. Strategies are needed that are appropriate to the risk and extent of armoring on each beach section of the harbor. In some cases, direct sand replenishment will be appropriate. Construction of "soft" revetments - either by new techniques or by retrofit to old structures – can also be used. These "soft" revetments mimic the action of natural dunes by periodically adding sand and plantings to the revetments so that they act as a dune. Any order of conditions for revetment, groin or seawall construction or replacement should include sufficient steps to avoid unnatural beach or dune loss. In some cases, however, the best strategy will be to remove groins and armoring, in whole or in part. (NRAB, Conservation Commission)

**Recommendation: Wildlife Protection.** Identify and protect wildlife corridors as part of the town’s various land preservation efforts. To minimize adverse human/animal interactions, ways to water and traditional crossings should be protected (OSC).

**Recommendation:** Propose a by-law to minimize exterior illumination within 100 feet of the shore through use of baffles and down lighting solutions. An education program should be developed to protect the night sky and traditional coastal wildlife activities (spawning, feeding, etc.). (NRAB)

**Recommendation:** Support Open Space Committee proposal that the town begin a special program to restrict development on the (51) town-owned properties within the

ACEC on or abutting coastal marshes, and prohibit the sale of these. (See Appx to Chapter 3). (NRAB, OSC)

**Recommendation:** Support the initiatives of the Coastal and Pond Access (C&PA) Committee to ensure broad public access in an environmentally sensitive manner (Board of Selectmen, NRAB)

**Recommendation: Public Access.** Access to the water is becoming increasingly difficult as more shorefront is privatized and traditional, neighborhood access points are closed by new development. Advocate for the Town acquisition of the Appendix 1 unbuildable or undeveloped coastal parcels, to augment the acreage of open space for recreation, create neighborhood “pocket parks” or boat launches, and contribute toward the goal that a Town Landing or “Way to the Water” is within ten minutes walk for nearly every citizen of Wellfleet. Such access points need not entail automobile parking, nor necessarily boat launches. Additional access points need not be municipally purchased, but could be obtained through creative use of easements, conservation restrictions, or other options. (C&PA)

**Recommendation:** Once access to the water is secured, the town should work towards obtaining public lateral transit of shorefront. Again, through creative usage of public funds, easements, tax policies, working with trusts and non-profit groups, lateral passage for historic and traditional uses should be assured for all residents. (C&PA, NRAB)

**Recommendation:** Scenic overviews should be identified and pocket parks designed for passive use. Families and elderly should be able to sit at a park bench or picnic table to observe and enjoy the beauty of Wellfleet Harbor. (DPW, Recreation Department)

**Recommendation:** Walking trails around Wellfleet Harbor should be designed and parcels of public access property stitched together. (Beach Administrator)

**Recommendation:** Hamblin Park, at the end of Uncle Tim’s bridge, should be upgraded with benches, paths and erosion controls. (Conservation Officer, underway in 2005)

**Recommendation: Old Fire Station:** Purchase the east half of the current lot. Establish a kayak launch site and address erosion problems. (Conservation Officer)

**Recommendation:** Support Planning Board efforts to redefine the Central District to more accurately depict existing development patterns. This densely developed area contributes nutrient loading to Duck Creek, has a certain historic and cultural value, and is poised to become served by the expanded Coles Neck Municipal Water supply. These factors in aggregate call for such measures as would reduce the potential redevelopment intensity of use. (NRAB)

**Recommendation:** Protect traditional maritime, water-dependent activities such as the fisheries, commercial and recreational boating and related service industries with

necessary Marina infrastructure repairs and improvements, such as stormwater runoff remediation, and interpretive, educational displays in town facilities. (Harbormaster)

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## **Chapter 5 – HERRING RIVER**

**General recommendations.** The NRAB supports the re-opening and establishment of increased tidal flow in all diked marshes in Wellfleet.

**Recommendation:** An advisory committee should be appointed for each watershed project consisting of: representatives of town officers, agencies and boards involved; federal and state agency representatives; and members of the public representing resource users, property owners, and other significant interests. The committee should provide technical advice based only on the best science and engineering. The committee should also create a basic restoration plan. Public hearings should be held at all major steps in the process (Board of Selectmen)

Note: As of September 2005, the Board of Selectmen of Wellfleet and the Cape Cod National Seashore, acting jointly, had appointed advisory committees for the Herring River marsh restoration. A Memorandum of Understanding jointly agreed to by the Board and the Cape Cod National Seashore defined the committee structure and charge.

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## **Chapter 6 – MARINA and BOATING**

**Recommendation.** The NRAB recommends that the town sponsor several visioning/strategic-planning sessions to determine what the town wants in the marina area and what development, if any, is appropriate for that vision. A venue for this process would be creation of, and approval by the Town, of a Marina Long range Plan by the Marina Advisory Committee (MAC). This plan should contain estimates of growth in Marina use and revenues. (MAC, Harbormaster)

**Capital Planning Process: Recommendation:** The NRAB recommends a local Environmental Impact Statement for marina projects greater than a certain impact (dollars or square feet), with distribution of the proposal to other town agencies and boards similar to the town owned land disposition process recently implemented by the board of selectmen. The NRAB believes that there should be greater public involvement in the review of capital expenditures of the marina. (Harbormaster, MAC)

**Recommendation.** Limit berthing in the dredged basin area of the harbor to a line north of the ACEC boundary of Chipman’s Cove. (Harbormaster)

**Facilities for Commercial Boaters: Recommendation:** Commercial fishermen should be given higher priorities on any waiting lists. We believe that every effort should be made to preserve the town's fishing heritage by providing, if necessary, storage, dry-dock, repairs, ice, water unloading, and provision needs. (Harbormaster)

**Waiting lists: Recommendation:** The NRAB is concerned about the increasingly limited access to moorings and slips at the marina. Waiting lists for moorings and slips and the process should be open and understandable. To the extent lawfully allowed, residents should be granted preference versus non-residents. Currently, turnover is very low (5%); a greater percentage of space should annually turn over. A lottery might be established for a certain number of spaces. Transfer provisions should also be reviewed (family, death etc.). The Inspector General's recommendations relative to Harwich last year should be consulted. (Harbormaster)

**Recommendation.** Education of all boaters in the harbor is the key to safety. All boaters – power boats, sailors, kayakers – need to be aware of traffic and areas of risk. The goal should be that any boater on the harbor should recognize safety as a priority. (Harbormaster)

**Boat Launching: Recommendation:** Establish management guidelines for the use of town landings, including, where appropriate, automobile and trailer parking, launching, and dingy storage. All boat launching via trailer should be done at the marina facilities or at launching points designated by the Harbormaster. (Harbormaster, C&PA)

**Recommendation:** Designating appropriate activity areas (as was done with windsurfing) for kayak launching, water skiing / tube pulling, extreme sports, etc and publish 'right of way' protocols for distribution through beach sticker program and Harbormasters Department. (Harbormaster, Beach Administrator)

**Recommendation.** We recommend that power boats and deep keel sailing boats be excluded from aquaculture grant areas, to avoid risk of damage to equipment (see Ch 3A) (Harbormaster)

**Recommendation. Divers.** All divers must display a diving flag and stay within 100 feet of it. Boaters should observe the divers' flag and stay more than 100' from it. Divers must stay 100 feet clear of any aquaculture lease sites, exempting the lease holder. There shall be no diving for shellfish from October 1 to April 1 south of a line from the breakwater to the eastern tip of Great Island. Diving in the channel is prohibited.

It is imperative that all boaters also understand the significance of a diver's flag and the need to stay clear. (Harbormaster)

**Recommendation.** Prohibit the use of PWC at high speed everywhere except in the open waters of the south harbor. Elsewhere, 'No Wake' rules must apply. A launching area at Burton Baker Beach would permit PWC to be closer to the south harbor and not have to make a long reach at slow speed to attain a permitted zone. Any PWC in Wellfleet harbor should be registered with the Harbormaster. (Harbormaster)

**No Wake Zones: Recommendation:** After appropriate notice and hearing, the Harbormaster should be authorized to establish appropriate operational restrictions to preserve important natural resource areas of the town (no wake zone in important marsh areas; no landing areas where necessary to protect shorebirds, etc.). (See Chapter 3.) (Harbormaster)

**Kayak/Small Craft: Recommendation:** While the town should encourage the development of the Cape Cod Water Trail for small craft, there is the problem that kayaks contain no sanitation devices, can access special areas of marsh and beach frequented by shorebirds and endangered species which have previously been inaccessible. The marina should ensure that appropriate launch areas are available separate from traditional boat ramps and traffic (need for appropriate signage). Restrooms may need to be expanded for the expected growth in personal watercraft. (Harbormaster)

**Small Boat sailing. Recommendation.** The Chequessett Yacht and Country Club (CYCC) offers lesson and opportunities for small boat sailing in the harbor. Small boat sailing is especially suited to a shallow, relatively sheltered harbor such as ours. These offer great opportunities for recreation and learning, especially for youth. The Town Recreation Department should work with CYCC to expand small sailboating opportunities in the harbor. (Recreation Director)

**Pump-out Facilities: Recommendation:** We recommend that the Town fully support the updated sanitary pump-out facility program that the Harbor Master has proposed. We recommend that a sealed head program and an alternate program for transients be established and enhanced. . Above all, an on-going education program for boaters is key to success of this protection effort. Without their active support, the program cannot succeed. (Harbormaster, NRAB)

**Road Runoff/Marina: Recommendation:** To minimize the impact of road runoff from the marina parking lot, we recommend that the Town install catch basins, regrade the surface so that water is directed into the catch basins and regrade and resurface the entire parking lot. Vegetative borders should be established. (Harbormaster, DPW)

**Water Quality: Recommendations:** As indicated in the Water Quality chapter, water quality is a major concern to the many users of Wellfleet Harbor. The marina should implement a standard water quality-testing regimen. Pump outs and fuel facilities should be constantly monitored. Run-off from the pier should be minimized. Oil booms should be easily deployed. The Town should make resources available (for training, personnel and gear) to expand the current oil containment program that the Harbor Master has established. Boat maintenance should be monitored and education efforts directed to minimize use of harmful chemicals. More eco-friendly engines should be encouraged. Protocols should be established for oil spills, chemical spills, biohazards and marine stranding (stranded mammals, when euthanized, may have to be treated as hazardous waste and may be harmful to natural resources). (Harbormaster)

**Alternative Energy: Recommendation:** To the extent possible, the marina should implement “green” technologies such as wind and solar energy, greywater systems, recycling and composting operations. (Harbormaster)

**Public Education: Recommendation:** We recommend that the Chamber of Commerce booklet contain several pages detailing harbor ecology and marina/harbor/shellfish regulations and facilities. (Chamber of Commerce)

**Special Events: Recommendation:** In order to celebrate the town’s maritime heritage, efforts should be made to attract visits from tall ships, training vessels or historic vessels. (Harbormaster)

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## Chapter 6A – DREDGING

**Dredge Spoil: Recommendation:** Dredge spoils can be used to renourish Wellfleet’s beaches. Priority should be given to beaches on the north and east sides of the harbor. An appropriate technical study should be completed before any beach is renourished, especially to avoid that the sand is quickly swept off a beach and onto the inter-tidal flats. The Conservation Commission must, of course, approve any renourishment. Costs can be borne by shorefront owners with armored properties under orders of conditions to renourish their beaches. (Harbormaster, Conservation Officer)

**Recommendation.** A working group of conservation scientists and the harbormaster’s office should convene to identify alternate ways of disposal of “black mayonnaise” spoils. (Harbormaster)

**Recommendation:** A dredging plan should be prepared by the Harbormaster for review by the Marina Advisory Committee, Conservation Committee and Natural Resources Advisory Board. The plan should include:

- description of the dredging process;
- plan for spoils removal;
- pre-testing of sediments, for pollutants (such as heavy metals) and other risk elements;
- proposal for scientific monitoring to determine any effects on adjacent ACEC designated areas and to determine rates of infill following completion of dredging. (Harbormaster)

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## Chapter 7 – COASTAL ECONOMICS

**Marina Recommendations** (Harbormaster):

- Ensure that all fees assessed for services at the marina cover all direct and indirect costs of marina operations.
- Support the marina in developing a long-range business plan. Seek assistance of a marina operations consultant with expertise to establish and test financial projections. Seek state, county or federal grants to finance study
- Ensure that marina enterprise fund has sufficient funds to do regular maintenance, long-term improvements and periodic necessary dredging.
- Establish public “viewing” area with seating, protection from sun and moving vehicles for citizens to watch harbor activities (many citizens travel to Chatham to watch day boats unload).
- Investigate opportunity and viability of high-speed ferry service.

**Harbor Resource Recommendations (NRAB):**

- Encourage adoption of sustainable practices so that natural resources of the harbor (shellfish, finfish, etc.) are not exploited beyond their capacity.
- Work with Division of Marine Fisheries and Cape Cod National Seashore to open up tidal flow to restricted marshes for the purpose of assisting passage of herring and other baitfish. Reestablishment of traditional fishery runs would be expected to improve finfish in harbor for commercial and recreational fishery.

**Economic Development Recommendations (for Long Range Plan):**

- Encourage establishment and expansion of water dependent and water related uses along the waterfront, consistent with regulations that protect the ACEC. One approach is to favor the harbor shoreline for coastal dependent activities (those that must be performed in the coastal zone – marina services, water transport, etc.). Coast linked activities (such as marine science research) and coastal activities serving residents (real estate services, restaurants, retail stores) would have lesser priority. Promote public access to the waterfront where such access will not conflict with water dependent uses.
- Seek grants and partners for construction of marine science laboratory, aquaculture, shellfish hatchery, maritime history and coastal education center near the harbor. Seek a partner (Cape Cod Community College, Suffolk University, U Mass. Dartmouth, Mass. Maritime, or other academic institution).
- Create a Town of Wellfleet economic development committee to assist in partnering with private and public agencies to assist development of marine technologies employment.
- Work with Lower Cape Cod Development Corporation to develop seafood coops, joint marketing plans, and small business assistance programs for Wellfleet businesses. Support firms entering or expanding international markets.
- Support a town-wide marketing program to “eat local” (fish, shellfish, produce, etc.)

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## **Chapter 8 - OVERSIGHT**

**Recommendation:** Create an office or a process, linked to NRAB, that oversees overall harbor oversight issues. (Town Administrator, Board of Selectmen)

**Recommendation:** Independent watershed groups (“Friends of...”) should be formed by local citizens to monitor developments and help keep local residents informed. (Interested Citizens of Wellfleet)

## INTRODUCTION

Wellfleet Harbor was designated in 1989 by the Secretary of Environmental Affairs in as an “Area of Critical Environmental Concern” (ACEC) (301 Code of Massachusetts Regulations 12.00). The designation responded a local citizen’s petition. This designation recognized the quality, uniqueness and significance of the harbor’s natural and cultural resources.

The designation consists of 12,350 acres - Wellfleet Harbor and Bay shoreline, the Herring River system (Gull/Higgins/Herring kettle ponds complex), and small contiguous resource areas located in the towns of Truro and Eastham. For areas within the Cape Cod National Seashore, the ACEC extends from the surface water resource to the 10' elevation contour line; for the rest of Wellfleet, the designation area generally continues 100' landward from the 10' contour line. A map of the Wellfleet Harbor ACEC is at the end of this introductory chapter.

The action affords Wellfleet Harbor heightened environmental scrutiny and review through the existing state environmental regulatory and review framework. These regulations are listed below. Summaries can be reviewed at the ACEC program website, [www.mass.gov/dcr/stewardship/acec](http://www.mass.gov/dcr/stewardship/acec) . The Coastal Zone Management (CZM) website, [www.mass.gov/czm/envpermittoc.htm](http://www.mass.gov/czm/envpermittoc.htm), has a good summary of coastal resource regulations.

ACEC Regulations (301CMR 12.00)

Coastal Zone Management Regulations (301 CMR 20.00, 21.00)

DEP Wetlands Protection Act Regulations (310 CMR 10.00)

DEP Inland and Coastal Wetlands Restrictions (310 CMR 12.00, 13.00)

DEP Waterways (Ch.91) Regulations (310 CMR 9.00)

DEP 401 Water Quality Certification (314 CMR 9.00)

DEP Surface Water Quality Standards (314 CMR 4.00)

DEP Solid Waste Facilities Site Assignment Regulations (310 CMR 16.00)

Massachusetts Environmental Policy Act (301 CMR 11.00)

The purpose of these regulations is the long-term preservation and management of a critical resource.

However, the main consequence of the designation of our harbor as an ACEC is

to remind us anew that we are stewards of the harbor. Citizens of Wellfleet have accepted this challenge for over 300 years. They have done so recognizing the beauty and value that the harbor has for the Town. They have done so valuing also our sense of Wellfleet as a community. This plan is one further step in that on-going history.

For much of the East Coast, shorelines, fields and forests have given way to golf courses, gated communities and luxury homes. Intertidal marshes have given way to marinas and high-rise condominiums. Seasonally used beach cottages have become million dollar mansions. Each new resident uses coastal resources more intensely than their predecessor. Coastal habitats change constantly, but the rate of change is becoming more rapid. How much change is acceptable? Can change be managed to keep within limits that are appropriate and acceptable? Can we maintain the harbor that in a way that supports the community that is Wellfleet?

The members of the NRAB have lived with these questions for the past two years.

During the course of our harbor management review, we decided that there were several large themes that we could all generally agree on.

1. Water quality. Clean water is important to fin fishing, shell fishing, boating, swimming, and other economic and recreational uses of the harbor. Since so many of the uses rely on clean water, protection of water quality became the number one objective.
2. Multiple uses. Since there were so many uses of the harbor, any harbor policy had to recognize and allow for diversity. No single use could exclude other uses. The harbor is balanced among its many users and should remain so.
3. Traditional and historic uses. While no use may monopolize the harbor, effort would be made to respect, accommodate and encourage those traditional and historic uses of the harbor that have given Wellfleet its New England character.
4. Respect for local employment. True communities must provide local employment opportunities. Provision must be made for jobs for local citizens that do not jeopardize the environment or sustainable yields. Harbor management policies need to be crafted which create, encourage and support employment activities that provide livable wages, and which ensure the continuation of an active, affordable community.
5. Public access. The resources of the harbor should be managed to assure fairness and accessibility to all. Enhanced public access to the harbor is an important policy goal.
6. Longer term perspective. Policies should respect the interests of future generations in the health, safety and beauty of their future world. Policies should

reflect wise use principles that ensure that future generations may still find Wellfleet a healthy, safe, sustainable community in which to live.

7. Shared resources. We share the environment with many other species, and their health and well-being are inextricably entwined with our existence.
8. Respect for what we don't know. There is a developing public policy theme called the "precautionary principle", which can loosely be summarized as a traditional conservatism and skepticism relative to the promises of technology. While little in our environment is pristine and untouched by human interaction, we should value natural processes over technological quick fixes.

Over thirty years ago, the Pogo comic strip made history using the line, "We have met the enemy, and he is us". We have a lot of people sharing a small peninsula. Our 21<sup>st</sup> century lifestyle leaves a large ecological footprint. We generate a lot of externalities in our everyday lifestyle.

Wellfleet is a gem in a world of suburban sprawl and anonymous, look alike communities. People recognize this, and more and more people want to live here. Wellfleet real estate is hot, hot, HOT. People like to be near water. This community is not immune to the general economic pressures applicable to shorefront property up and down the Atlantic coast. While the National Seashore controls two-thirds of the town, the remainder could easily become a Wildwoods (New Jersey), an Ocean City (Maryland), or Myrtle Beach (South Carolina). We kid ourselves if we think we're immune from those development pressures.

If we do nothing, what will Wellfleet Harbor look like in twenty years? What action now will make a difference in the quality of our lives 10 years from now? Twenty years from now?

The public policy process is often noisy, messy, and circuitous. Winston Churchill is quoted as saying that democracy is the worst system, except for all the others.

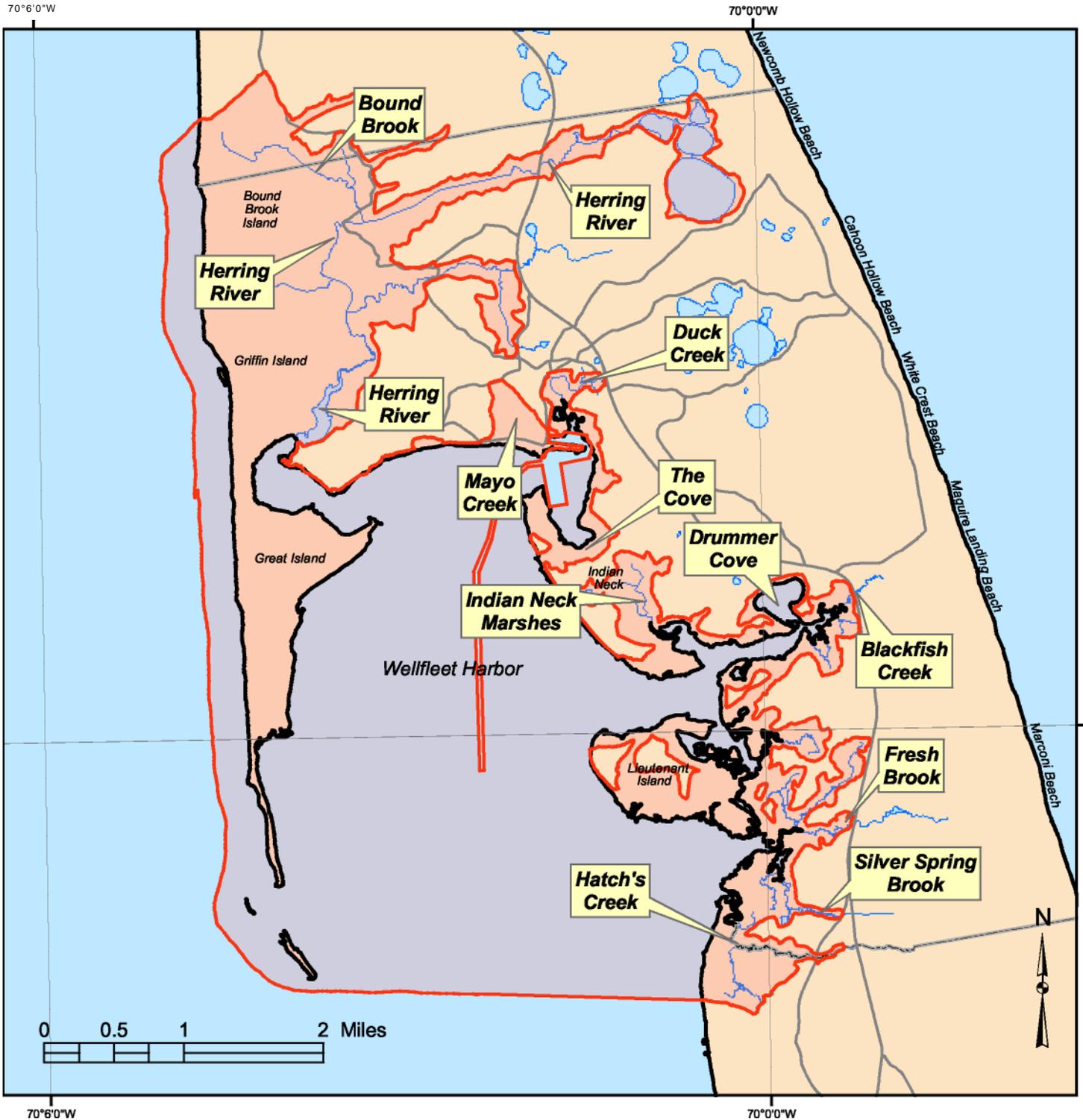
As aware, concerned citizens, we're teachable, capable of adjusting our lifestyles. We can work together to ensure that our grandchildren and great grandchildren will continue to enjoy Wellfleet as a very special place.

# Wellfleet Harbor ACEC



Cape Cod Commission  
A Division of Barnstable County

Town of Wellfleet



## Chapter 1 - HISTORY OF WELFLEET HARBOR

Wellfleet Harbor, a shallow embayment covering 6,094 acres at high water with a tidal amplitude of ten feet, lies open to southerly winds but is protected on the east and north by the curving arm of the Lower Cape and on the west by a bastion of islands of glacial till linked by tombolos and ending in a long sandy spit, Jeremy Point. For the purposes of this Management Plan, we have defined the Harbor as the area comprising all of the waters north of a line running easterly from Jeremy Point to the waters north of a line running easterly from Jeremy Point to the mouth of Hatches Creek, the Eastham-Wellfleet boundary, including the various adjacent salt marshes, the several estuaries and tributary streams as far as the tide flows, and the surrounding upland shores to the extent that they are significantly related to the environment and economy of the harbor waters.

**Geologic History.** Like all of Cape Cod, Wellfleet Harbor was first formed some 50,000 years ago by the final glacial era of the Wisconsin State of the Pleistocene Epoch and has undergone extensive modifications during the final withdrawal of the ice from the erosion of both the eastern and western shorelines by wave action, flash flooding, extensive siltation, and the rise of the sea level. The original Cape Cod Bay shoreline slanted southwesterly from High Head (in North Truro) along what is now the western edge of Billingsgate Shoal. Somewhat east of this ancient beach a series of high accumulations of glacial till extended from north to south, comprising what are now called Bound Brook, Griffin, Great, Great Beach Hill, Little Beach Hill and Billingsgate Islands. Still farther to the east another row of glacial deposits ran south from Bound Brook Island to Merrick Island, Chequessett Neck, Indian Neck, and Lieutenant Island. Within the inverted V formed by these two lines of mounded till now lie Wellfleet Harbor and the Herring River, Duck Creek, and Blackfish Creek estuary systems, relics, it is believed, of an ancient glacial lake.

As the sea level rose during the post-glacial period, at a rate of about one meter every 1,000 years, westward sloping valleys (known as pamets) eroded by glacial outwash, and other low-lying areas between the hills of glacial till were flooded by the rising waters, creating a multitude of peninsulas and islands. The topography was, however, only temporary, for the incoming tides flowing up these many estuaries and inlets deposited more sediment than was carried out by the ebbing waters. Thus for thousands of years and down to the present there has existed a continuous process by which the various estuaries and embayments around the harbor – and likewise the northern part of the harbor itself – have imperceptibly but steadily grown shallower. In addition, as the tidal currents have been slowed, spits of sand and, later, tombolos have formed between the southern islands facing the Bay – between Griffin and Great Island (“The Gut”), between

Great Island and Great Beach Hill (“Middle Meadow”), between Great Beach Hill and Little Beach Hill, and between Little Beach Hill and Billingsgate Island (“Billingsgate Beach”, later to become “Jeremy Point”). Likewise, barrier beaches took shape between

the South Truro bayshore and Bound Brook Island, blocking the mouth of Bound Brook, and between Bound Brook Island and Griffin Island, diking off Duck Harbor, the old northern outlet of the Herring River. This obstruction of outlets to the Bay increased the rate of siltation and aggradation and over the millennia hastened the evolution of the Herring-River-Pole-Dike-Creek-Bound estuary system from a complex of Subtidal inlets to tidal flats to low marshes to brackish fresh marshes to high marshes, and finally to shrubby wet meadows. A similar process occurred in the Duck Harbor and Blackfish Creek estuary systems.

At the same time, the erosion of the high coastal banks enclosing the Harbor on the west, north and east – Great Beach Hill, Great Island, Chequessett Neck, and Lieutenant Island – and likewise, the wearing away by waves and currents of the once inhabited Billingsgate Island (last visible at high tide in 1938), of Smalley Bar, and of Egg Island caused the flooding and ebbing tides to deposit an undetermined quantity of silt on the harbor bottom, which in the early post-glacial millennia was undoubtedly considerably deeper than at the present. A hydrographic chart surveyed in 1850 shows depths off Chequessett Neck one to three feet greater than at present.

This shoaling of the Harbor caused by waves and tidal currents was increased in the early eighteenth century by the windblown erosion of Griffin and Great Islands, Great and Little Beach Hills, and Billingsgate Beach. These once wooded islands and barrier beaches had been reduced in colonial times to barren migrating dunes by deforestation and overgrazing, and the prevailing westerly winds driving the sand into the Harbor. A series of petitions addressed to the General Court by the inhabitants in 1741 and later years warned that the oyster beds might be buried in sand and the harbor might be made unnavigable by the windblown silt unless further destruction of the islands' vegetation could be prevented.

The aggradation of the estuaries and salt marshes was further increased by artificial structures. Perhaps as early as the eighteenth or even the seventeenth century, the inhabitants began the practice of diking salt marshes to create hay meadows. The largest of these dikes was that across the Herring River, constructed in 1908 and rebuilt in 1974; the remains of other, older dikes are to be seen in many locations, for instance in the upper reaches of Duck Creek near Route 6. In addition, a railroad embankment was constructed across Duck Creek in 1870 and a few years later was extended northward across the Pole Dike Creek, Herring River, and Bound Brook marshes. During the 1950's, an embankment was built across the mouth of Mayo Creek to replace a bridge which extended Commercial Street to Commercial Wharf.

The most serious damage was done by the Herring River Dike financed by the town by a \$10,000 bond issue, which turned a productive estuary and salt marsh, abounding in life and serving as the most important factor in the harbor's food chain, into a highly acidic and anoxic environment characterized by massive kills of anadromous and catadromous fishes. This 1908, dike, reconstructed in 1974, was, however, only the most detrimental of many dikes and embankments which both diminished the productivity of the harbor

and increased the rate of siltation by reducing the rate of tidal exchange. The damage was worsened by the filling in of salt marshes, for instance along Commercial Street.

The natural siltation of Duck Creek was thus accelerated first by the filling of wetlands, the dikes, and the railroad embankment and then was made even worse in 1953 by the construction of the breakwater and the Marina and the dumping of dredge spoil in Chipman's Cove, on the northern point of Indian Neck, and in Mayo Creek marsh.

Riprap and concrete rubble dumped by the Town at the Gut with the intention of retarding erosion of the bank facing the Bay had the unexpected effect of so destabilizing the lateral drift of sand as to threaten a breakthrough of the of the Bay into the Herring River. The danger was averted in 1986 by the removal of the rocks and rubble. With this one exception, the entire bay shore from the Truro line to Jeremy Point and likewise the western Harbor shore from Jeremy point to the Dike have remained free from seawalls and groins, thanks to the existence of the National Seashore. Consequently, these beaches have maintained their dynamic equilibrium and have suffered minimal destructive erosion. Unfortunately, seawalls and groins built along Chequessett Neck and Mayo Beach from the Herring River to the Town Pier and along the shores of Indian Neck and Lieutenant Island have seriously destabilized these beaches and have caused erosion of the unwalled banks and dunes, for instance at the Chequessett Yacht and country Club and along Mayo Beach Road (Kendrick Avenue). At the northwest corner of Lieutenant Island the average annual erosion has been calculated to be 5.6 feet per year.

Although some depths were greater in earlier centuries, Wellfleet Harbor has been a tidal harbor since the first settlements in the 1600s. Boats and ships, such as the eighteenth-century whalers and the nineteenth-century mackerel schooners, anchored in the deep hole south of Egg Island, where boats tended them from the beach, or else, in the nineteenth century, they tied up at one of the five wharves, where they grounded out at low tide. Wellfleetians have sailed on the tides ever since the seventeenth century, as they still must do from all moorings outside the dredged basins and slips in Duck Creek.

The 1850 hydrographic chart shows all of Duck Creek eastward of Commercial Wharf (the site of the present Town Pier) dry at mean low water, as it probably had been, at least in large part, since the first settlements. It was not until the early 1950s that the Town, under the leadership of Charles E. Frazier, Jr., undertook to create a deep-water harbor in these mudflats. The first dredging with state funding was begun in 1952, when a 160 by 275 foot area in front of the newly constructed Town Pier and a 70- foot long channel to deep water were dredged to a depth of six feet at mean low water. In 1955 a channel around Shirttail Point and a basin north of the Point were dredged to six feet at MLW. In 1957 the mooring basin south of the Pier was extended 1,850 feet to the south. The breakwater was constructed in 1958 and the same year the Army Corps of Engineers dredged a ten-foot deep mooring basin, 800 by 500 feet and a channel of the same depth three-quarters of a mile long to buoy 12. The Army Corps of Engineers provided maintenance dredging in 1972 and 1981 and by the state in 1968 and 1982. The spoil from these later dredgings was barged to a disposal site in Cape Cod Bay. But that from

the earlier dredgings was used, as has been noted, to construct the Marina or was dumped in Chipman's Cove, on Indian Neck, or in the Mayo Creek Marsh.

Silver Spring Harbor, south of Lieutenant Island was in the first half of the eighteenth century “the only harbor that the ancient town of Eastham have or can have to harbor their vessels, take in loading, or unload goods either to or from market.” (Eastham Town Meeting resolution, May 15, 1738). This haven, which in 1738 was protected by Billingsgate Beach, and the still extensive Billingsgate Point (Island), appears to have fallen into disuse by the nineteenth century, probably both because of shoaling and because of greater exposure to southwest winds. It was supplanted by Blackfish Creek, where the Southern Wharf was constructed in 1856 on what is now called Old Wharf Point.

The Herring River also once afforded a usable tidal harbor. In the early eighteenth century the town's first wharf was built on Griffin Island and was reached by a ford known as the Wading Place. Ships also anchored in Smith's Cove on the North side of Great Island opposite the site of Smith's Great Island tavern. In 1840 the River Wharf Company built the Union Wharf somewhat further upstream under the Chequessett Neck Bluffs. All this area is now largely tidal flats and probably was already shoaling by the middle of the nineteenth century, for the principal piers became Commercial Wharf (1835), Central Wharf (1863) on Mayo Beach near the Mayo Beach Light (1839), and Enterprise Wharf (1870) at the west end of Mayo Beach where the modern road turns inland. The first Billingsgate light, erected in 1822, was replaced by a new lighthouse in 1858.

Thus the natural processes of nature, abetted by man's “improvements,” have created a shallow embayment characterized by a bottom with a very gradual gradient, by a tidal range of ten feet (the largest south of Maine), and consequently extensive tidal flats which total 2,279 acres. The mean depth at mean low water is 3.5 feet and no inshore areas are of navigable depth at low tide (Curley et al. 1972). The six-foot depth contour (at MLW) is 1,000 yards or more distant from Mayo Beach or from any portion of Duck Creek and at least 500 yards distant from Indian Neck. The natural deep-water anchorages in the middle of the harbor are exposed to south and southwest winds and to waves with a fetch of more than eight miles from the Brewster shore. Protected marina slips and inshore moorings navigable at low water can be afforded only by artificial channels and basins, which currently are requiring maintenance dredging about every six to eight years.

**Cultural History.** The first European to visit Wellfleet Harbor was probably the French explorer Samuel de Champlain, who explored the area in 1606 and appropriately christened it Port aux Huitres (Oyster Harbor). The Pilgrims of Plymouth lost little time in exploiting the region's marine wealth. Indeed they were so impressed by the abundance of both shellfish and finfish that even before the first Lower Cape settlements of 1644 they nicknamed both the harbor and the surrounding shores for London's famous

fish market at Billingsgate and had already explored and named the Herring River and knew the Great Bass Pond” near its mouth.

Native Americans were living around the entire perimeter of Wellfleet harbor from Great Beach Hill to Hatches Creek as early as the Middle Archaic Period (8,000 – 6,500 B.P). The inhabitants of the Pononakanet, the local village of Nauset Indians, had combined summertime agriculture and wintertime shellfishing to establish a permanent year-round economy, whose stability was evidenced by the large ossuary (a multiple secondary burial) discovered in 1979 on Indian Neck.

The seventeenth-century settlers, who established homesteads widely scattered on the banks of the Herring River estuary and Duck Creek and on Chequesett Neck and near Silver Spring, relied largely on an agricultural economy based on the abundant salt hay meadows, but they also made good use of the oyster beds both for food and for commerce. A 1674 town meeting held in Eastham (of which Billingsgate Hamlet was then part) voted a bylaw to exclude fishermen from other towns from the Billingsgate flats.

After 1700 the inhabitants turned mainly to the sea for their livelihoods. In the early decades whales were hunted in the waters of the Harbor and of Cape Cod Bay in whaleboats, frequently manned by Indian harpooners, and the whales were brought ashore in Great, Lieutenant, and Try Islands to be tried in great iron kettles. As the local supply of whales was depleted, the people of Billingsgate began building oceangoing whaling ships that cruised as far as Africa. By 1775, it is reported, 420 men were sailing on town fleets of some twenty or thirty ships, bringing great prosperity to the inhabitants. Elisha Doane, the leading ship owner, was reputed to be the second wealthiest man in Massachusetts. The British blockade during the Revolution, however, brought the town’s lucrative enterprise to an abrupt halt. The idle ships rotted at their moorings, the owners went bankrupt, the sailors moved off the Cape, and when peace came there was no money in the town to rebuild the whaling fleet, save on a most modest scale.

The 1770s brought another disaster to Wellfleet, as the town was now called: the loss of the oyster industry. The reasons for the disappearance of the beds have not been positively identified, but it is speculated that the causes were overfishing, the unrestricted use of oyster shells to manufacture lime, and the failure to replace the harvested oysters with cultch (shells) on which new spat could set.

The simultaneous destruction of both the oyster fishery and the whaling had a lasting economic impact, and the population of 1,234 in 1775 declined abruptly. Though after the war Wellfleet slowly recovered, by 1790 the town still contained only 1,113 inhabitants – over a hundred less than before 1776 – and in 1800 only 1,207 people lived in the town.

After the Embargo of 1807 and the War of 1812, from which New England ports suffered grievously, the fishing fleet was slowly rebuilt and by 1837 Wellfleet was home port to some 39 fishing vessels, mainly mackerel schooners, employing 496 men.

Since the seventeenth century, Cape Cod's rutted sand county roads had made travel and the shipment of freight to and from Wellfleet by ship the fastest and cheapest means. Around 1800 the *Mary*, a 24-ton sloop, began a packet service between Wellfleet and Boston, which was continued by other vessels (except during the war of 1812) until 1870, when the Old Colony Railroad reached Wellfleet.

From the 1830s the port of Wellfleet developed rapidly, and the town changed from a scattering of widely spaced farmhouses to a village clustered on the north bank of Duck Creek and along Main Street. No doubt the meager overgrazed Wellfleet farmland offered few enticements to keep a man from the sea. A total of five wharves were built, as has been noted, between 1835 and 1870, in addition to the Southern Wharf on Blackfish Creek. Around these wharves arose various supporting enterprises. In 1837, thirty-nine salt works were producing 18,000 bushels of salt annually. Along Commercial Street were grocery stores, ship chandlers, sail lofts, and hardware stores. Henry Rogers' shipyard on Duck Creek below Uncle Tim's Bridge built eight vessels between 1848 and 1853. The Wellfleet Savings Bank and Wellfleet Marine Insurance Company were established in 1863. Meanwhile, the oyster industry had been revived by the ingenious strategy of bringing oysters from Chesapeake Bay and other southern waters in schooners to Wellfleet and planting them in beds in the harbor until they acquired the true Wellfleet flavor; the oysters were then profitably marketed in Boston. This industry is said to have employed at one time as many as forty schooners. Meanwhile, the relayed oysters spawned and produced a new race of native Wellfleet oysters. Another encouragement to the fishing industry was the Old Colony Railroad, which after 1870 made it possible to ship fish by train to Fall River and thence by steamship to New York and Philadelphia. At the peak of the boom, about 1879, 95 fishing vessels were sailing from Wellfleet.

Yet after 1875 there were signs of decline, though in 1877 the harbor was still homeport to 60 vessels. There were many factors which made it difficult for Wellfleet to compete with Boston, Gloucester, Provincetown, and other fishing ports: the silting of Duck Creek caused by the railroad and Mayo Creek embankments, overfishing of the distant banks, the disadvantages of the shallow-draft centerboard schooners required by the tidal harbor. In the 1870s a petition was sent from Wellfleet to Congress asking that the harbor be dredged, but to no avail. By 1900 not a single deep-sea fisherman was living in Wellfleet.

Captain Lorenzo Dow Baker's purchase in 1885 of the Mercantile Wharf for conversion into the Chequessett Inn marked the beginning of the development of the summer visitor industry planned to replace the defunct mackerel fisheries, though the first summer people had appeared in 1870 with the locomotives. As adjuncts to the Inn, which harbored the Wellfleet Yacht Club, a number of summer cottages were built on Chequessett Bluffs and elsewhere. An associated project was the Herring River Dike intended to "reclaim" the Herring River marshes and thereby, it was hoped, eliminate the mosquitoes, create agricultural land, and open up Great Island, Griffin Island and other areas to real estate development. These and other development projects proved, however,

to be premature and except in the case of the Herring River Dike (which put an end to the herring fishery), had little impact on the harbor or its environment. The present Chequessett Yacht and Country Club was not established until 1931.

The project begun in 1952 to convert Duck Creek into a dredged harbor for shellfish draggers and recreational boats, coinciding with the beginning of a period of continuously accelerating real estate development, did, however, have important consequences, some of which have been noted above.

The increased residential and commercial building adjacent to the harbor and along Duck Creek, the Marina, and the greatly increased number of boat moorings and slips undoubtedly has had some relationship with the pollution of the harbor waters by nitrates and bacteria and eutrophication. Duck Creek from Uncle Tim's to Shirttail Point was closed seasonally, May 1 to October 1. Then, in 1985 the Herring River above the Dike was closed permanently; in addition, since 1985 the Herring River below the Dike and Hatches Creek in South Wellfleet have been closed intermittently. It is quite possible, however, that undetected pollution existed before 1972, for defective septic systems, boat discharges, and storm-water runoff are not modern inventions.

Perhaps the most important environmental event in the modern history of the harbor has been the establishment of the Cape Cod National Seashore in 1961. This act protected the entire western shore of the Harbor from Jeremy Point to the Dike against all development, and afforded similar protection to Griffin, Bound Brook and Merrick Islands and to all the wetlands and shores of the Herring River estuary system as far as Herring Pond. Supplementary protection has been provided by the extensive Massachusetts Audubon Society Wildlife Sanctuary around the shores of Silver Spring Bay and Loagy Bay, and also by the Southern Wellfleet Marsh Trust in Loagy Bay and the Wellfleet Conservation Trust lands adjacent to Loagy Bay and in Blackfish Creek.

Since the early 1800s oyster seed and mature oysters have been planted on town beds and private beds, known as "grants", which in the early 1900s extended 2,040 acres of the harbor. The use of powerboats for dragging began in 1902. The growing of oysters on grants has enjoyed uneven success in recent years because of the presence not only of oyster drills but also of *Codium*, a destructive exotic seaweed, and of MSX (multinucleated sphere X), a disease fatal to oysters though harmless to humans. Since 1974, however, local shellfishermen have enjoyed considerable success with the cultivation of littlenecks and cherrystones (quahogs or hard-shelled clams) grown from laboratory-produced seed planted in propagation boxes and transplanted into grow-out beds, where the quahogs are protected from their natural enemies and achieve a high survival rate.

A decision of the Massachusetts Supreme Judicial Court issued in 1994 (Pazolt) ruled that the planting or growing of shellfish on privately owned tidelands without permission of the owner was not fishing within the meaning of the Ordinances of 1641 – 1647 and therefore not a public right.

**Recent History of Wellfleet Harbor.** What efforts have been made to keep our waters (ACEC classed as an Outstanding Water Resource (ORW)) clean since 1995?

The various town agencies and boards (Planning Board, Zoning Board of Appeals, Board of Health, Conservation Commission, and Open Space Committee) have acted to protect vast areas of wildlife habitat, reduce potential sources of water pollution, prevent the construction of private docks on shoreline properties and preserve the natural beauty of Wellfleet Harbor. The Town adopted a wetland bylaw to protect buffer zones to wetlands, administered by the Conservation Commission.

No dogs are allowed on the beaches during the daytime in the summer. Bales of hay are placed between roads and wetlands to act as filters of bacterial and nutrient contamination. Midcape Lumber will not cut pressure treated lumber on its premises. Regulations for new construction include improvements in septic systems. Failed septic systems must be replaced with new systems, which conform to new regulations. Boat pump out services are provided free of charge to any boats entering Wellfleet Harbor. Leaks from tanks at gas stations have been monitored and treated. New tanks must be double walled.

Increasing recreational uses of the tidal areas has led to conflicts. Watercraft have damaged and have been damaged by shell fishing gear on shellfish grants. New recreational sports such as jet skiing, kite boarding and kayaking have increased the numbers of people out in the harbor. Increased numbers of people with commercial shellfish permits has increased pressure on wild stocks of shellfish.

Regulation of activities in the harbor has been fairly effective. Shellfish grants must be marked off with buoys. Commercial dragging of shellfish is restricted to certain areas and certain times of the year. Jet skis can only operate in the deep channel. Windsurfers must stay out of aquaculture areas during the three hours before and after low tide and must stay at least 50 ft away from swimmers.

Quahog Parasite Unknown (QPX) has appeared on several grants in Wellfleet in late 2004. Most of the clams in the areas showing symptoms have been removed and either sold for food or destroyed. The appearance of QPX in the harbor has heightened our awareness of the importance of following best practices in procuring and raising shellfish on grants.

For years there has been a decline in the North Atlantic fisheries. This has caused the few commercial fishermen still in Wellfleet to either move or pursue more profitable activities.

In 2001, the breakwater channel was dredged. The State Department of Environmental Management dredged the inner harbor from the mooring basin around shirttail Point in 2002. Dredged areas fill in with thick viscous sediment locally known as black mayonnaise. Sedimentation studies indicate that dredged areas will gradually fill in and require periodic maintenance dredging to remain clear. There is a plan to dredge the

mooring basins in 2006. After that, decisions need to be made about providing for future dredging activities in the marina.

People come to Cape Cod for the ability to live near the water and enjoy clean air, clean water and a rural or small town lifestyle. Land prices have increased overall but most significantly near shorelines. Year round residency has increased. The growth in number of visitors and year round residents have contributed to water pollution and nitrogen loading in our bays and estuaries.

The impact of increased usage can be minimized through public education and support of environmentally friendly business practices. People who feel ownership of the environment will act with greater responsibility for its preservation.

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## Chapter 2 -HARBOR WATER QUALITY

Water quality is the theme that ties together all of Wellfleet Harbor. Shellfishing, beach-going, boating, water sports, natural resources ... all depend on the excellence of water quality in the harbor.

In 1989, Wellfleet Harbor was designated an "Area of Critical Environmental Concern" (ACEC). The state ACEC designation recognized the quality and significance of the harbor's natural and cultural resources. The ACEC designation recognized that Wellfleet harbor was an "Outstanding Water Resource" (OWR, see 310CMR4.0). This is the highest and most demanding state classification level. Degradation of ORW waters is not allowed (310CMR 4.04).

In the last ten years, the Town of Wellfleet has seen major growth. This has also resulted in a more intensive use of the harbor. There are now many warning signs of harm to the harbor environment. Several studies have reported elevated nutrient nitrogen levels in the north and east of the harbor, especially Duck Creek, the Herring River estuary and Blackfish Creek. High levels of Chlorophyll (a measure of algal activity) have been measured in Duck and Blackfish Creeks. As well, there has been a loss of biological diversity in the bottom sediments of those same two creeks. Shellfishermen report an increase in fouling by seaweeds. Algal blooms and excessive seaweed growth have been seen in Chipman's Cove. (QPX, a parasite harmful to quahogs, may be hosted in seaweeds; see Ch. 3A.) The shellfish closure below the Herring River dike has been enlarged.. Eelgrass is no longer present in the harbor. Beaches have eroded. In the Fall of 2004, qpx, a quahog disease, was found in Wellfleet Harbor for the first time. In the Spring of 2005, a "red tide" event occurred in Wellfleet Harbor, driven by an unusual Spring nor'easter.

We should not assume we are without further risk. It is imperative and useful for the Town to continue taking all reasonable measure to protect this harbor resource which is so vital to us all. We urge that two principles underlie these efforts:

- "an ounce of prevention is worth a pound of cure"
- maintaining and restoring natural processes around the harbor and its watershed is the best way to protect the complex ecological system that is the harbor.

### Harbor Overview

Wellfleet Harbor, by reason both of its geography, watershed and proactive management, is well favored to maintain good quality water.

First, the harbor has a wide southern entrance and a large (10 foot) tidal range. Every tidal cycle, about two-thirds of the water in the harbor is exchanged with Cape Cod Bay. (However, the completeness of the exchange has not been demonstrated. That is, the proportion of the tidal flow which leaves on one ebb and comes back in on the next

flood is not known.) The extremes of the harbor - such as Duck Creek or the Herring River estuary - are almost completely emptied at each low tide. (Compare this to the northern end of Pleasant Bay or along any of the Nantucket Sound estuaries, which remain well watered even at lowest tides.) The outgoing water is replenished with water from Cape Cod Bay, part of the larger Gulf of Maine oceanic system. The result of this flushing is that any pollutants tend to be diluted and removed before they can accumulate and do harm.

A second advantage is the nature of the upland that comprises the watershed of Wellfleet Harbor. This watershed is small, only about twice the area of the harbor itself. Additionally, much of that upland is in conservation land: the Cape Cod National Seashore (CCNS), the Massachusetts Audubon Sanctuary (MAS) in South Wellfleet, the Wellfleet Conservation Trust and the South Wellfleet Trusts being the main owners. These upland and salt marshes are maintained in a natural state, whose normal processes help maintain the health of the harbor.

Finally, the Town and citizens of Wellfleet have long recognized the importance of harbor water quality. Town Meetings, the Board of Health, the Conservation Commission, the Marina management and many others have acted to preserve the resources of the harbor.

In seeking to protect the harbor, we cannot focus only on the harbor itself. What happens on the uplands surrounding the harbor, especially human activity, can affect the quality of harbor waters. Wellfleet is built on a base of porous sand left over from the last glacier: underground water flows into the harbor from these sands. Rivers and creeks flow into the harbor from the uplands. Any pollutants or nutrients that find their way into these flows (above or below ground) – from septic systems, from fertilizers, from road runoff or any other source – will get to the harbor. The underground flows in particular are very slow – typically about one foot per day. It will take one or five or ten years for any pollutants in the groundwater to reach the harbor.

These watershed flows into the harbor have been divided into nineteen mini-watersheds, or local drainage areas. (see map from Massachusetts Mini-Bay report). These mini-watersheds in many respects act independently from each other.

Thus, we could expect that the issues in Duck Creek (adjacent to the major population center of the Town and to the Marina), the Herring River (mostly in the CCNS but with a severe tidal restriction) and Blackfish Creek (less peopled uplands, more open tidal flushing but right on Rt 6) would be different from each other. This will prove to be the case.

The concept of mini-watersheds could have an important regulatory consequence. Wetland protection regulations are based on the concept of set-backs. Sources of pollution closest to a water body are more tightly regulated. For coliform bacterial contamination, this makes sense. For nitrogen nutrient pollution, it does not. Nitrogen (mostly as nitrates) can travel long distances through the sand which makes up Cape Cod. Thus a harborside source and a source a mile inland – but still within the same mini-watershed – can, in the long run, equally contribute to pollution.

**Recommendation.** Investigate the regulatory consequences, including by-law and local health regulation changes, in support of the mini-watershed concept. (NRAB, Board of Health (BoH), Conservation Officer)

The remainder of this chapter will be devoted to two main topics and several minor ones:

- coliform bacteria
- nutrient overload (primarily nitrogen) in the harbor
- chemical pollutants, "red tides" and Mung (local name for brown drift macro algae).

### **A. Contamination: Coliform Bacteria and Other Pathogens**

For the average citizen or visitor to Wellfleet, water quality is defined by the level of bacterial contamination. It is absence of this contamination which defines waters safe for shellfish harvesting or swimming.

By this standard, Wellfleet has excellent waters.

Harborside beach closings due to contamination are rare and episodic. Regular spot checks on the beaches are organized by the county Department of Health. Any findings of a sufficiently high bacterial count to warrant a beach closing have invariably been temporary and short term: beaches are retested and found again to be clean.

The vast majority of the harbor is open to shellfish takings without any health restriction. There are three small permanent closures: Duck Creek upstream of Uncle Tim's bridge, Hatches Creek and the Herring River adjacent to and also north of the dike. The whole Herring River estuary is closed immediately after a heavy rainfall. Duck Creek between Uncle Tim's and the Marina is subject to a summertime seasonal closing for prophylactic reasons, to avoid risk of contamination during the summer boating season.

Recently (Spring 2005) the shellfish closures south of the Herring River dike have been temporarily extended due to coliform contamination. The Cape Cod National Seashore has completed a fundamental study on this issue (reported by Dr John Portnoy at the 3<sup>rd</sup> Annual State of Wellfleet Harbor conference, November 5 2005). The report showed that the contamination came from north of the Herring River dike. Water conditions there – low salinity, low pH and low dissolved oxygen – enhance bacterial growth. Restoration of tidal marshes in the Herring River would greatly improve the water conditions, leading to lower bacterial growth. Also, the higher seawater volumes would dilute and remnant bacteria.

Coliform testing for shellfish regulation is performed by the state Division of Marine Fisheries (DMF). In 2004, a detailed survey of Duck Creek was completed. A preliminary finding, reported by Jerry Moles of DMF, was there was no evidence of point source contamination (as from failed or inadequate septic systems). Several potential sources for storm-water runoff contamination were noted along Commercial Street from

the Marina to Route 6.

Bacterial contamination arises almost entirely from human and other animal wastes. These can enter the harbor from failed septic systems, from boat discharges, from road rainwater runoff and from direct animal wastes on the beaches. In addition, some sediments may act as reservoirs for bacteria, to be released following rain or other disruptions of the sediments.

It needs to be remembered that very little waste can contaminate a large volume of harbor water. The waste from one person can contaminate a volume of water that just covers a single shellfish aquaculture grant!

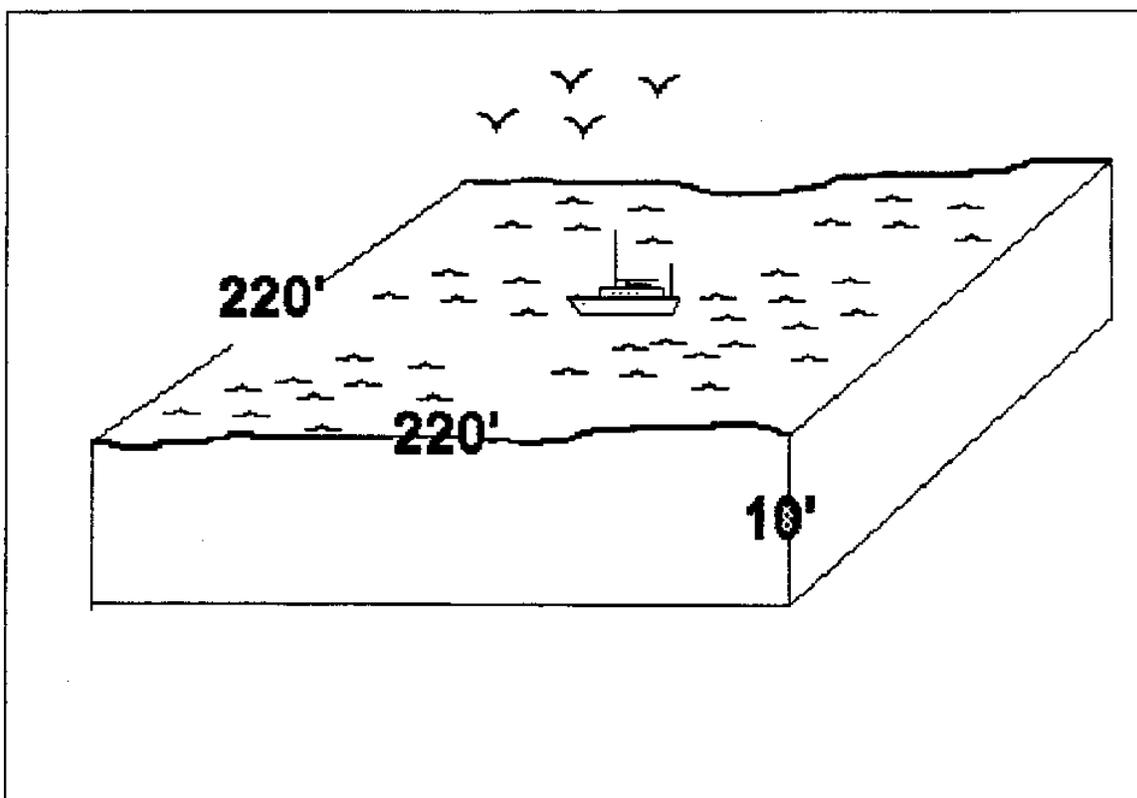


Fig 2. Body of water contaminated to a level exceeding the shellfish standard when one person's daily waste is discharged. (From HMP, 1995)

The healthy situation in Wellfleet harbor is due in part to the many proactive measures implemented in the last 10 years.

The Harbormaster has instituted and maintains a system of boat pump-out for yachts as well as an education campaign. Dogs are restricted from beaches during the summer season. At a number of points around the harbor, doggie mitts are provided for clean-up of wastes. The town Board of Health has acted to enforce local and state regulations, requiring Title V standard septic systems upgrades for identified failures and transacted properties. The town Department of Public Works (DPW) has installed and

maintains catchment basins on Whits Lane, Bank Street, Railroad Avenue and Commercial Street. This is part of a program recommended by Stearns&Wheeler in 2001 (copy of report is in the Wellfleet Town Library). A similar program of storm water remediation is planned by the Harbormaster for the Town Marina: the program is mostly funding delayed.

Some on-going actions must be continued and even strengthened:

**Recommendations:**

- adequately fund and staff the Town Departments of Health and DPW (Board of Selectmen, Town Administrator);
- continue and enforce regulations for dog-walking and provision of “pooper bags” at all Town beaches (Beach Administrator, Dept. of Public Works (DPW));
- the plan for storm water remediation along Commercial Street must be completed as soon as possible, including any special situations noted by DMF that will require co-operation from abutters; Wellfleet’s DPW should continue to carry out regular maintenance and clean-out of existing catchments (DPW);
- continued education for boaters to use the harbor pump-out facility is important; a by-law to prohibit boat toilet flushing in Wellfleet Harbor is needed (Harbormaster)

In addition, some new actions are recommended:

**Recommendations:**

- a Town by-law should be established to require pick-up of dog wastes at any harbor beach (private or public) during the swimming and shellfish growing seasons (NRAB, Beach Administrator);
- ensure that any construction or other project should result in no increase in run-off (as is the case now in Duxbury) (Conservation Commission)
- provide toilet facilities at all town beaches. This is especially important at heavily used Mayo Beach: the only toilet is way down at the Harbormaster’s or at Baker’s Field (Beach Administrator, DPW)
- especially along Duck Creek, the Town should work with abutters to provide the maximum vegetated (upland or marsh) buffer between the roads and the estuary (NRAB, Conservation Officer, Open Space Committee)
- remediate the high coliform bacteria counts in the Herring River system by restoring tidal flushing above the current dike (Board of Selectmen);
- any septic or other system within a set-back distance (about 100 yards) of any water body, including the harbor, should be at least upgraded to Title V (Board of Health)
- refer any subdivision proposals with drainage in resource setback areas to the Conservation Commission for review of catch basin design, installation and maintenance plans (Planning Board)
- work with the state to ensure effective run-off control from Rt 6 (DPW)
- assign responsibility to the DPW for cleaning and inspection of all catch basins in Town (DPW)

- a regular monitoring system in the mini-estuaries is needed to track improvements in coliform levels resulting from investments in reduced run-off (current monitoring only serves well to identify excursions into unsafe conditions) (Conservation Officer)

## **B. Nutrient Overload**

All plants require certain basics to thrive: sunlight, water, as well as sources of carbon, hydrogen and oxygen that are the major elements needed to build plant structures. Many other elements are also needed: chief amongst those are nitrogen and phosphorous. In chemically useful forms, these are much less abundant in nature than the basic three building blocks. (For this reason, nitrogen and phosphorous are the two major components of lawn and garden fertilizers.)

All living plants contain nitrogen (N) and phosphorous (P). Both are required for maximum plants growth. A deficiency in either nutrient implies that that nutrient becomes the limiting factor for growth.

In marine, coastal systems in the north Atlantic, it is generally found that nitrogen is the limiting nutrient. (In kettle ponds the opposite is true: P is the limiting nutrient.) This has been experimentally confirmed for Wellfleet harbor, by measuring the ratio of N:P. Thus, any excess input of nitrogen into a marine environment, such as Wellfleet harbor, leads to increase algal growth in the harbor.

The environmental problems which can follow are due to overgrowth. Over the millennia during which Wellfleet Harbor has come to be, a complex and balance ecosystem has evolved. This system comprises many plants and animals: salt marsh grasses, phytoplankton, invertebrates, shell and finfish, mammals and birds are just a few of the inhabitants (see Ch 3 & 3A on Natural Resources). Excess nitrogen favors only a few of these, typically phytoplankton, other algae and some seaweeds that are able to use both sunlight and the nitrogen. These species begin to grow to excess. (A similar process can take place in an over-fertilized, untended home garden. We have a special name for those plants whose growth is thus favored: they are called "weeds".)

This unwanted excess growth is the start of a process called "eutrophication". This is a process not only of eventual decay but also of great loss of biological diversity. The excess growth leads to a clouding of the water, harmful to many beneficial bottom dwelling plants such as eelgrass and benthic algae. (Normally, the algae and phytoplankton are consumed by larger animals. In excess, however, they die, fall to the harbor bottom and decay.) This decay uses up the dissolved oxygen which is necessary for all life.

It needs to be emphasized that this process of eutrophication occurs only with an excess of nitrogen nutrients. Some nitrogen is required for a healthy, balanced marine environment, just as in the case on land. Only the excess is a concern.

Eutrophication is already well advanced in parts of Cape Cod. The most dramatic recent example is at Waquoit Bay in the town of Mashpee. The algal growth there has

been sufficient to for actual mats of growth to be found at the surface. All the former eelgrass beds, as well as any beneficial shellfish and fin fish are gone. Chatham also has serious problems in some of its inner bays, which will require expensive remediation, Fortunately, Wellfleet Harbor is not in as great risk.

What are the sources of nutrient nitrogen in Wellfleet? We have no detailed data for the harbor. The general sources are known from much work on other north-eastern estuaries.

Of the natural nitrogen sources, atmospheric deposition is the most important. This deposition comes from nitrates, formed in the atmosphere by lightning and washed into the harbor or groundwater by rain. In addition, some bacteria in the salt marshes can directly convert (fix) atmospheric nitrogen to a useful chemical form.

A second natural source into the harbor is from the workings of salt marshes and other primary producers themselves. Healthy salt marshes can release nitrogen, either dissolved (primarily as ammonium) or carried as “detritus” (small decay particles from salt marsh grasses). This release is part of a healthy ecosystem: it is why salt marshes are so important to the harbor’s productivity. However, in a nutrient overloaded marsh, there is excess nitrogen release from both sources. Also, in tidally impacted tidal creeks, this detritus can be trapped in sediments, releasing nitrogen preferentially during the summer, which is the season of highest risk for eutrophication

Past research has identified several man made sources of nitrogen:

- septic systems
- road-run off after rains (coming from atmospheric and vehicular deposition onto roadways as well as animal wastes)
- direct atmospheric deposition from power plant emissions
- fertilizers.

Of these, septic systems are almost always the greatest local contributor of nitrogen. Thus, nitrogen overloads in coastal estuaries are directly related to population and population growth in the watershed.

There have been three studies of nitrogen loadings in Wellfleet Harbor over the past ten years:

- Massachusetts Minibay Project (1998), managed by the Cape Cod Commission with DEP funding;
- a volunteer managed revival of the minibay effort, focusing on the harbor's mini-estuaries (Duck Creek, Herring River, Blackfish Creek), sponsored by the Cape Cod National Seashore CCNS)and the Massachusetts Audubon Society (MAS)starting in 2002
- the Massachusetts Estuaries Project (MEP), supported by the state DEP and the Town of Wellfleet, started in 2003 and intended to run until 2007.

In addition, the Massachusetts Water Resources Authority (MWRA) and Center for Coastal Studies have had projects to monitor the direct effect of the Boston outfall pipe on Cape Cod Bay nitrogen. Thus far (through the 2005 season), no effect has been

shown. The MWRA project will be on-going.

### **A. Minibays Critical Loading**

This was a watershed effort in the history of estuarine management and regulation on the Cape. The concept of mini-estuaries and their associated local watersheds was introduced. (See the Wellfleet Mini-watersheds map following.) The idea of a watershed is a critical departure from past thinking and regulations. All of the sources in a watershed can contribute to nutrient overload. It is not just the sources close to (within a set-back from) the harbor mini-estuary that are of concern. A flushing rate for each mini-estuary was estimated from tidal hydrodynamics. A critical nitrogen loading limit was defined. This was related to three factors:

- the goal for water quality in the estuary: as all of Wellfleet Harbor is an OWR, the highest standards were employed. It is readily admitted that these standards, while based on experiences with other estuaries, are not precise. Local biological conditions may be different from those in the model systems;
- flushing time: systems with poor flushing can sustain less nitrogen enrichment;
- size of the mini-estuary.

The minibays project also included estimates of nitrogen loadings from both natural and anthropogenic sources. The anthropogenic estimates were based on models of population and septic loads feeding the ground water lens.

The conclusion of the Minibays project was that three mini-estuaries of Wellfleet Harbor were at risk for nitrogen overload:

- Duck Creek
- Upper Blackfish Creek, east of Pleasant Point
- Fresh Brook (called Upper Hatches Harbor in the report).

As part of the project, a range of data was collected at ten locations around Wellfleet Harbor. The data included nutrients, temperature, dissolved oxygen and Chlorophyll (a direct measure of plant production in the water column).. The data showed higher levels of both nitrogen and chlorophyll in the north of the harbor.

The study included a more detailed analysis of Duck Creek itself. It was estimated that the nitrogen loading in the Duck Creek water was 70% from Cape Cod Bay (carried in with the tide), 15% natural sources and 15% from land sources. During the summer, an amount of nitrogen equal to the land sources is thought to be released from sediments. This release is much higher than central harbor sediment release. The timing is especially harmful for eutrophication.

# Mini-Watersheds to Coastal Embayments

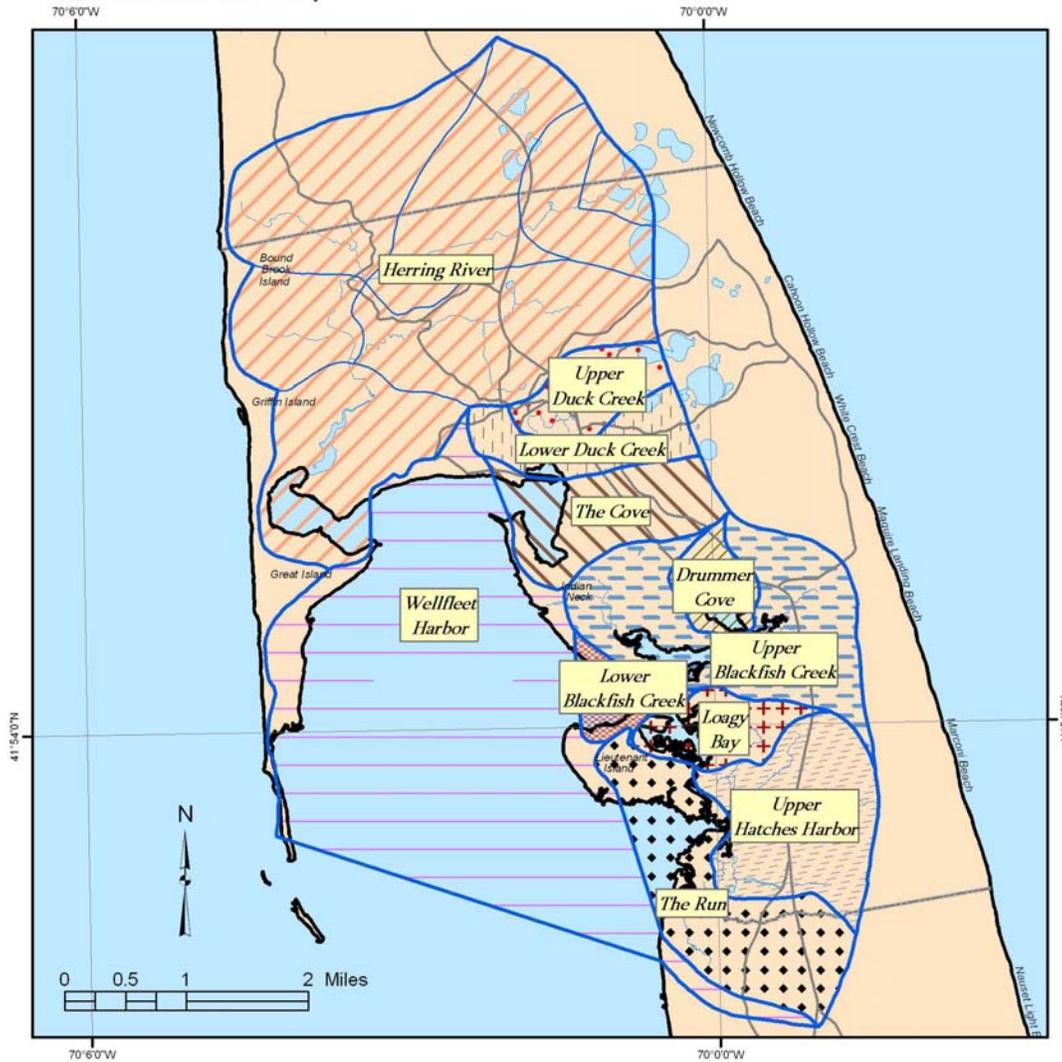


Watershed Lines Derive from  
Mini-Bays Study, 1998



Cape Cod Commission  
A Division of Barnstable County

Town of Wellfleet



## **B. CCNS/MAS**

In the summers of 2002-2005, nutrient data were collected by MAS volunteers and analyzed at the North Atlantic Coastal Laboratory (NACL) of the CCNS. Results are shown in Fig 4 following. The main conclusions are consistent with the Minibays data: that most of the harbor has excellent water quality but that there is a concern in the north and east ends of the harbor, especially in Duck Creek, Chipman's Cove and eastern Blackfish Creek. The levels of total nitrogen in Wellfleet Harbor approaches (but does not equal) the levels found in the most impacted areas of Pleasant Bay and Chatham.

The results of this project are intended to be indicative of possible problems in Wellfleet Harbor, allowing the Town to begin to explore remediation options. Definitive, actionable results will come from the Massachusetts Estuaries Project. It is expected, however, that results from the CCNS/MAS project will be incorporated into the final MEP report.

## **C. Massachusetts Estuaries Project (MEP)**

The state Department of Environmental Protection (DEP) has initiated the Massachusetts Estuaries Project, based on the requirements set by the Federal "Clean Waters Act". The project is managed by a group, headed by Dr. Brian Howes, at the School for Marine Science and Technology (SMAST) at UMass-Dartmouth. Funding comes from the state and from co-participant towns. The Town of Wellfleet is an active co-participant in the project. The goal of the project is to evaluate key estuaries in Massachusetts, defining critical nitrogen loadings and biological risks, and to assist in devising remediation plans where needed. This is an extremely professional and sophisticated project which will utilize all best practices for monitoring and evaluation. The project started in 2003 and will continue on a most intense level in 2004-2006. A final report should follow in 2007.

This project will be critical for Wellfleet. It is important to understand the process.

The MEP will do the basic science for Wellfleet Harbor. This science includes basic chemical measurement, the two most important being nitrogen loadings and dissolved oxygen (DO). All fish and other marine animals require sufficient DO to thrive: Low DO, which can be a direct consequence of eutrophication, can lead to fish kills and other damage. Tidal hydrology will also be measured, leading directly to an estimate of tidal flushing and residence times. A high tidal flushing leads to shorter residence times. A short residence time can offset the effects of higher nitrogen, by sweeping the nitrogen out to sea before it has time to do damage. The final set of science measurements have to do with biological indicators: chlorophyll pigments (directly related to algal concentrations) and estimates of biological diversity in bottom sediments. The connection between nutrient levels and biological harm is the most difficult part of the project.

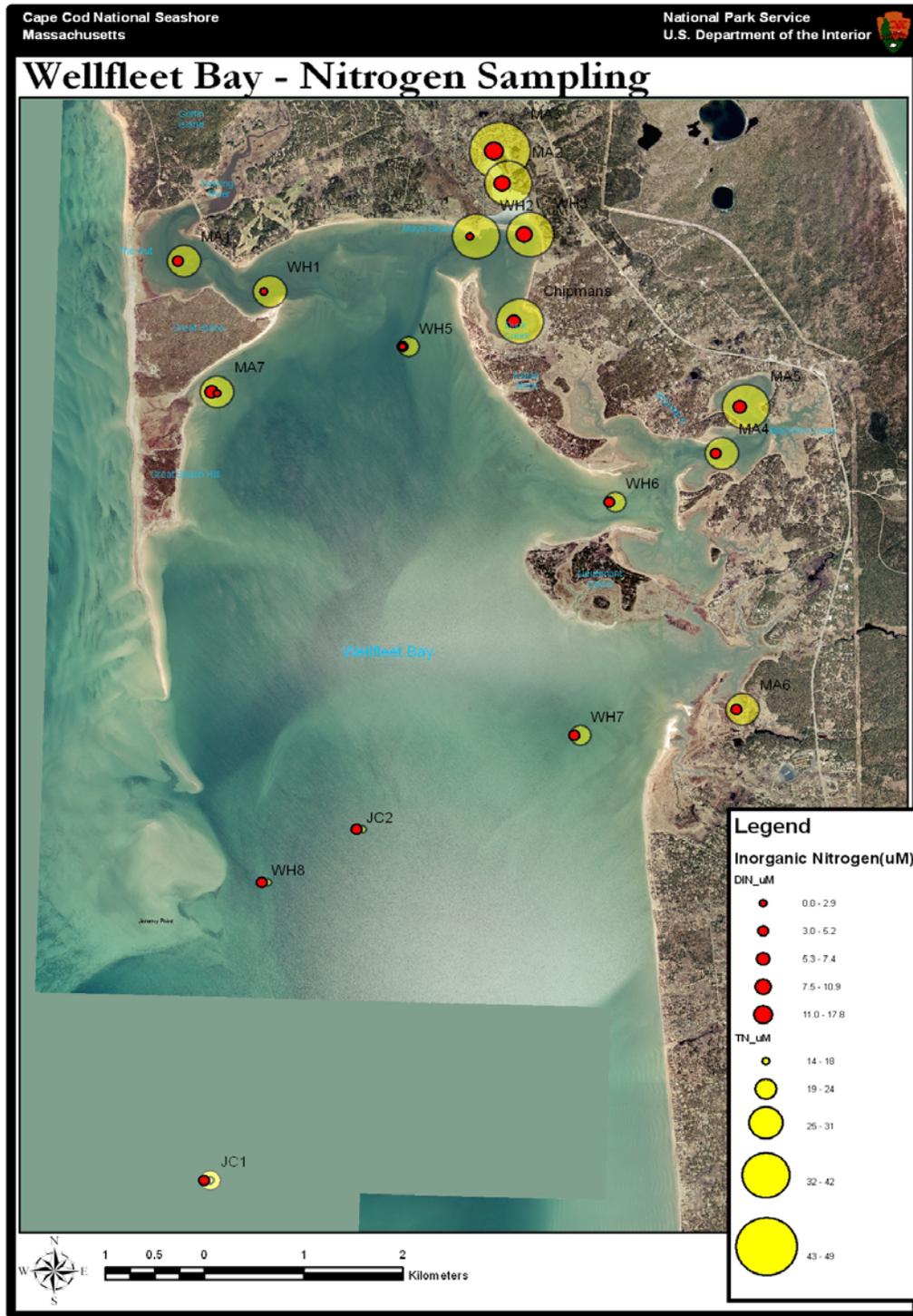


Figure 4. Total nitrogen (yellow/light, uM) and dissolved inorganic nitrogen (red/dark, uM) nutrient sampling in Wellfleet Harbor. Summer averages 2003-2005. (Lee & Riehl)

Using this science, plus experience from other estuaries, a critical nitrogen concentration is estimated for each mini-estuary. Excess of nitrogen above this concentration could lead to eutrophication. The MEP will report these critical concentrations to the DEP.

The next step in the process is regulatory, by the DEP. The DEP will set, for each mini-estuary in the harbor, a Total Maximum Daily Load (TMDL) for nitrogen nutrients. The TMDL is the maximum daily flow of nitrogen into any mini-estuary which will not cause an excess over the critical loading. The TMDL will become a standard for the harbor, with regulatory force. Because of the importance of the TMDL, public hearings are required before DEP can finalize these limits.

As part of its work, the MEP will also model and verify nitrogen sources (atmospheric, sediments, septic, fertilizers, etc. for each mini-estuary. This model is directly tied to land use information – number and kinds of housing, lawn areas, etc – that are in the watersheds for each estuary. An estimate of build out is included in this modeling. Based on these models MEP can report the daily load of nitrogen that is actually flowing into each mini-estuary. Excesses of such loads, over the TMDL, trigger a need for remediation.

A status report on the MEP for Wellfleet was presented to the Town Board of Selectmen in May 2005 and at the State of Wellfleet Harbor conference in November of 2005. The initial conclusions were the same as those from the mid-1990s: the basic harbor water quality is good but there is concern (probably requiring remediation) in Duck Creek, Chipman's Cove, Blackfish Creek, off Mayo Beach and also possibly in the Herring River estuary. Elevated levels of chlorophyll were reported from these areas. More disturbingly, there is also evidence of biological harm (loss of biological diversity) in both Duck and Blackfish Creeks.

We believe there is enough known about nutrient overload in Wellfleet harbor to begin thinking about and planning for remediation.

For remediation, the MEP is recommending that natural processes be used before any de-nitrifying systems are tried. Natural processes include improved flushing, salt marsh restoration and (for Wellfleet) use of growing shellfish. (Shellfish require nitrogen for growth; they must be harvested or relayed out of affected areas to be effective for nitrogen removal.)

We also believe in a "nature knows best" philosophy. Natural processes would also have an advantage over de-nitrifying septic systems of having a faster improvement response. Nitrogen which is already in the ground water would continue to flow to the harbor for many years even after such systems are installed. (Sewerage or de-nitrifying septic systems would, however, have an additional advantage of improving drinking water quality in the long term.)

Wellfleet, through its Board of Health, has already considerable experience with small scale denitrifying systems. These are currently required under local health regulations when siting a new or upgraded septic within a 100' setback from marine resource areas (or any drinking water well). The local regulation was adopted on the recommendation of the 1995 Harbor Management Plan. Technologies employed are called I/A (innovative or alternative), to distinguish from conventional Title V septic system designs, which do not reduce nutrients.

The standard for an I/A system is to reduce nitrates to 19 mg/l from an assumed 42 mg/l strength.

The Barnstable County Department of Health and the Environment has been leach testing I/A brands and supplying data to the Department of Environmental Protection. The county has also set up a tracking system for performance sampling and maintenance events of installed systems to support local Boards of Health.

Wellfleet is a leader in applying a consistent evaluation of septic systems proposal and requiring advanced treatment where feasible.

There will be a further product from the MEP that will be available to the Town. As part of the analysis of Wellfleet Harbor, a hydrodynamic model of tidal volumes and flows will be created. This model will be invaluable in planning remediation efforts, particularly in removing tidal restrictions.

**Recommendations:** Create an education program for citizens, board members and Town officials to increase knowledge about nitrogen overloads, the MEP process and likely outcomes. (Natural Resources Advisory Board, Conservation Officer)

-An education program is needed to encourage a minimum use of fertilizers in Wellfleet (Natural Resources Advisory Board, Conservation Officer, Conservation Commission.)

-A broad public education program on modern denitrifying technology options and costs is required. Experiences with currently installed systems will be valuable references. (NRAB, Board of Health).

- The key sites for remediation planning are:
- Duck Creek – improved flushing by opening the RR dike and Mayo Creek; create a shellfish sanctuary north of the dike;
  - Chipman's Cove – consider special nitrogen wastewater limits for the Cove area, recognizing the critical importance of the Cove to Wellfleet's
  - Shellfishing, both recreational and commercial;
  - Mayo Beach area – consider special nitrogen wastewater limits for the Mayo Beach area (which may also alleviate high drinking water nitrate issue there);
  - Herring River – restore tidal flows by opening the dike;
  - Blackfish Creek – open the tidal restrictions at the east end of the creek and begin to plan for denitrifying septic along east Blackfish Creek and drummer Cove.

More detail on these and other recommendations for action in the harbor and key mini-estuaries are in the final section of this chapter.

### C. Other Issues

**Chemical Contaminants.** Especially during the 1960s and 1970s chemical pollution was a key issue in the United States. By "chemical pollutants" are meant oils, pesticides, PCBs, heavy toxic metals, etc.

It is clear that great progress has been made since that time. For example, Wellfleet now has two pairs of nesting Osprey in the harbor, both nests being on Lt. Island. During the 1960s, these birds had a major population decline due to DDT and other chlorinated hydrocarbons in the environment. The removal of DDT and other chlorinated hydrocarbons from the environment has been a major victory for a cleaner world.

The progress that has been made is also reflected in the fact that there are no broad based issues facing the Town and harbor managers. Of course, the preventive procedures and regulations put in place twenty-five years ago need to be enforced. Wellfleet nearly had a disastrous situation due to an inappropriate disposal of some mercury containing herbicide. We have all recently read of an oil spill in Buzzard's bay: a smaller version is possible in Wellfleet Harbor.

It is essential that the town departments that have responsibility for control of chemical contamination - especially the Departments of Health and The Marina - are adequately funded and staffed. Moreover, when these departments need to take tough measures to maintain the good harbor quality which we now enjoy, they must continue to have the support of the Town's citizens and officers.

**Recommendation:** Coastal Zone Management (CZM) has published (April 2001) a Marina Best Practices Guide for environmental protection. The Harbormaster has implemented many of the provisions: full compliance is supported by NRAB. The same provisions should apply to any private business located on the harbor shoreline. For example, provision must be made to collect and safely dispose of any oils or other hydrocarbons. No activity which might chemically contaminate the harbor – such as power washing of boats – should be allowed along the harbor shoreline. (Harbormaster)

**Recommendation:** Many households accumulate wastes – pesticides, solvents, etc – which must not be disposed of into groundwater via septic. Currently, these materials can be taken to the Transfer Station twice a year. A more convenient system would help ensure proper disposal. We recommend that the Transfer Station devise a system so that wastes could be brought for proper disposal at any time that the Transfer Station is open. (DPW)

**Red Tide.** Red tide is an algal bloom affecting the shellfish industry. The algae produce a toxin which can cause Paralytic Shellfish Paralysis (PSP). PSP does not affect the health of shellfish which ingest the algae. It is extremely toxic to people who eat any shellfish that contain the PSP toxin.

Up until the Spring of 2005, Wellfleet had never had a major red tide event. According to Dr Donald Anderson of the Woods Hole Oceanographic Institute (WHOI), red tides had been extremely rare in all of Cape Cod Bay. However, in 2005, unusual and intense NE storms pushed red tide into all of Cape Cod Bay from the Gulf of Maine.

The risk now is that red tide may reoccur in Wellfleet on a regular basis. That risk is enhanced by the life cycle of the algae.

After blooming, the red tide algae can have a spore like stage in their life cycle. The spores can fall to and reside in bottom sediments. In future Springs – when the waters begin to warm above 5 C - the spores can be activated (bloom again) due to temperature and disturbances to the sediments.

There are no certain known steps to prevent red tides. There seems (according again to Dr Anderson) to be a risk correlation with sediment disturbances which allow the spores to become active and with higher nutrient levels which enhance the bloom. (It has been suggested that the Spring 2005 red tide bloom was accelerated by nutrients washed into Massachusetts Bay by the heavy rains. If verified, this would be direct evidence that the health of Wellfleet Harbor depends also on the health of the whole Gulf of Maine oceanic system. )

The 2005 bloom seems to have originated with cyst bed off Casco Bay and the Bay of Fundy in the Gulf of Maine. Following the 2005 event, there is now concern that a cyst bed may have been created in Cape Cod Bay. Testing is underway at WHOI.

**Recommendation:** If a cyst field is confirmed in Cape Cod Bay, test Wellfleet Harbor sediments for “red tide” cysts. If found, then appropriate regulations on shellfish dragging and dredging should be enacted to reduce the risk of disturbing the cysts. (Shellfish Constable, Harbormaster)

**Mung.** Mung is a local name for a variety of brown algae or brownish-red seaweed mats which have appeared off the back side of Wellfleet over the past summers. These are not harmful. They are a great aesthetic nuisance, however, and greatly reduce the value of the use of the beaches for swimming and fishing.

Mung has never been found in Wellfleet Harbor. There have been reports that it has begun to come around the Provincetown hook. Appearance of mung in Wellfleet harbor could have potentially serious effects for beach use and for shellfishing.

There is astoundingly little known about mung: where it comes from and what conditions lead to its abundance. Without this information, it is difficult at best to judge either the risk or a counter strategy.

A recommendation is at the end of this chapter.

#### **D. Key Mini-watersheds**

**Duck Creek.** Duck Creek, located near the town center and marina, has been impacted in several ways. It has the highest nitrogen level of any part of the harbor. This creates an eutrophication risk not only in Duck Creek but in other near-by parts of the harbor, such as the outstanding shellfish beds in the Cove. Duck Creek upstream of Uncle Tim's Bridge is one of only two parts of the harbor regularly closed to shellfishing: in a shellfishing town, to have any part of the harbor closed is unacceptable. There are also significant sedimentation problems in Duck Creek. These include the "black mayonnaise", fine silts found near the marina (see Ch V). Long-time residents near Duck Creek report an increasing sedimentation of the waters and cordgrass growth, especially upstream of the railroad dike. (However, old photographs, from the turn of the nineteenth century, also show cordgrass in Duck Creek.) Upstream of the marina, the sediments have been shown to trap nutrients (Minibays project) and may also provide a refuge for bacteria.

The evidence suggests two root causes underlying these problems. First, the ground water flow into Duck Creek is nitrogen rich, due to all the septic in the mini-watershed of Duck Creek. The nutrient issues in Duck Creek are directly tied to the central area drinking water problems of high nitrates. The second root cause is the tidal restrictions put in place in the last 125 years: the railroad dike, the closing of Mayo Creek (a tributary of Duck Creek), the extension of Shirrtail Point to form the marina, the marina dredged channels and the breakwater.

The evidence of research done by Drs Graham Geise and Amy Dougherty on sediment flow in Wellfleet shows that the harbor is flood dominated: that is, the natural flow of the harbor is to bring sediment up into Duck Creek. Absent the tidal restrictions, that sediment would be pushed right upstream, acting to build up the upstream marshes. The tidal restrictions inhibit this natural process. The rise of sea levels is predicted to accelerate in the next decades, adding further importance to this issue.

**Recommendations:** A remediation plan is required for Duck Creek. There will be many components to a plan, as there is more than a single issue to consider. Some are listed here. We urge that a planning group be appointed to create a detailed program.

- investigate the effects of tidal restrictions (the railroad dike, the Mayo Creek Dike, the Marina pier) on sediment deposition in and tidal flushing in Duck and Mayo Creeks. (The original work by Geise, et al, was focused only on the Marina, not the tidal creeks.) In addition, a complete opening of the inlet to Mayo Creek was not modeled: the only change contemplated was to remove the flapper gate through the existing culvert. The effect of a combination of removals of more than one tidal restriction at a time was not considered.
- the nature of the sediments in Duck Creek north of the marina needs study, to determine if these are a source of nutrients, of bacteria and of other pollutants (Duck Creek was the commercial center of the harbor for over two hundred years).
- opening Mayo Creek could reduce sedimentation in the north channel, provide additional flushing of water to the inner harbor and restore the degraded marsh. It is recognized that there may be some affected properties in the Mayo Creek flood plain. A mandatory first step would be to survey the topography of Mayo

- Creek to determine the volume of possible tidal inflows and the effect on flood plain properties. Simple protective diking may be required. It may also be the case that above ground septic systems may be required: this should be seen as an opportunity to reduce nitrate flows into drinking water and the harbor. Many of the benefits of Mayo Creek restoration could still be achieved by using a self regulating tidal gate that would limit effects on the flood plain properties.
- complete the plan to establish catch basins along Duck Creek and at the Marina. Also, there is storm water discharge into upper Duck Creek directly from Rt 6: this is a state responsibility.
  - natural processes are to be encouraged. Naturally vegetated borders can remove both nutrients and bacteria. There is not much room along the west side of Duck Creek. However, a plan to work with owners on a border (which could be salt marsh) should be considered. It is well known that shellfish remove nitrogen as they grow. Shellfish reefs can be established in Duck Creek. (Initially, these shellfish might have to be relayed out elsewhere in the harbor before harvesting and consumption).
  - lawn fertilizers are not a major source of nutrients in Wellfleet. However, it is likely that the nutrient overload in Duck Creek is not great, so that even small progress in reducing nutrient levels could be helpful. Therefore, an education program should be established to encourage greatly reduced use of lawn and other fertilizers in the Duck Creek watershed and throughout the Town.

The goal of these actions is to limit damage to Duck Creek and begin a process of full restoration. This is consistent with our philosophy of being proactive to limit and correct damage to our harbor environment before they become severe and costly.  
(NRAB, Board of Health, Conservation Officer)

**Chipman's Cove.** Chipman's Cove forms its own mini-watershed, which runs from the north section of Indian Neck east to Rt. 6. The waters of the Cove are immediately adjacent to the highly impacted area of the Marina and Duck Creek. The Cove is a critical shellfishing area in Town. Excessive seaweed growth and algal blooms have been seen in the Cove. We strongly urge the need for a special program of testing and prevention in the Cove's watershed. As no further natural flushing of Chipman's cove is possible, the requirement of denitrifying septic systems there should be given serious study. Land for the siting of such systems needs to be identified. (Conservation Officer, Board of Health, Open Space Committee (OSC))

**Mayo Beach.** High levels of nutrient nitrogen are measured off Mayo Beach. Also, this is part of Town with elevated levels of nitrate in drinking water. There is no possibility of further natural flushing in this part of the harbor. Denitrifying systems will be required.  
(BoH)

**Herring River.** The fundamental problem facing the Herring River is the tidal restriction at the dike. There are many reasons in the context of a harbor management plan to open the dike (some of these are discussed more fully in other sections of this plan):

- creation of about 1000 acres of new salt marsh (the harbor now has about 1700 acres)
- creation of new shellfish beds
- reduction of bacterial contamination downstream, by a process of dilution. (At the end of a successful restoration, the Herring River will look much like Blackfish Creek. There are no shellfish closings on Blackfish Creek.)
- restoration of alewife and eel migrations as well as a nursery for baitfish
- storm surge protection
- wetland restoration that will help sequester nitrogen.

The Town should proceed to restore tidal flow to the Herring River, using a managed step-by-step process. (This process has, in fact, been started in 2005 by the Board of Selectmen and the CCNS.)

**Blackfish Creek.** Blackfish Creek shows also high levels of nitrogen nutrient and signs of biological degradation. There are two tidal restrictions at the east end of Blackfish Creek (at Rt 6 and the bike path). Removal of these would create additional flushing of the creek and would also create additional 100 acres of salt marsh. Road-run off from Rt 6 must be eliminated. It has to be considered, though, that Blackfish Creek, like Chipman's Cove, may eventually be a candidate for a local de-nitrifying septic upgrade program. This may be especially true in Drummer's Cove. Identification of sites along Blackfish Creek for de-nitrifying systems should be undertaken. (Conservation Officer, DPW, OSC)

**Cape Cod Bay.** The majority of nitrogen in the harbor at any time comes from Cape Cod Bay. This is a direct consequence of the 70% turnover each tidal cycle. Several other environmental problems (red tide, mung) have their origins outside Wellfleet's own harbor. The health of Wellfleet Harbor depends on the health of the whole Gulf of Maine oceanic system. Recently, the Town of Wellfleet, through its Town Administrator, participated in the State of Massachusetts Ocean Management Task Force. The recommendations of this task force can be found at

<http://www.state.ma.us/czm/momi/finalrpts.htm>.

**Recommendation.** The Town of Wellfleet should urge support for and implementation of the recommendations of the Massachusetts Ocean Management Task Force. (Board of Selectmen, NRAB)

**Recommendation.** Initiate co-operative programs with other Cape Cod Bay towns to address common issues affecting the health of Cape Cod Bay. (This could make use of the Cape Cod Commission as a start.) Important initial projects would be monitoring of Cape Cod Bay for nutrients and "red tide" cysts. (Board of Selectmen, NRAB)

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## Chapter 3 -NATURAL RESOURCES

This portion of the Harbor Management Plan focuses on the bountiful and diverse natural resources of Wellfleet harbor. The term 'Natural Resources' encompasses much more than that which has immediate market value, such as harvested shellfish or finfish species. The natural resources of our estuarine harbor and its watershed includes open marine waters, coastal tidelands, salt marshes and tidal creeks, barrier beaches and dunes, upland oak/pitch pine forest and heathscapes, as well as the several freshwater streams and sources which flow into the harbor.

These habitats support varied plant and wildlife communities, creating the Wellfleet Harbor landscape appreciated by townspeople and visitors for economic, aesthetic and cultural reasons. There must be very few other harbors in New England where one can see such a broad variety of wildlife – Osprey, gannets, sea ducks and Brant, seals, Ocean Sunfish and many others – right in the inner harbor itself. These natural resources are the wealth continuously produced by the forces of nature. We are charged with being good stewards of the resource that it may flourish for those who use it today and those who will come tomorrow.

Wellfleet has always earned its living from the harbor. Shellfishing has the longest known history in town, evidenced by pre-European shellfish middens that date back thousands of years. This productivity gave rise to the earliest European names for Wellfleet Harbor and Town: Port aux Huitres and Billingsgate. From colonial times through to the present day, the wild picking of shellfish and their aquaculture has been a key component of the town's economy.

In the eighteenth and nineteenth century, whaling and mackerel fishing were also important to the town. These are gone now. What still remains are the clean waters, fresh winds and sandy beaches - and the delicious shellfish - that draw people to Wellfleet. These same features also attract a wide variety of wildlife that use the marshes, beaches and harbor itself in their own ways. Protection of Wellfleet's natural resources is essential to maintaining the town's historical character as a New England fishing village.

The purpose of this chapter is first to recognize the diversity of natural resources and habitats in Wellfleet Harbor. We then seek to be good stewards of those resources to, at the least, assure that the diversity of these resources is sustained. In many cases, we can also restore and nurture the harbor's habitats.

### **Inventory of resources**

**Wellfleet Harbor.** Wellfleet Harbor is about 5 miles long north to south and a maximum of 3 miles wide at mean high water (MHW). The mean depth at MHW is 6.2 feet. The harbor is favored by a large tidal amplitude, on average 10 feet. Thus, much of the harbor bottom is uncovered at low tide. The harbor surface-water area decreases from 6,094

acres at MHW to 3,815 acres at mean low water (MLW). All the land below the extreme-low-water (ELW) line, or a line 1600 feet from the mean-high-water (MHW) line, whichever is less, is property held in trust for the public by the Commonwealth.

The lands between MHW and ELW (or 100 rods) constitute tidelands, which may be privately owned. By the Colonial Ordinances of 1641 – 1647 these lands were conveyed to the person who held the adjacent upland property. In many cases over the years, titles to the uplands and adjacent tidelands have been separated by distinct conveyances. Title to tideland is presumed to be held by upland property owner, unless deed research reveals clear evidence of separate conveyances, differentiating upland and tideland into separate parcels. In many cases of Wellfleet’s tidelands, title records are obscure or unresearched.

By the Colonial Ordinances of 1641 – 1647, the private tidelands are subject to the reserved public right to “fish, fowl and navigate”. The definition of these public rights has been the subject of litigation and court decisions from 1647 to the present. Recently, the Superior Court recognized ownership of tidelands off Indian Neck as belonging to an aquaculturists’ group over the claim of the upland property owner, where title research indicated that the flats had been separated from the upland property.

Titles to tidelands in Wellfleet Harbor are additionally held by various agencies and interests:

The United States: An undefined strip about 1,000 feet wide extending into the Harbor east of the Cape Cod National Seashore holdings of the tombolos and Jeremy’s Point, and west into Cape Cod Bay. The flats of the west side of the harbor were used for shellfish grow-out in the 1800’s.

The Town of Wellfleet: Unsurveyed and undefined tidal flats extending to mid-channel, ELW or 100 rods from the MHW of the following parcels: Map 20 parcels 9, 12, 16, 114; Map 22 parcel 23; Map 28, Burton Baker Beach, extending seaward from MHW of a portion of Indian Neck and Whitman property; Map 35, Pleasant Point Flats, an unsurveyed area between Pleasant Point Landing and parcel 139, extending from MHW to 100 rods or ELW; Map 30, Cannon Hill Beach, an unsurveyed area on Blackfish Creek; Map 35, Old Wharf Landing and the “wading place” extending across Blackfish Creek.

Commonwealth of Massachusetts: Indian Neck Conservation Area and Field Point.

Additional various holdings by the South Wellfleet Marsh Trust, Wellfleet Conservation Trust, Massachusetts Audubon Society – Wellfleet Bay Wildlife Sanctuary, and private real estate trusts and corporations.

At MHW, the harbor contains about 14,000 million gallons (Mgal) of water, dropping to about 5000 Mgal at MLW. Thus every tidal cycle, about two-thirds of the harbor's water is replenished from Cape Cod Bay. Fresh water enters the harbor from the principal rivers and creeks - Herring River, Mayo Creek, Duck Creek, Blackfish Creek, Fresh Brook, Silver Spring Brook and Hatches Creek - as well as from the fresh water Chequessett lens underlying the town of Wellfleet. The daily total freshwater input is considerably less than 1% of the tidal volume exchange. About two-thirds of the fresh water input is seepage from the lens.

The harbor thus averages about 32 parts per thousand (ppt) salinity, essentially the same as the bay. Lower salinity values can be found in the creeks at low tide or after a rain event.

Water quality is critical to the health of the harbor ecosystem; this topic has already received a chapter to itself.

### **The Ecosystem.**

Wellfleet Harbor, like all marine estuaries, is a remarkably complex and inter-related ecosystem. The need to preserve this ecosystem was recognized in 1989 when the harbor was designated by the state an "Area of Critical Environmental Concern" (ACEC).

We recognize five basic habitats around the harbor: beach and dune, salt marsh, intertidal flats, subtidal bottom and the water column itself. These are not a static system. There is tidal interchange with fresh inputs at the shoreline, diluting harbor salinity and creating a wide range of salinity regimes and associated biotic communities. Aquatic life zones are tempered by water clarity and depth of light penetration. The primary photosynthetic energy producers are the algae and macro-algae near-shore, phytoplankton in the open waters. Salt marshes and tidal flat algae can produce biomass at a yearly rate comparable to tropical rain forests and over twice the rate of northern forest or agricultural land. These producers are the base of the complex food web, the basis for all the life in the harbor be it shellfish, birds or animals.

**The Yearly Cycle.** Throughout the year, the harbor is alive with activity. In the early spring, Piping Plovers, Willet and Red-winged Blackbirds arrive to nest on the beaches and marshes. Osprey can be found again around their nesting poles. Alewife return from the sea, migrating up the Herring River to their spawning ponds.

As the temperature increases, Diamond-backed Terrapins appear in the tidal creeks, coming out onto the neighboring dunes and uplands to lay their eggs. When the water temperature exceeds 70 F, oysters and quahogs begin to spawn. Finfish are active throughout the system: baitfish (mummichog, silverside and menhaden) in the creeks and sportfish (blues and stripers) in the larger creeks and the open harbor. Sea turtles such as Leatherbacks enter the harbor to feed on jellyfish. Marine mammals, including Grey Seals, Pilot Whales and White-sided Dolphins can be seen swimming in the harbor. Sadly, sometimes the latter two species are found stranded in the shallows along the

harbor.

Late summer, fall and winter actually sees an increase in the diversity of bird life. A wide variety of shorebirds fly thousands of miles to feed on the rich resources of the harbor before continuing thousands of miles more to their winter grounds. Whimbrel, a species of curlew, can be the most dramatic of these: its main food is Fiddler Crabs. Herons and Egrets disperse from their nesting grounds to the tidal creeks.

As colder weather arrives, we find an abundance of waterfowl in the harbor. Black Duck and Brant feed in the estuaries, joined by the last of the Yellowlegs remaining from the summer. Eider, Scoter, and Long-tailed Ducks feed mostly on shellfish in the open harbor. Loons, Gannets and Great Cormorants are fish eaters. Up to nine species of Gulls and Terns have been seen on one November day at the L-shaped pier. Even in dead mid-winter, there are tracks of Otter, Coyote, Fox and Raccoon along the mud-banks and beaches. Far down on Jeremy Point, Sanderling and Dunlin chase the waves seeking food, always under the watchful eye of a Merlin and with ever-present Gulls calling in the background.

**Species.** A good indicative list of major species for in and about Wellfleet Harbor has been given in the 1995 Harbor Management Plan. Some issues and species of special interest are discussed here.

**Bivalve Molluscs.** Oysters, Quahogs, Soft-shelled Clams, Razor Clams, Blue Mussels, Ribbed Mussels, Surf Clams and Bay Scallops constitute the most common bivalve species. In Wellfleet Harbor, the first two - Oysters and Quahogs - are today the most important commercially: these are the main shellfish focus of this plan.

Because of the importance of shellfish to Wellfleet – as a natural resource, as a cultural resource and as an economic resource – the subject is more fully discussed in a separate sub-chapter (3A).

**Finfish.** It is recognized that finfishing is an important sport activity in Wellfleet Harbor, for blues and stripers, especially. The Harbor also affords an important nursery area for juvenal fish of many species, such as Winter Flounder and Menhaden. So-called baitfish - Mummichog, Killifish and Silversides - flourish in tidal creeks and on tidal flats.

Anadromous and catadromous fish such as Alewives and Eels pass through the harbor between pond and open ocean. Even up to the early 1900's, these fish were commercially important in Wellfleet. The closing of the Herring River dike in 1908 put an end to that resource.

From the intertidal lands, lobsters have been harvested by traps and diving, and various fish species are caught by line and trap fishing methods. These activities are regulated by the State Division of Marine Fisheries describing catch size and quantities, seasons, etc. for recreational and commercial fisheries, and present no management problems. Laws are enforced by the State Environmental Police

Officers (EPO's) routinely patrolling regional waters and ports.

. Declining stocks has resulted in the loss of a local, commercial fisheries fleet and a shift toward recreational pursuits. A large trip boat for recreational fishing operates out of the Town marina, as do many smaller charters. Perhaps the largest group of recreational fishermen uses private boats. These may be trailered in and launched from the Marina to customize fishing expeditions, or depart from slip or mooring.

Finfish are an important resource to be managed. However, there is virtually no recent reliable data on finfish populations that would establish either a current status for these species or trends. The last complete report was published in April 1972 by the Division of Marine Fisheries. The lead author was John R. Curley, so this is commonly referred to as the "Curley report".

**Recommendation:** Expand the role of the Herring Warden, within the proposed Town Oversight Office (see Ch. 8), to that of advocating for and managing healthy, sustainable stocks of finfish in Wellfleet Harbor. (Herring Warden, Town Administrator)

**Recommendation:** Undertake regular inventory of baitfish, squid and jellyfish in the harbor, as well as a survey of Alewives and Eels that run between the harbor and the ponds. The emphasis on baitfish is predicated on the idea that if baitfish are present, the larger sport fish will come. It may also be useful to monitor for specific larger finfish, such as Flounder, which may have a specific loss of bottom habitat. (Herring Warden)

**Recommendation:** Map the habitats required by finfish – such as salt marsh, eelgrass, and seabed bottom types – in Wellfleet Harbor. Where needed, habitat restoration projects (eg: salt marsh restoration, eelgrass planting) should be undertaken. (Herring Warden)

**Other Species of Special Interest.** Besides the bivalve shellfish and finfish, certain species found in the Harbor are of special interest and concern:

a. Piping Plovers. This federally endangered species nests on beaches from about mid-April to mid-July. The majority of the nests are on Jeremy Point, where there is minimal conflict with other beach users. Plovers also nest on the east side, from Field Point south to South Sunken Meadow Beach. The most serious point of conflict is with aquaculture traffic on Field Point.

b. Osprey. The populations of these birds were dangerously reduced in the 60's and 70's due to use of chlorinated pesticides such as DDT. With the banning of these pesticides, Ospreys have made a remarkable recovery in New England. Two pairs currently nest in Wellfleet, on Lt. Island.

c. Whimbrel. This curlew migrates in great numbers through Wellfleet, arriving south in

the late summer from its Hudson Bay nesting grounds. Upwards of 1000 birds may occur in a given year. As the population in North America is estimated to be less than 60,000 birds, Wellfleet has an important role to play in the conservation of this species. The main food in Wellfleet is fiddler crabs.

d. Diamondback Terrapin. This reptile is at its northern limit in Wellfleet Harbor. It is a state listed threatened species. Terrapins live in the tidal creeks and nest on adjacent sandy uplands, where it is very sensitive to development. There is a major project at the Massachusetts Audubon sanctuary to study and manage this species. It has been discovered that Chipman's Cove and Blackfish Creek are the major feeding ground for terrapins: one of the key foods is Green and other crabs, which are shellfish predators.

e. Loggerhead, Leatherback and Ripleys Sea Turtles. These species are found in the summer harbor, feeding respectively on jellyfish and crabs. When cold weather arrives, these turtles are sometimes trapped in the Harbor and the Bay. Massachusetts Audubon and the New England aquarium have a program to rescue the turtles and release them in Florida.

f. Squid and Jellyfish. There can be remarkable populations of squid and jellyfish in the harbor. Squid use the harbor to spawn in the spring. The squid are themselves food for sport fish. Jellyfish are food for Leatherback turtles. Some species of Jellyfish are markers of biological stress

g. Blackfish and Porpoises. Blackfish, a small whale, were common in Wellfleet Harbor in early colonial times, before 1750, and formed the basis of an important early industry. Along with porpoises, these are still seen occasionally in the Harbor, often when they are stranded in shallow estuaries.

h. Mackerel. Like Blackfish, mackerel also provided an important Wellfleet industry. Today they are a rare species in the Harbor.

i. Alewives. In Wellfleet, as in many New England towns, the annual migration of Alewives up river to their breeding ponds was a major Town event. From Colonial times up until the Herring River and other alewife runs in town were diked off, the right to take Alewives during their annual Spring run was a valuable right. There are still Alewife in at least the Herring River, though in much reduced quantities, and threatened by the dike induced silting and decay of the river. Removal of these dikes would lead to restoration of this great Spring event.

j. Horseshoe Crabs. These prehistoric survivors use Wellfleet beaches to lay eggs in the Spring. These populations in Massachusetts have been gradually declining, as they are valuable for medical testing purposes. There is no population data for Wellfleet Harbor.

**Recommendation:** Undertake population studies on horseshoe crabs in Wellfleet Harbor in order to understand the risk to the population. (Shellfish Warden)

k. **Invasive Species.** With the "globalization" of the environment, many invasive species have entered the harbor and its shores. Examples of these are Phragmites (a kind of reed), Japanese Shore crabs and Codium (a sea weed). A colonizing species, sea squirts (Didemnum) are a recent addition to the list of potentially harmful invasive. These invasives tend to push out native species such as Cattails or Rock Crabs. In a marine system, where boats can come from all over the world, control of these species is difficult. The best defense is early discovery and attack.

The state is planning an active campaign in the summer of 2006 to identify and track invasives, using a system of volunteers.

**Recommendation.** An informational campaign should be prepared for shellfishermen and boaters to create an early warning system for invasives. As part of its Best Management Practices program, the Harbormaster should work with boaters to reduce the risk of invasive species coming into Wellfleet Harbor on boat hulls, in bilge water or by any other mechanism. (Shellfish Constable, Harbormaster, NRAB)

**Habitats.** This rest of this chapter is organized according to the five habitats of the harbor.

**Beach & Dune.** Approximately 15 miles of beach and dune border Wellfleet harbor. These beaches start at the Eastham line at the Massachusetts Audubon Society sanctuary. They continue northwards on Lieutenant Island, Old Wharf Point, and Indian Neck to the marina. From the marina, the beaches turn west along Mayo Beach past Power's Landing towards the Gut. South of the gut is the final run of beach, running down Great Island to Jeremy Point all of which is part of the Cape Cod National Seashore.

The beaches are habitat to many plants and animals. There is a community of beach grasses which all help to stabilize the landscape. Diamond-backed Terrapins, Horseshoe Crabs, Horned Larks, Piping Plovers and Least Terns all nest on the beaches and dunes. We have also observed that the beaches are a favorite habitat for playing children and grandchildren.

Erosion of beaches and dunes is a natural process on the Cape, a response to sea-level rise. Sea level rise has occurred historically at about a foot each century. Global warming is predicted to increase this rate by up to a factor of two. Global warming may also increase the number of storms that attack our beaches, which removes sand from the beaches and can spread it over productive bottoms in the harbor.

Shorefront owners have responded to these events by attempting to protect their buildings through construction of seawalls, revetments and groins. This is understandable.

However, the on-going "armoring" of Wellfleet's shoreline has its own negative impact on the beaches. By denying replenishing sand to the beaches, the erosion of those beaches is accelerated. There is now abundant evidence of this erosion. Old photographs of Wellfleet beaches plus the memories of many citizens confirms the loss of this valuable

resource. This degradation is inconsistent with the designation of Wellfleet Harbor as an ACEC. The loss of beaches also denies the citizens of Wellfleet the rights to use the inter-tidal beaches for “fishing, fowling and navigation”. Armored beaches are mostly underwater. Steps are needed to remedy the loss.

The problem is compounded by the current permitting process. Individual owners seek permits from the Conservation Commission one property at a time. However, once one property along a section of coast is armoring, accelerated erosion (scouring) occurs at adjacent properties. This eventually forces all owners along the beach to become armored. (Dramatic examples of what happens if a property is not armored can be seen on Indian Neck, Lieutenant Island and the west of Mayo Beach.)

The stewards of Wellfleet harbor have taken some positive steps to protect our beaches and dunes. The co-operation between the Town and the Cape Cod National Seashore to protect the dunes system at the Gut using a system of snow fencing to direct pedestrian traffic and catch wind blown sand has been successful. Dr Jim O’Connell of Wood’s Hole Oceanographic Institute has undertaken a survey of shoreline change in Wellfleet. This survey will provide specific data relating to beach loss. A summary of the report was presented at the “State of Wellfleet Harbor” conference in November 2005.

**Recommendation:** NRAB is concerned about the long-term impacts of coastal armoring in Wellfleet and believes that there should be no new coastal armoring. At the same time, we recognize that finding the right strategy that preserves beaches while accounting for property owner concerns is difficult. We recommend that a “summit” of local boards and expertise to devise creative solutions to coastal erosion and sand transport in Wellfleet Harbor. Wellfleet should be a leader, rather than a passive observer, in seeking legal and environmental solutions to human efforts to control nature. (NRAB, ConsCom)

**Recommendation:** The beaches of Wellfleet must be restored. Strategies are needed that are appropriate to the risk and extent of armoring on each beach section of the harbor. In some cases, direct sand replenishment will be appropriate. Construction of "soft" revetments - either by new techniques or by retrofit to old structures – can also be used. These "soft" revetments mimic the action of natural dunes by periodically adding sand and plantings to the revetments so that they act as a dune. Any order of conditions for revetment, groin or seawall construction or replacement should include sufficient steps to avoid unnatural beach or dune loss. In some cases, however, the best strategy will be to remove groins and armoring, in whole or in part. (NRAB, Conservation Commission)

**Salt Marshes & Tidal Creeks.** The border of Wellfleet Harbor that is not beach is salt marsh. The largest of these are at the Audubon Sanctuary, on Lieutenant Island, bordering Blackfish Creek, behind Indian Neck, along Duck Creek and at the Gut, Middle Meadow and South Meadow on Great Island. The total acreage of salt marsh is about 1700 acres. Conservation groups, including Massachusetts Audubon Society, the Wellfleet Conservation Trust, the Town of Wellfleet and the Cape Cod National Seashore, own most of these marshes

Salt marshes are immensely productive habitats. The growth and decay of the salt marsh *Spartina* grasses is a primary source of nutrients for the harbor. Many small fish and crustaceans use the salt marsh tidal creeks as nurseries. Terrapins in the summer and Black Duck in the winter live along the creeks. Willet, Salt Marsh Sparrows and Red-winged Blackbirds breed in the marshes. Migrating shorebirds feed there.

A recent issue of concern with Atlantic salt marshes is an observed die-back of cordgrass. This can be observed, for example, at the Gut. The cause is not known and is the subject of on-going research.

Sea level rise can also affect salt marshes. As sea level rises, natural sediments are deposited on the marsh, gradually raising its level. At the back, landward side of the marsh, the rising sea level erodes the uplands. As it does so, the marsh migrates inward and colonizes the land. Long term protection of salt marshes – and thus long term protection of the harbor’s productivity – requires that the land behind the marshes be protected and be kept without armoring structures. Thus revetments, groins and seawalls can lead to loss of salt marsh habitat as well as beach and dune.

**Recommendation:** Propose a town by-law that prohibits any revetments, seawalls or other new structures within 100 feet of any coastal salt marsh. (OSC)

The Open Space Committee (OSC) has identified about 524 properties that contain or abut coastal salt marshes. Of these, 51 are Town owned (see Appx to this chapter). All these properties are within the ACEC of Wellfleet Harbor.

**Recommendation:** Support Open Space Committee proposal that the town begin a special program to restrict development on the (51) town-owned properties within the ACEC on or abutting coastal marshes, and prohibit the sale of these. (See Appx to Chapter 3 for the list). (NRAB, Open Space Committee)

In the past, diking and filling have destroyed salt marshes around Wellfleet harbor. Sometimes, the diking was undertaken for mosquito control. Subsequent research has shown this not to be effective. Sometimes the diking was to create new fresh water habitat. It has been subsequently understood that this habitat is degraded. The main loss of salt marsh to diking is along the Herring River and Mayo Creek, at the east end of Blackfish Creek and behind Lieutenant Island. The state has published an "Atlas of Tidally Restricted Marshes in Massachusetts". Restoration of the four marshes named would increase the acreage of salt marsh in Wellfleet Harbor by over 50 per cent.

**Recommendation:** Develop a detailed inventory atlas of Wellfleet’s salt marshes. This should include historical data, from aerial surveys (which go back to 1938) and/or older maps. (Conservation Officer)

**Recommendation:** Prepare a proposal for the restoration of Herring River, Mayo Creek, Blackfish Creek and Fresh Brook (Thimas Bog) tidal marshes and flats. The NRAB takes the position that restoration of these marshes is one of the most valuable steps that could

be taken to maintain and enhance the quality of the natural resources in Wellfleet harbor. (NRAB, Conservation Officer)

**Recommendation:** As the tidal creeks are a key nursery habitat for the harbor, the biological health of these should be monitored. We propose an on-going sampling program to track the abundance of finfish and nursery species. (Herring Warden, DMF)

**Recommendation:** Some areas of the harbor are recognized as critical wildlife habitats (even above the ACEC designation of the whole harbor) for ducks, shorebirds, terrapins and shellfish. They deserve special protection. We propose that eight areas be designated as "Salt Marsh Protection Areas". Much of the shore of these areas is already conservation land. The inland borders of the proposed areas follow the ACEC border.

- East of a line running from the SW corner of Lt Island to South Sunken Meadow beach at the Eastham line;
- The north-west corner of Lt Island, from the revetments east to near the boathouse;
- Loagy Bay, including the marshes south and east of Old Wharf;
- Blackfish Creek, east of a line from Pleasant Point landing to the Old Wharf Point;
- North and east of Field Point, towards Fox island;
- Chipman's Cove, the ACEC part south and east of the mooring basin;
- The Herring River estuary, west of a line from the NE corner of Great Island to the salt marshes west of the Chequesett Country Club;
- An eelgrass restoration area, to be determined, on the west side near Smalley Bar (see below).

The protection areas are shown indicatively on the following map.

The following regulation should be established for these protection areas:

- Current moorings, wild shellfishing, aquaculture, fishing and hunting are allowed;
- No new moorings or new aquaculture grants in these areas;
- Shellfish dragging is not allowed;
- Boating in these areas to be on a no wake basis;
- No shoreline structures or armoring are allowed.

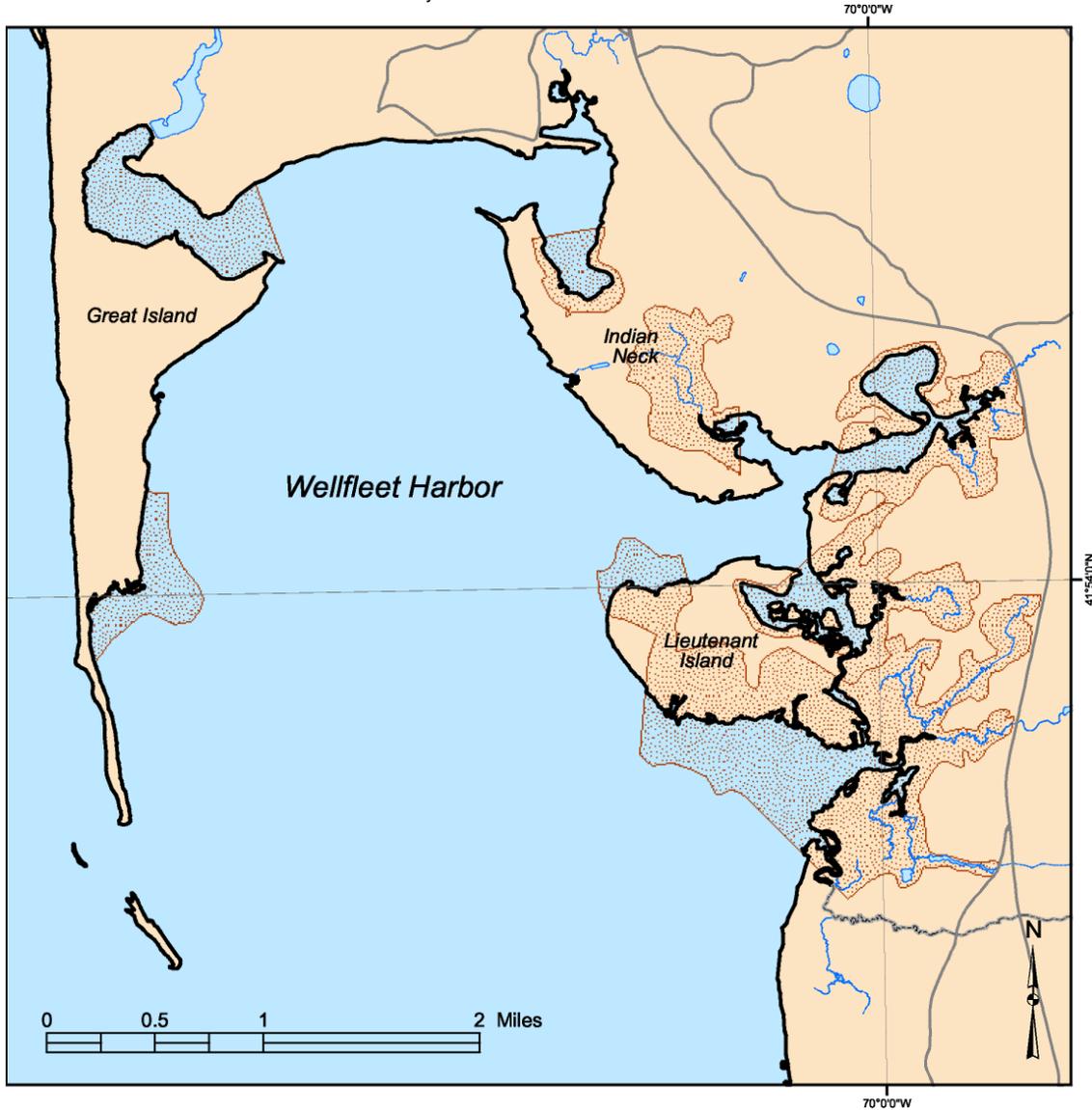
# Proposed Salt Marsh Protection Areas



Cape Cod Commission  
A Division of Barnstable County



Town of Wellfleet



The uplands surrounding these protection areas are also important for their preservation: these uplands should be protected through a combination of zoning regulations, conservation restrictions and conservation land purchases;

Maintaining good water quality is imperative to protecting the sanctuaries. The uplands of the sanctuaries are priorities for possible de-nitrifying septic

**Intertidal.** This is the habitat used by shellfish. Algae on the flats are one of the primary producers in the harbor. Widgeon grass is also an important primary food source, especially in the southeast harbor. The intertidal flats are the home to many other invertebrates and mollusks that are part of the food chain in the harbor, especially for migrating shorebirds. Of these, Wellfleet harbor is particularly important for Whimbrel, which feed on the fiddler crabs. In the winter, Brant and Canada Geese feed on the alga and widgeon grass.

The Town and Massachusetts Audubon Society have supported a joint project to map and study the intertidal habitat in Wellfleet harbor. A map has been produced, showing the bottom type: sand, mud, etc. On-going research is directed at “ground truthing” this map.

In Wellfleet harbor, shellfishing is a special issue. The natural ("wild") shellfish are intensively harvested and managed. Cultching, seed picking or relaying, area closures are some of the technical methods by which this management can be done. The Shellfish department regulates these activities. In addition, there are about 150 lease sites for aquaculture (shellfish farming) in the harbor. We support these activities as part of the history of the Town and as a critical part of the economy. Wellfleet Harbor is already an intensively utilized resource. Any expansion of shellfishing practices must be done without harm to the diversity of other resources in the harbor. In addition, we recognize that the intensity of shellfishing creates a risk of disease and loss of genetic diversity in the wild stocks.

Any degradation of the intertidal habitat could be a serious loss to Wellfleet. The initial finding of the Massachusetts Estuaries Project of biodiversity loss in Duck and Blackfish Creeks is a warning indicating a need for remedial action (ref: Dr Brian Howes at the 3<sup>rd</sup> Annual State of Wellfleet Harbor Conference, Nov. 5 2005).

**Recommendation:** The intertidal flats in Wellfleet harbor have been little studied in the past. The research begun by the town, Wellfleet Bay Wildlife Sanctuary and the Massachusetts Estuaries Project should be continued and supported to ensure that biodiversity is maintained. (Shellfish Constable)

**Recommendation:** Loose aquacultural netting is a threat to wildlife (such as terrapins, birds and fish). All netting should be removed at harvest time. Efforts should be made to clean up the shoreline each year, as is now done by the Shellfish community (Shellfishermen)

**Subtidal bottom:** The deep-water bottom in the harbor is the benthic habitat. A wide variety of important species live or have lived there, such as quahogs, bay scallops, winter flounder and eelgrass.

Of these, we consider eelgrass as the most indicative of the harbor's health. It is a plant of high biological productivity. It is a nursery for many species, especially bay scallops. It is an indicator of environmental health for an estuarine system. According to several long time Wellfleet residents, eelgrass used to be present in the west side of the harbor. It is not there today. (However, eelgrass is abundant from Duck harbor south to Jeremy Point on the outside in Cape Cod Bay.) Eelgrass can be shaded by excess growth of attached (epiphytic) and drift (planktonic) algae promoted by nutrients in the water. It can be affected by temperature change. Human disturbance (boating or dredging) can also cause beds to decline.

**Recommendation:** Map the subtidal bottoms in Wellfleet and inventory the basic fauna. Following this study, a program is needed to follow the health of this environment, including the effects of dragging. (Harbor Office)

**Recommendation:** A project should be undertaken to attempt eelgrass restoration in Wellfleet harbor. A firm sandy bottom is needed, which should not present a conflict with draggers. The restoration beds should also be marked as off limits to boaters and draggers. The area of Smalley Bar is a good candidate location, as is the sanctuary area south and south-west of Lt. Island. Success would give assurance of the health of the harbor system and would also encourage a bay scallop industry. Failure would require a careful evaluation of the reasons for failure and possible consequences for the rest of the harbor. (Shellfish Constable)

**Water Column:** The water column itself is also an important habitat. Larval shellfish grow in the water column. Shellfish and other benthic fauna live at its bottom. Phytoplankton - the food of shellfish - and young shellfish swim in the water. Important sportfish, such as Strippers and Blues are found in the harbor's waters. Sea turtles and dolphins are regularly seen in Wellfleet. The harbor for birds is most alive in the winter, when many birds live and feed at the water's surface. Merganser, Loons and Cormorants are fish eaters. Bufflehead, Eider, Scoter and Long-tailed Ducks dive for mussels and crabs.

Clearly, water column quality is critical to the health of Wellfleet harbor. For that reason, water quality and recommendations is a separate chapter in this plan (See Ch 2).

**Uplands:** Wellfleet Harbor is bordered by the Town's uplands. About half the fresh water that enters the harbor comes as rain that filters through the uplands first (the other half falls directly on the harbor). Protection of the harbor cannot be secure unless the uplands are also healthy.

**Recommendation:** Lands adjacent to the harbor, ideally back to 100', should be naturally vegetated to provide a buffer for the harbor. This is especially important behind

salt marshes. Beach and dune systems should be protected by modified conditions on construction and maintenance of hardened structures. (NRAB, OSC)

Open spaces protection, by purchase or conservation restriction, are an important part of the strategy for the harbor. The Open Space Committee of Wellfleet, in collaboration with the Wellfleet Conservation trust, has identified several key areas for protection. NRAB endorses the following as critical to the harbor:

**Duck & Mayo Creek shoreline:** This is the traditional social and commercial heart of the maritime community. Wellfleet Center is where it is because of the historic focus on Duck and Mayo Creeks for marine foods, transportation, etc. This area is still the main attraction in terms of the Town's aesthetic appeal to both residents and visitors, production of shellfish, recreational boating and finfishing. However, views and access are blocked by many non-water-dependent uses.

**Land (including wetlands) subject to tidal restoration:** Most of these, with the exception of the Thimas Bog in South Wellfleet, are identified in the Cape Cod Commission Inventory of Tide-restricted Wetlands. The Head of Mayo Creek is a good example of one that has already been protected by WCT and LB acquisition.

Others include:

- Doane's Creek marsh (between Route 6, Pole Dike, Coles Neck and the Library).
- Gull Pond Road swamp and bog between Route 6 and CCNS boundary.
- Mill Creek including CYCC and other private properties east to Hamblin Farm/
- Thimas Bog.
- Mayo Creek landward of Kendrick Avenue and seaward of Chequesset Neck Road including filled wetland behind the Mayo barrier beach.

Upland parcels landward of fringing salt marshes especially within the ACEC. These are town-wide on the bayside. The objective is to obtain public ownership or conservation easement to allow marshes to migrate landward with sea-level rise.

Uplands surrounding:

- Fox Island marsh.
- The Run
- Drummer Cove

In many cases, these parcels not only protect the harbor but also provide wildlife corridors that are critical for maintaining the native fauna of Wellfleet.

**Recommendation:** Develop and implement strategy to protect - via purchase, by-law or other means - critical harborside conservation parcels. These include lands along Duck & Mayo Creeks, wetlands subject to tidal restoration and uplands fringing salt marshes. (OSC, Wellfleet Conservation Trust, NRAB)

**Natural Resource Protection.** Occasionally, conflicts arise among the various users of the harbor's resources. Often, this is because the regulations, and especially the reasons for having them, are not known to visitors. The fishermen are concerned about clean

water as their livelihood depends on it. Many other users do not share this degree of concern and may on occasion foul the water in various ways: spilling hydrocarbon containing products, discharging human wastes, scraping bottom paint and leaving pet wastes on the beach. Many Marina, Beach and General Regulations stem from these problems.

**Recommendation:** Design and distribute NRAB produced “Natural Resources Protection” pamphlet through the Beach Sticker program, the Harbormasters’ and Recreation departments and other Town venues in order to educate and inform the visiting public. (NRAB)

References:

O’Connell, J. “Shoreline Erosion in Wellfleet Harbor”, 3<sup>rd</sup> Wellfleet State of Wellfleet Harbor Conference”, November 5 2005

Personal communications from Robert Prescott, Robert Buchsbaum, John Portnoy and Carl Breivogel (Wellfleet Herring Warden)

Curley, J.R., Lawton, R.P., Whittaker, D.K., Hickey, J.M., "A Study of the Marine Resources of Wellfleet Harbor", Division of Marine Fisheries, 1972

**Ch 3 Appx: Town Owned Parcels Within the ACEC For Conservation  
Open Space Committee – December 2005**

<b>No.</b>	<b>Map</b>	<b>Lot</b>	<b>Acres</b>	<b>Location</b>
1	4	40	2.45	Williams Pond
2	8	270	4.78	Pole Dike Creek marsh
3	9	637	5.21	Gull Pond landing
4	11	4	6.43	Duck Harbor landing
5	13	118	2.7	Pole Dike Creek marsh
6	13	155	2.96	Pole Dike Creek marsh
7	14	114	0.24	Mayo Creek at Cheq. Neck Rd
8	14	119	0.27	Mayo Creek at Cheq. Neck Rd
9	14	120	0.24	Mayo Creek at Cheq. Neck Rd
10	14	121	0.26	Mayo Creek at Cheq. Neck Rd
11	15	150	7.81	Hamblen Park
12	15	151	4.38	Hamblen Park
13	18	8	5.99	The Gut
14	20	4	4.43	Baker's Field
15	20	5	0.25	Baker's Field
16	20	6	0.52	Baker's Field
17	20	7	0.52	Baker's Field
18	20	9	5.59	Mayo Beach
19	20	11	0.37	Mayo Beach
20	20	12	0.56	Mayo Beach
21	20	16	0.91	Mayo Beach
22	20	31	0.47	Mayo Beach
23	28	80	9.64	Indian Neck
24	28	82	4.73	Indian Neck
25	28	239	12.56	Indian Neck
26	29	499	0.07	Drummer Cove
27	29	502	4.42	Drummer Cove
28	29	502	0.27	Drummer Cove
29	29	504	0.33	Drummer Cove
30	30	178	1.92	Blackfish Creek
31	35	23	0.24	Old Wharf Point
32	35	26	0.18	Old Wharf Point
33	35	52	0.76	Old Wharf Point
34	35	53	0.14	Old Wharf Point
35	35	54	0.35	Old Wharf Point
36	35	55	0.05	Old Wharf Point
37	35	56	0.15	Old Wharf Point
38	35	57	0.14	Old Wharf Point
39	35	210	7.66	Pleasant Point
40	36	288	0.93	Off Grove Ave.
41	36	289	0.19	Off Grove Ave.
42	40	81	0.47	Lt. Island
43	40	170	0.54	Lt. Island
44	40	171	0.38	Lt. Island
45	40	176	4.31	Lt. Island
46	40	184	0.82	Lt. Island
47	41	47	2.34	Box Turtle Woods
48	41	47.1	2.09	Box Turtle Woods
49	41	47.2	2.01	Box Turtle Woods
50	41	152	3.1	Lt. Island
51	46	19	5.6	Hatches Creek

## Chapter 3A -Shellfishing in Wellfleet Harbor

Shellfishing has always been integral to the life of Wellfleet Harbor and to the community which is the Town. It remains so today. It is a business of great satisfaction – Wellfleet’s shellfish products naturally grown in the harbor are world renown – and profit. It is also a business of high risk to losses from weather, diseases and pollution.

This chapter discusses both the wild shellfishery and the cultivated (aquaculture) shellfishery in Wellfleet.

### Wild Shellfishery

Oysters, Quahogs, Soft-shelled Clams, Razor Clams, Blue Mussels, Ribbed Mussels, Surf Clams and Bay Scallops constitute the most common bivalve shellfish species. In Wellfleet Harbor, the first two - Oysters and Quahogs - are today the most important commercially: these are the main shellfish focus of this plan.

There is evidence of greater past abundance of the Bay Scallops. It is likely that the loss of eelgrass is a major reason for the reduction of Bay Scallops; for this reason an eelgrass restoration program is recommended. Blue Mussels are not encouraged in Wellfleet Harbor as their growth pattern tends to smother oysters and quahogs. Ribbed Mussels are common in the tidal creeks; while edible they are not generally tasty. The other clams are less common and less commercially important in the harbor; there is therefore much less information on their abundance in Wellfleet. However, soft-shelled clams (steamers) can have cyclical sets that are a boon to fishermen.

Wild shellfish are harvested for market either by hand-picking (Oysters) or hand-raking (Quahogs). Wild pickers can often be seen in Wellfleet at low tide on the flats, part of the Town’s distinctive culture. This cultural importance is confirmed by the large numbers of shellfish licenses issued (Annual Town Reports, Wellfleet):

### Fisheries Permits Issued

License type	Issued 2001	Issued 2002	Issued 2003	Issued 2005
Eel	3	1	5	3
Commercial	216	213	202	206
Junior comm'l	10	7	8	3
Senior comm'l	93	90	78	74
Resident				
Recreational	324	310	325	322
Senior Res.	235	251	246	245
Seasonal Res. Rec.	179	169	117	162
Non-Resident	224	123	139	179
Seasonal N-R Rec.	150	113	n/a	137
Total	1434	1277	n/a	1331
Revenues	\$69,464	\$54,438	n/a	\$61,429

In addition to the hand harvesting of shellfish, draggers also operate both inside Wellfleet Harbor (quahogs and oysters) and on the Billingsgate shoals outside (mostly surf clams). In 2005, about 8-10 small draggers operate regularly inside the harbor and about 3-4 bigger boats outside.

The fisheries permits represent a source of revenue to the Town. The revenue generated by Wellfleet's shellfishing – several millions of dollars – is discussed in Chapter 7.

The entire tidal and subtidal lands are divided into areas open to pickers with commercial and non-commercial shellfish permits as follows:

AREA 1: Commercial only; area north of a line from the seaward end of the Breakwater to the easternmost tip of Great Island.

AREA 2: Non-commercial only; area off Indian Neck south from the Breakwater to the second groin.

AREA 3: Commercial and Non-Commercial – the rest of the harbor excepting aquaculture licensed areas.

Maps of the shellfishing areas can be found on the Wellfleet Shellfish Department website:

[http://www.wellfleetma.org/Public\\_Documents/WellfleetMA\\_Departments/shellfish](http://www.wellfleetma.org/Public_Documents/WellfleetMA_Departments/shellfish).

**Oysters.** Oysters have been known in Wellfleet Harbor since before the arrival of Europeans, as shown by the many midden heaps around the harbor. When Samuel Champlain explored Cape Cod's waters in 1605, he called Wellfleet Harbor "port des huitres," which means "oyster harbor." Early colonial reports of the abundance of oysters (and other shellfish) affirmed Wellfleet's primacy as a shellfishing town. The delicious flavor of Wellfleets is enhanced by the high (30 ppt) salinity of the harbor.

However, twice in the past, (in the 1770s and 1870s) there have been serious crashes in the population of oysters in Wellfleet. In the first instance, the crash was probably due to the use of oyster shells for lime, denying young oysters of a hard substrate on which to set. The second crash was probably due to overfishing. The resource was replenished by imports of oysters from Connecticut, Chesapeake Bay and (more recently) the Taunton River.

The data since the 1870's show a commercial and recreational catch of wild oyster ranging from about 1000 to 10,000 bushels annually. Large year-to-year variations exist. In 1972, the Division of Marine Fisheries (DMF) made an estimate of the total oyster population in Wellfleet harbor (the so-called "Curley report"). This work estimated that the total wild population was at least 20 times the catch. This work should be periodically repeated.

. In 2003, the Wellfleet Shellfish Department estimated that the town's commercial oyster catch was over 2,250 bushels, a typical year. At 375 oysters per bushel, close to 850,000 oysters were harvested. This limited production of oysters from such pristine waters makes the Wellfleet oyster a true delicacy.

**Recommendation:** Every three years, sample and report the size of the wild oyster population in Wellfleet Harbor (Division of Marine Fisheries (DMF), Shellfish Constable)

The wild fishery in Wellfleet must be protected and encouraged, as a common, valuable (and tasty) resource. Once at legal size the resource is available to anyone owning a commercial (or, with some restrictions, a recreational) license. This process is called "wild-picking" and follows a centuries old model that is regulated by legislation dating back to the earliest colonial times

One strategy to promote the wild fishery is to ensure that there is adequate shellfish habitat in the harbor. A significant former shellfish growing area was in the Herring River, between what is now the dike and High Toss Bridge. Restoration of the Herring River (see Ch 5) would renew this habitat. In general, it is important that the Town recognizes that the tidal flats are an important habitat – just like forest and dune – and be active in protecting them.

A second approach is to rebuild oyster bars, for the purposes of spawning and growth, in areas of the harbor now depleted of natural product. Areas to be considered could include Silver Springs (known in colonial times as Hitchin's creek and reported by Belding to be a major source of oysters before 1750) and SE of Great Island. The process could be arranged so that harvest of mature oysters was allowed on one bar while young oysters were growing in another (see 1998 Shellfish Management Plan). The Shellfish constable would oversee the process.

**Recommendation:** Support establishment of oyster bars in appropriate (non-productive, non-aquaculture) habitats of the harbor. (Shellfish Constable)

A third approach to ensuring a healthy wild fishery is based on knowledge of the life cycle of young oysters. Young oysters, in the first three weeks after egg fertilization, live in the water column as microscopic free swimming creatures called veligers. At the end of this period the veliger seeks to attach (set) to a hard surface on which it grows for the rest of its life. It is thought that the earlier population crashes were caused in part by the use of oyster shells for lime, rather than returning them to the harbor as attachment surfaces. Modern practice, employed by Wellfleet's Shellfish Department, is to provide hard surfaces by spreading shells around the harbor. This process is called "cultching".

Poor water quality, leading to excessive algal growth, may directly interfere with the set of oysters, by producing a surface slime on the cultch.

**Recommendation.** Continue and expand, as needed, cultching operations in Wellfleet Harbor. (Shellfish Constable)

The fourth strategy for shellfish propagation in Wellfleet Harbor is aquaculture (see section below),

**Recommendation.** Many visitors and summer residents in Wellfleet do not fully understand our shellfish industry and its importance. An on-going educational program (for example, informative plaques are already located at Mayo Beach and the Town Pier) should be expanded. As part of this, a shellfish aquarium should be located in the Shellfish building. (NRAB, Shellfish Constable, Harbormaster)

Several predators feed on shellfish: oyster drills, crabs, whelks and moon snails. To a certain extent these are themselves predated by Terrapins and Diving Ducks. Trapping is also used to protect aquaculture beds

Also, *Codium fragile* and *Gracilariaria*, invasive seaweeds, can create considerable and expensive nuisances by clogging nets and floating shellfish off beds.

**Recommendation.** A plan is needed to educate and devise remedies for invasive species in Wellfleet Harbor (Conservation Officer, Shellfish Constable, Harbormaster)

In addition, three oyster diseases, known informally as “MSX”, “dermo” and “JOD” (juvenile oyster disease), are present in the harbor. These persist despite much research. These diseases are managed by good husbandry by aquaculturists, especially in timing the planting and harvesting of stocks to avoid peak periods of the disease. For wild stocks, it is important to maintain a geographically disperse population in the harbor.

During the winter of 2004, another shellfish disease was discovered in Wellfleet Harbor: qpx. “Qpx” affects only quahogs, as discussed below.

The shellfish industry also received a severe economic blow in the summer of 2005, with an outbreak of “red tide”. While “red tide” does not affect the health of shellfish, it creates a toxin that makes shellfish unsafe for human consumption. “Red tide” is discussed further in Chapter II on “Water Quality”.

**Quahogs.** Quahogs (hard shell clams) also have a long history in Wellfleet Harbor. That history is less well known than that of oysters, probably because Quahogs had been commercially less valuable than oysters. Due to the recent development of effective quahog aquaculture, today quahogs are also a substantial source of revenues to shellfishermen.

The early life history of quahogs is similar to that of oysters. The big difference comes that young quahogs find their permanent home in the harbor bottom. The result is that quahogs must be dug out, whereas oysters can be picked off the harbor flats. (It would thus be much more difficult to over-harvest quahogs.)

In intertidal areas, quahogs are harvested by raking. Quahogs are also harvested in deeper water areas by dragging the harbor bottom from boats. Dragging may enhance

quahog productivity, by making a less firm bottom. At the same time, dragging is harmful to any bottom growing vegetation such as eelgrass.

**Recommendation.** Research is needed to understand the effects of dragging on the sub-tidal environment. Dragging must be restricted from environmentally sensitive areas. (Shellfish Constable)

The most recent quahog issue in Wellfleet harbor has been the appearance, in the fall of 2004, of the disease “QPX”, affecting several aquaculture sites on Egg Island and Indian Neck.

“QPX” stands for ‘Quahog Parasite Unknown’. Research has identified it as a parasite, a member of the phylum, Labyrinthulomycota. Infection appears incurable in clams, but of no health threat or risk to human consumers. As clam tissues become too inflamed to filter out harmful bacteria, the animals become prone to secondary infections. Mortality tends to occur near or at market size, with occurrences most severe in the Spring and Summer. This is an emerging disease of severe concern to North East, Atlantic hard-shelled clam shellfisheries, both wild and cultured.

QPX is most prevalent in cultured clams, but occasionally afflicts native populations with a heavy set. QPX as an opportunistic parasite, which may be common in harbor environments. Once quahogs have been infected, QPX is very contagious. The spread is probably by direct contact not through the water column. (Thus, overcrowding on growing beds and the practice of moving stocks from one part of the harbor to another may need to be limited, depending on the science.)

There is also evidence that northern quahogs are less susceptible to QPX than southern stocks, probably for genetic reasons.

Areas known to be affected by QPX are prohibited from exporting seed product. However, it is possible that the outbreak of QPX in Wellfleet was due to imported of infected seed from Barnstable, a previously infected site that had been State certified.

The initial reaction of Wellfleet’s shellfishermen to the discovery of QPX was to ensure that all beds containing contaminated animals were harvested and the animals disposed of. This plan was carried out under the supervision of the Shellfish Constable and the Barnstable County Extension Service. The cost of this action to the affected shellfishermen was very high. There is also considerable on-going research to better understand and test for the disease, at Woods Hole Oceanographic Institute (WHOI) and the Southeastern Massachusetts Aquaculture Center (SEMAC).

**Recommendation:** The Shellfish Constable, using the best available science, and with the support of the shellfish community and the Board of Selectmen, should continue to take all necessary steps to control threats (such as QPX and other diseases) to both the wild and aquaculture populations of all shellfish. This may require controls on seed imports or on growing conditions. Support to develop resistant genetic strains of shellfish is encouraged. (Shellfish Constable)

For all natural resources, and especially shellfish, outstanding harbor water quality is essential. This is discussed in detail in Chapter 2. Some key recommendations from that Chapter are summarized again here:

**Recommendations:**

- to prevent coliform contamination in the harbor, there must be useful provision of sanitary facilities for beachers and boaters; there must also be effective control of animal wastes on all beaches;
- road and marina storm water run-off must be controlled by completing a system of catchments and funding regular maintenance of these;
- steps must be taken to remediate nutrient (nitrate) overloads, especially in Duck Creek, the Cove, along Mayo Beach and in Blackfish creek;
- the Marina must have effective programs to avoid fuel and boat waste spills and also to avoid introduction of invasive species. (Beach Officer, Harbormaster, DPW, Conservation officer, By-law Committee)

## **Aquaculture**

Wellfleet's shellfishing community has been a leader in developing a totally different approach to the shellfishing industry. This is shellfish aquaculture, based on licensed use of the public tidelands. In a community with limited year-round employment opportunities, shellfish aquaculture represents a significant contribution to local economy.

The working of private shellfish beds is an old tradition in Wellfleet, going back to at least the 19<sup>th</sup> century. It seems to have originated in the practice of "growing out" two year old oysters coming from southern waters (especially the Chesapeake). (The same species of eastern oyster, *Crassostrea virginica*, is native up and down the eastern seaboard.) The oysters would thereby acquire the special Wellfleet taste.

One of the greatest contributions to the science of aquaculture was made by a Wellfleetian, David Belding, who studied the local shellfish from his laboratory on the wharf of the Chequessett Inn. In 1911, Belding published a landmark study chronicling the life, growth, and cultivation of shellfish. His findings are still used by modern aquaculturists.

Aquaculturists are granted licenses for the exclusive right to grow shellfish on these public tidelands. These are seeded with juvenile oysters and quahogs. In two/three years, these have grown to market size and are harvested. The current farming practices are derived from a practice of grow-out which was popular in the late 19th century. At the moment, aquaculture production continues to increase on a regular basis.

The Board of Selectmen, under authority granted in Massachusetts General Law Chapter 130, sections 57-68, may lease shellfish aquaculture sites in any of the tidal or intertidal lands in the Harbor currently designated for such licenses.

The following areas are designated for such licenses. Each license area is marked by yellow buoys.

AREA 1: On tidal lands off Mayo Beach and Chequessett Neck from the eastern boundary of the Town property at Powers Landing to the Town pier and at least 300' northward of a line from the seaward end of the breakwater to the easternmost tip of Great Island, except in the area above mean low water on Egg Island.

AREA 2: On tidal lands lying north and easterly of the breakwater and of the northerly tip of Indian Neck.

AREA 3: On tidal lands off the westerly side of Old Wharf Point and at the entrance of Loagy Bay.

AREA 4: On tidal lands on the west side of the Harbor from the easternmost tip of Great Island south of the southern end of Great Beach Hill Island. (not currently used. Deep water license areas require more area to meet the same productivity of vehicle-access grants, and are generally more difficult to work.)

Productively worked licensed areas are permitted renewals by the Board of Selectmen. There are provisions that define an underutilized aquaculture licensed area, and the Board of Selectmen has the discretion to either renew or revoke the license.

According to an inventory of aquaculture leased sites provided by the Shellfish Constable [2005] the total acreage reserved in granted area is 189.5 acres, or approximately 5% of the 3815 acres of intertidal area. (This includes three acres considered "open" at Lieutenant's Island, which have not been granted). This is distributed among 73 primary grant holders as named per area, with allowance for up to four individuals per license. Fifty-one licensed grant holders have been permitted license area extensions or additional areas, while seventeen grant holders still work only their originally licensed area, according to the Shellfish Constable Wellfleet has more shellfishing grants than any municipality in Massachusetts.

As the aquaculture industry expands, the area available for aquaculture becomes more scarcer. This is a natural consequence of a crowded harbor. It is important that available tidelands be used as fully and as efficiently as possible.

**Recommendation.** Review and upgrade regulations for efficient lay-out and use of aquaculture areas. A process needs to be established for reclamation and re-assignment of license areas that are not being productively used. This process should include a set of priorities for assignment of licenses to new applicants. (Shellfish Advisory Committee)

Aquaculture recognized in law as farming (the so-called "Pazolt" decision of the Massachusetts Supreme Judicial Court). Therefore, use of the tidelands for aquaculture does not have the same general protections as that of shellfishing, which is protected

under colonial ordinances. Because the practices and the equipment used, aquaculture may cause conflicts with upland shoreline owners. Many of the titles to intertidal lands are uncertain, depending on whether or not the ownership was separated from the upland ownership. Long range management of the harbor may require better knowledge of title issues.

**Recommendation:** Estimate and report costs to clarify titles of inter-tidal lands of Wellfleet. (Town assessor)

Most upland owners, however, welcome aquaculturists on the flats in front of their property. It is important that the Town act to support this good working relationship.

A further benefit of aquaculture is in helping maintain wild shellfish populations. The dense populations of sexually mature shellfish in propagation areas contribute spat in the water column. During the summer months, billions of free floating eggs and sperm unite to form larvae. Some of these eventually come to rest on substrates, where they can develop into mature shellfish. Thus, the licensed propagation areas and Town propagation areas not only produce the mature shellfish harvested by the licensees or transplanted by the Shellfish Department, but also serve to maintain the essential "wild" populations outside the licensed propagation areas, which are either harvested or remain to serve in turn as spawning stock.

Aquacultural practices continue to improve in Wellfleet. For example, oysters can now be grown to maturity in two seasons. This avoids loss due to those oyster diseases which affect older shellfish.

**Recommendation.** Support regulations and best management practices to manage aquaculture sites for healthy production, by controlling seed stock quality, by ensuring a genetically diverse population and by following best practices for site cultivation. The guide to best management practices for aquaculture, published by SEMAC (SouthEastern Massachusetts Aquaculture Center) is highly recommended. (Shellfish Constable)

### **The History of Oyster Aquaculture**

(Much of the following material was taken from the SPAT(\*) website.

Aquaculturists begin with oyster seed. Oysters produce huge numbers of eggs and sperm that unite out in the water. The resulting veliger is tiny, only about one tenth of a millimeter long, and its chances for survival are slim. In this stage, the young oysters are easily swept out by tides, rain, and runoff, ravaged by temperature changes, or gulped by zooplankton or small fish.

At the end of its free-swimming life stage, the veliger seeks a clean, calcareous surface, perhaps attaching itself to an adult oyster. To foster wild oyster stocks, the

Wellfleet Shellfish Department deposits cultch, or broken shells, in strategic spots in the harbor.

Some growers collect seed in the wild, but most oystermen and women now purchase seed from hatcheries. Under carefully controlled conditions, the shellfish hatcheries replicate the natural spawning of oysters, keeping temperature and salinity constant, protecting the juveniles from predators, and feeding them with microscopic plant cells called phytoplankton. Before sale, hatcheries must certify that the oyster seed is free from diseases that might harm the local oyster population

Aquaculturists using seed oysters place the oysters on the harbor bottom, often in bags. During the warmer months, growers tend to the bags to keep them clean and to sort the oysters so they're not too crowded, ensuring they get a good flow of water. As the oysters grow, they must be spread out to new bags, much the way plants growing in a greenhouse need to be repotted. This process involves sorting the oysters by size, so bags contain similar sized oysters. Tending the bags also means removing predators, such as the tiny snails called oyster drills.

In the winter months, some aquaculturists bring their bags into chambers, similar to root cellars, so the oysters will not be harmed by ice when the harbor freezes and thick slabs of ice are churned up by the tides. The shellfishermen who use cultch, however, usually leave the shells on the bottom, allowing the oysters to grow as they do in the wild.

Harvest regulations exist to protect the shellfishery. When oysters are two to three years old and have grown to at least three inches long, they can be harvested. Oysters are sexually mature by this point, so even farmed oysters contribute to the natural populations of oysters around Wellfleet Harbor by spawning before they are harvested.

Cultivating or farming oysters and other shellfish as it's done in Wellfleet is an environmentally sustainable alternative. Shellfish aquaculture does not involve any feeding, fertilizing or additives, so there are no chemical additions to the bay. The oysters under cultivation simply consume phytoplankton as they do in the wild. As they feed, oysters actually clean the water, each one filtering about 15 gallons of water per day, converting much of the nitrogen they remove from the water into protein.

This entry can be located: <<http://www.wellfleetoysterfest.org/aqua-facts.html>>

\*Shellfish Promotion and Tasting (SPAT) is a local grass-roots organization, dedicated to public education about shellfishing practices and support of shellfish farmers. They have established the annual, cultural event, the 'Wellfleet Oyster Festival' held following Columbus weekend, to raise funds toward supporting local aquaculture industry. This event features an oyster-shucking contest, shellfish information booths, arts, crafts and retail vendors, music, drama and poetry performances, as well as good food and community spirited entertainment.

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- [http://www.pac.dfo-mpo.gc.ca/sci/shelldis/pages/chyddcc\\_e.htm](http://www.pac.dfo-mpo.gc.ca/sci/shelldis/pages/chyddcc_e.htm)
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- [http://www.wellfleetma.org/Public\\_Documents/WellfleetMA\\_Departments/shellfish](http://www.wellfleetma.org/Public_Documents/WellfleetMA_Departments/shellfish)

NB: this last reference is to the excellent web-page of Wellfleet's Shellfish Department

## Chapter 4 - SHORELINE LAND USE

**Introduction.** Waterfront land on the Wellfleet harborshore is a precious resource, sensitive to the tremendous erosion pressures of nature and stress of human activities. Waterfront property is valuable not only for sentimental reasons (family vacations, generations of ownership) but also as a valuable investment commodity (capital appreciation). Real estate values are influenced by such classifications as "water view" and "beachfront". Cottages of the 1900 through 1970's vintage have been renovated or demolished to make way for the architecturally designed, contemporary homes of the latest construction boom years, 1997 through the present.

The appreciating value of shoreline residential property has redefined the character of Wellfleet's waterfront and use of resource area buffer zones. There is increased potential for conflict over physical access to the water, and visual / aesthetic impact of structures massed against a historically low-profile landscape.

The Shoreline Land Use chapter focuses on the use and protection of Wellfleet's waterfront lands. The specific goals of the land use planning efforts are:

1. Promote public access to the waterfront.
2. Preserve open space around the shoreline.
3. Maintain and improve the quality of natural resources of the Wellfleet Harbor watershed and coastal habitats

**ACEC Designation.** The Massachusetts Executive Office of Environmental Affairs designated Wellfleet Harbor as an Area of Critical Environmental Concern (ACEC) in 1989 (301 Code of Massachusetts Regulations 12.00). The designation consists of 12,350 acres - Wellfleet Harbor and Bay shoreline, the Herring River system (Gull/Higgins/Herring kettle ponds complex), and small contiguous resource areas located in the towns of Truro and Eastham.

For areas within the Cape Cod National Seashore, the ACEC extends from the surface water resource to the 10' elevation contour line; for the rest of Wellfleet, the designation area generally continues 100' landward from the 10' contour line.

The 'ACEC' designated area, including the entirety of any properties which the bounds run through, from the general area of the dike at the Herring River running south along harbor shoreline lands will be evaluated for “adequacy of resource protection”. The ACEC in the Cape Cod National Seashore is considered adequately protected by National Seashore policies and land use controls.

Portions of the area have been designated by the Department of Conservation and Recreation [under the Department of Environmental Management] as containing visual landscapes and cultural resources that place it in the top 5% of all landscapes in the Commonwealth (1982 Massachusetts Scenic Landscape Inventory). Important habitats within the ACEC boundary include largely unaltered barrier beaches, islands, marsh systems, salt and fresh water ponds, rivers, bays and tidal flats. These provide flood control, storm damage prevention, improved water quality, wildlife habitat, and recreational opportunities to surrounding communities”. (Wellfleet Harbor ACEC, Department of Environmental Management summary paper, Summer 2003.).

In 2002, the state’s Natural Heritage and Endangered Species Program (NHESP) identified approximately 7,990 acres or 65% of the ACEC as core habitat through their BioMap project. Almost 30% of the land in the Wellfleet Harbor ACEC is covered by either forested or wetland habitats, with a majority of the area consisting of Wellfleet Bay’s open waters. Although less than 5% of the land within the boundary is residential, much of the land immediately adjacent to the boundary has been converted to residential development. The Cape Cod National Seashore and Massachusetts Audubon Society] contribute over 25% or 3400 acres of protected open space in the ACEC”. (Wellfleet Harbor ACEC, Department of Environmental Management summary paper, Summer 2003.).

One effect of a ACEC designation is a permanent moratorium on new or expanded Chapter 91 licensed waterways construction, such as of docks, piers or other water-dependant structures, which would negatively impact natural resources, habitats and submerged lands.

Two other parameters reviewed against Massachusetts General Law Chapter 91 Waterways Regulations (310 CMR 9.00) applications for pier and dock constructions are: water quality rating and productivity of resource areas. Wellfleet Harbor has been ranked “Outstanding Resource Waters” (ORW) by the state, and both wild and cultured shellfish resources are acknowledged as highly productive.

Without the ACEC moratorium, projects could potentially be licensed under conditions of strict performance standards and engineering to satisfy “no negative impact” toward the resource qualities. The designation status affords the greatest level of protection in limiting licensing to only grandfathered structures, to be repaired or renovated to the original design.

**Recommendation:** Separately differentiate the ACEC area with its own permitting criteria, distinct from other districts: coordinate with regulatory boards to develop objectives, such as maintaining a naturally vegetated buffer between natural resource features and permitted structures and uses. Provide forum for regulatory boards to work out criteria to consider when permitting coastal development projects. (NRAB)

Areas exempted from the 'ACEC' designation are the Town Marina: inner basin north of the parking lot and the channel around Shirrtail Point, the mooring basin, and the buoyed navigational channel leading out of the Harbor 100' wide along the northern side of the inner basin and 2500-yard extending from the previously licensed 125' wide dredge channel from Bouy 12 due south to Bouy 10. This is for the purposes of maintenance of municipal infrastructure. The office of Coastal Zone Management accepted these boundary clarifications in 1990.

**Historic Seaport.** The land bordering Duck Creek along East main Street and Commercial Street was developed beginning in the early 18<sup>th</sup> century. At that time, what has become Duck Creek Marsh was a port for large fishing and whaling vessels on the high tide. Although whaling activity died with the Revolutionary War, fishing and shellfishing continued and by the mid 1800's, wharves circled Duck Creek. Banks, groceries, hardware stores and lumber yards opened on Main and Commercial Streets, to support the maritime trade and commerce.

Late 18<sup>th</sup> century deforestation of uplands to provide lumber for home and ship building and open area for agricultural uses may have caused topsoil erosion and possibly contributed land-sourced siltation of inner Duck Creek Harbor. General erosion trends and the depositional nature of the tides contribute a water-sourced siltation to the inner harbor, importing sediments from the open Cape Cod Bay into the harbor. Fine silts, sands and clays on the incoming tide suspend in the water column, depositing in the furthest reaches of creek inlets, accumulating as mucky "black mayonnaise". Harbor basin bathymetry and / or lack of tidal flushing contribute to the distinctive accumulations in Duck Creek and Wellfleet Marina.

Historically, Duck Creek waters were further exacerbated by the construction of the railroad bridge and dike across Duck Creek (1869) and tidal restrictions of Shirrtail Point and Mayo Creek. Eventually, boats could enter or leave the inner harbor only at high tide.

**Recommendations.** Because of the importance of Duck Creek, centrally located in the Town, several recommendations for its preservation are summarized here:

- Restore the Mayo Creek marshes
- Open the RR dike
- Plan for de-nitrifying septic systems in the Duck Creek mini-watershed
- Provide naturally vegetated buffers alongside Duck Creek
- Complete the process of preventing storm-water run-off along Commercial Street and its feeders; ensure that the catchment basins are regularly maintained
- Prevent storm-water run-off at the Marina

The major change to the Wellfleet waterfront came with the building of the present marina. In the 1950's, a breakwater was constructed at the end of Indian Neck barrier beach to provide sheltered anchorage. A marina with the "L-shaped" Pier was constructed and dredging programs initiated to provide deep-water anchorage for the commercial fishery fleet and seasonal recreational boaters in the harbor and around the marina mooring basins.

Shorefront development in the Central District has been marked by a departure from the traditional maritime, water-dependent uses, as the shops of shipwrights, sail-makers, coopers and fish packers, etc. have become art galleries, bed and breakfasts, seasonal retail shops, restaurants and condominiums.

**The Waterfront Today.** Much of the ACEC area is protected open land space or open waters. Of the Shoreline lands, most is zoned residential. The Central District represents a mix of uses, commercial and residential. Town owned lands include the Marina, several public beaches, six acres at Hamblin Park, Bakers Field recreational area and many shoreline public access points.

### **Open Space / Protected Land**

**Cape Cod National Seashore.** The US Congress established the Cape Cod National Seashore in 1961. It is under the purview of the Department of the Interior. The Act preserves 61% of Wellfleet's land area, mostly on the ocean side but including the entire Herring River estuary and Great Island barrier beach/tombolo formations extending to Jeremy's Point. The National Seashore is active in resource management and public education. Its legislative mandate is to provide recreational access, cultural preservation and continuity of traditional ways of life.

**Wellfleet Bay Wildlife Sanctuary, Massachusetts Audubon Society:** The Wellfleet Bay Wildlife Sanctuary owns shoreline in South Wellfleet extending from south of Lieutenant Island to the Eastham town line. Sanctuary lands are open to Massachusetts Audubon members, and the public by admission fee. Staff conduct a wide range of guided walks, educational seminars, and provide instruction in local schools. Wellfleet Bay Wildlife Sanctuary is actively involved in resource preservation.

**Wellfleet Conservation Trust:** The Wellfleet Conservation Trust (WCT), a non-profit organization, has focused on protecting harbor shore lands and wetlands, and owns 96 properties (268 acres) independent of Town of Wellfleet Open Space/Land Bank acquisitions. In addition, the Commonwealth of Massachusetts holds 92 acres in Indian Neck Marsh north of Field Point, and 4.5 acres of Fox Island, managed by the WCT for conservation and passive recreational access.

The South Wellfleet Conservation Trust has some additional holdings along Blackfish Creek and Lt. Island.

**Review of Shoreline Protection.** One value gained by the “ACEC” designation by the state has been a moratorium on projects permitted under MGL Chapter 91, effectively prohibiting any new or expanded pier and dock construction activities in the freshwater, harbor and bay shore areas contained in the ACEC boundary..

There is grandfathering protection afforded to structures pre-dating the 'ACEC' filing, allowing replacements (same footprint) or repairs through Chapter 91 filing and Conservation Commission 'Orders of Conditions'.

This type of moratorium is distinct from a building moratorium enacted temporarily for the purpose of addressing regulation change. The “ACEC” moratorium IS the intended regulation change. This has effectively prevented shoreline and pond periphery dock sprawl. The designation has not prevented the construction of any primary use structures, such as single-family dwellings.

Given the pressure to maximize waterfront properties and the escalating real estate values associated with shoreline view, the ACEC designation has been essential to protecting wetland resource areas and productive shellfish beds from intertidal construction (just as the CCNS enactment has prevented 'Coney Island - like' development of the backshore).

Because of its economic value, waterfront land is usually developed and is rarely left as open space. There are a number of advantages to preserving public open space, as well as limiting the lot coverage of expansions to developed and redeveloped properties along the shoreline. Naturally vegetated buffer areas act as filters of bacterial and nutrient contamination that may enter the waterway as road or storm runoff, and groundwater infiltration. Preserving waterfront land saves habitat for delicate marsh, dune and heathland ecosystems. Finally, waterfront open space promotes public access for activities such as swimming, boating, shellfishing, walking or simply viewing the harbor.

**Recommendation:** Town agencies and boards should create a strategy to address problems of sea level rise, salt marsh migration and design an appropriate long-term land use strategy. (NRAB, ConsCom)

**Recommendation:** A 100-foot naturally vegetated buffer zone should be created for all municipally owned parcels along the shore. (There are benefits for any buffer zone, no matter how small.) Private landowners should be encouraged to follow suit through educational brochures. Americorps members should be enlisted to survey all parcels along the harbor shore to identify run-off problems. (NRAB)

**Recommendation:** NRAB is concerned about the long-term impacts of coastal armoring in Wellfleet and believes that there should be no new coastal armoring. At the same time, we recognize that finding the right strategy that preserves beaches while accounting for property owner concerns is difficult. We recommend that a “summit” of local boards and expertise to devise creative solutions to coastal erosion and sand transport in Wellfleet Harbor. Wellfleet should be a leader, rather than a passive observer, in seeking legal and environmental solutions to human efforts to control nature. (NRAB, ConsCom)

**Recommendation:** The beaches of Wellfleet must be restored. Strategies are needed that are appropriate to the risk and extent of armoring on each beach section of the harbor. In some cases, direct sand replenishment will be appropriate. Construction of "soft" revetments - either by new techniques or by retrofit to old structures – can also be used. These "soft" revetments mimic the action of natural dunes by periodically adding sand and plantings to the revetments so that they act as a dune. Any order of conditions for revetment, groin or seawall construction or replacement should include sufficient steps to avoid unnatural beach or dune loss. In some cases, however, the best strategy will be to remove groins and armoring, in whole or in part. (NRAB, Conservation Commission)

**Recommendation: Wildlife Protection.** Identify and protect wildlife corridors as part of the Town's various land preservation efforts. To minimize adverse human/animal interactions, ways to water and traditional crossings should be protected (OSC).

**Recommendation:** Propose a by-law to minimize exterior illumination within 100 feet of the shore through use of baffles and down lighting solutions. An education program should be developed to protect the night sky and traditional coastal wildlife activities (spawning, feeding, etc.). (NRAB)

## **Public Access**

**Beaches.** Most of the harbor is surrounded by beautiful sandy beach, which provides excellent swimming conditions with relatively calm waters, except during stormy weather. Most beaches are presumed privately owned (but not extensively deed researched) but the Town owns four public beaches with varying levels of facilities for the users.

**Power's Landing.** Facing south and located west of the marina, this beach has 122 feet of shoreline and a parking lot large enough for 47 cars (beach program sticker required). There are areas of narrow beach associated with seawall or revetments constructed by upland property owners. No drinking water, changing or toilet facilities are provided.

**Mayo Beach.** This area was a gift to the Town, carrying stipulations that lands be available for the recreation of citizens in perpetuity. This is the most centrally located beach lying immediately west of the marina with a shoreline of 1700 feet and marked swim area. Windsurfing is restricted, to avoid user conflicts. There is a basketball court, free parking for 95 cars, boardwalk for handicap accessibility, viewing benches and picnic tables. Adjacent is Bakers Field recreational area, with temporary portable toilets. Parking is free; no beach sticker is required.

**Indian Neck Beach.** Located immediately south of the breakwater, this beach faces west and extends 575 feet along the shore, with 325' owned by the Town and 250' owned by Wellfleet Conservation Trust. The only facility is a parking

lot for 80 cars (beach program sticker required); windsurfing is restricted, to avoid user conflicts.

**Burton Baker Beach.** Also on Indian Neck, this beach lies one half mile south of the breakwater and has 2150 feet of shoreline. There is very limited parking along the side of the road and entrance to the beach (about 10 cars, beach program sticker required). It is the designated windsurfer launch beach, with an area set aside for rigging. Armoring along this shoreline has caused vertical loss of beach, impacting public right of access.

**Shoreline Access.** Horsely and Whitten, consultant for the Coastal and Pond Access Committee (C&PA), has produced a report titled “Ways to the Water” which researched ownership to 58 public landings identified in the 1995 Harbor Management Plan Appendix. The report and various maps were presented to the Board of Selectmen during the Spring of 2005. The Coastal/Pond Access Committee will review the report and make recommendations for suitable uses for each landing, and any needed improvements.

**Recommendation:** Support the initiatives of the C&PA committee to ensure broad public access in an environmentally sensitive manner (Board of Selectmen, NRAB)

**Recommendation: Public Access.** Access to the water is becoming increasingly difficult as more shorefront is privatized and traditional, neighborhood access points are closed by new development. Advocate for the Town acquisition of the Appendix 1 unbuildable or undeveloped coastal parcels, to augment the acreage of open space for recreation, create neighborhood “pocket parks” or boat launches, and contribute toward the goal that a Town Landing or “Way to the Water” is within ten minutes walk for nearly every citizen of Wellfleet. Such access points need not entail automobile parking, nor necessarily boat launches. Additional access points need not be municipally purchased, but could be obtained through creative use of easements, conservation restrictions, or other options. (C&PA)

**Recommendation:** Once access to the water is secured, the town should work towards obtaining public lateral transit of shorefront. Again, through creative usage of public funds, easements, tax policies, working with trusts and non-profit groups, lateral passage for historic and traditional uses should be assured for all residents. (C&PA, NRAB)

**Recommendation:** Scenic overviews should be identified and pocket parks designed for passive use. Families and elderly should be able to sit at a park bench or picnic table to observe and enjoy the beauty of Wellfleet Harbor. (DPW < Recreation Department)

**Recommendation:** Walking trails around Wellfleet Harbor should be designed and parcels of public access property stitched together. (Beach Administrator)

**Private Landings.** The Chequessett Neck Yacht Club has a launching area restricted to members only. There are two private docks near Paine Hollow Landing, one in Duck Creek by Cove Gallery, and two in Loagy Bay.

## Public Parks and Recreational Areas

Hamblin Park consists of six acres, also known as Cannon Hill, accessed across the picturesque foot bridge known as ‘Uncle Tim’s Bridge’ on the east bank of Duck Creek. There are current concerns that this most photographed and intrinsic Wellfleet landmark may need structural upgrades. Any improvements should be performed under the parameters as a “State Listed Historic Structure” to retain its unique construction conventions, and with respect to the performance standards of the ACEC designation. The park was donated to the Town by Arthur T. Hopkins in 1931, and is the only park within the Central district that has a view of Wellfleet Marina, the harbor and Town shoreline. The Wellfleet Recreation Department holds an Annual Easter Egg Hunt in the park for the children of the community. There are several footpaths enjoyed by pedestrians and bicyclists, in need of rehabilitation. The area should be revegetated with native trees and plants to minimize erosion and habitat destruction, along with silt fencing and hay bales along the perimeter path.

**Recommendation:** Hamblin Park, at the end of Uncle Tim’s bridge, should be upgraded with benches, paths and erosion controls. (Conservation Officer, underway in 2005)

**Recommendation: Old Fire Station:** Purchase the east half of the current lot. Establish a kayak launch site and address erosion problems. (Conservation Officer)

Baker’s Field is located in the Central District north of Mayo Beach, accessed by Kendrick Avenue, has a large sports field used for baseball, softball and soccer as well as unstructured activities; a playground with components scaled for preschoolers as well as children over six years old; a regional skate park; four tennis courts, and a seasonal tent used for music and theatrical performances. A summer day program for children is operated on site, providing recreational programs and opportunities to visitors and citizens alike. Parking is adequate.

**Central District.** Many of the 18<sup>th</sup> and 19<sup>th</sup> century structures downtown have been converted from captain’s or sea merchants’ homes and businesses into uses supporting today’s seasonal, visitor-based economy: lodgings, restaurants and attractions with a mix of year-round and seasonal residences. Guidance by the ‘Historic Review Board’ and the ‘Historic Commission’ has helped to preserve the exterior architectural details of State-listed Historic structures where property owners proposing renovation and remodeling projects are able and willing to comply with period restoration directions.

A Town of Wellfleet ‘Demolition Delay’ bylaw can be invoked to review proposals involving 25% or greater demolition of a State-listed Historic structure.

Proposals deemed to be a ‘Development of Significant Impact’ under local zoning bylaw can be referred to the Zoning Board of Appeals, or ‘Developments of Regional Impact’ can be referred to the Cape Cod Commission for review.

Even with the intrusion of modern construction materials and details there remains a unique, attractive character of Wellfleet's Central District as a traditional New England fishing village.

**Recommendation:** Support Planning Board efforts to redefine the Central District to more accurately depict existing development patterns. This densely developed area contributes nutrient loading to Duck Creek, has a certain historic and cultural value, and is poised to become served by the expanded Coles Neck Municipal Water supply. These factors in aggregate call for such measures as would reduce the redevelopment intensity of use. (Planning Board, NRAB)

**The Marina and Mooring Basin.** The Wellfleet marina consists of an L-shaped pier for commercial vessels, a series of slips and a mooring area. There are two boat launching ramps and a parking lot on Shirttail Point to accommodate users of marina facilities. Restrooms with six toilets and two showers are provided next to the Harbormasters shack for public use, with low-flow, water conservation plumbing fixtures and a ‘Recirculating Sand Filter’ denitrifying septic system to provide advanced nutrient treatment. This was installed under recommendation from the Barnstable County Department of Health and the Environment, with grant funds. Recent conditional failure requiring repairs have demonstrated the need for local Health Department conditions of operation and maintenance, and periodic review of system performance. This has replaced an antiquated tight tank and costly pumping and hauling fees.

**Recommendation:** Protect traditional maritime, water-dependent activities such as the fisheries, commercial and recreational boating and related service industries with necessary Marina infrastructure repairs and improvements, such as stormwater runoff remediation, and interpretive, educational displays in town facilities. (Harbormaster)

### **Local Regulatory Development Process**

The following is a review of the regulatory permitting processes by town boards, to determine whether there is adequate protection of shoreline lands. Individual boards have not established definitions or procedures for review of shoreline land area protection consistently or distinctly, other than setback delineations.

**Planning Board.** The Planning Board is the board which investigates and proposes appropriate zoning bylaws. The adoption of local zoning is a community-driven process, requiring the Planning Board to hold public hearing to consider each new bylaw or amendment. Proposals may also come by citizen petition, or recommendation of the Board of Selectmen. If the proposal is accepted by a 2/3 majority of Town Meeting, and approved by the Attorney General, the bylaw becomes effective. There is ‘grandfather’ protection afforded to structures and uses which pre-exist the zoning change.

The Planning Board reviews proposed subdivisions activities under the subdivision control act and local subdivision regulations. New subdivision proposals must conform to lot size minimums, frontage requirements, and drainage/utility requirements.

**Zoning Board of Appeals.** The Zoning Board of Appeals (ZBA) of Wellfleet is authorized under MGL chapter 40A to interpret local zoning bylaws and hear applications seeking relief under 'Special Permit' or 'Variance' requests.

The Wellfleet ZBA only considers upland lot area in calculating "footprint", or lot coverage allowances, which has the effect of disqualifying unbuildable wetland areas from any useful credit.

In hearing applications for relief, the ZBA considers conformity to zoning district definitions and objectives, prescribed lot coverage allowances, frontage and setbacks, and criteria described for eligibility under 'Variance' and 'Special Permit' sections. The only specific resource area setback recognized in Wellfleet Zoning Bylaw is the Federal Floodplain (to the 12' contour line). This is the only distinct way in which Wellfleet's shoreline are held to review different from the zoning districts. There is no specific waterfront-zoning district, as there is a CCNS district.

Each application is considered by the ZBA for its individual merits or potential detriment to the neighborhood, and proposals may be allowed subject to conditions or limitations.

**Conservation Commission.** The Conservation Commission reviews applications under the authority of the 'Wetlands Protection Act' (MGL 131 section 40, codified in 310 CMR 10.00) and local environmental bylaw to regulate protection of the following interests: public and private water supply, groundwater supply, flood control, storm damage control, prevention of pollution, and protection of lands containing shellfish, fisheries and wildlife habitats.

Landscape features subject to protection are: coastal banks and dunes, surface waters (marine and fresh) or wetlands, beaches, coastal flats, swamps and marshes, any land subject to tidal action, flooding or coastal storm flowage, estuaries or rivers. Any activities likely to result in the removal, filling, dredging or altering of these resource areas requires a review of the project. Activities to be performed within 100' of these resources, the "buffer zone, are reviewed to consider whether the project poses any potential to result in an alteration of or detriment to protected resources.

The Conservation Commission may impose 'Order of Conditions' describing performance standards, impact mitigation, or site restoration plans. This 'Order' can only be lifted when a site inspection satisfies that conditions have been met and a 'Notice of Compliance' is issued. Some projects are previewed under a 'Request for Determination of Applicability' filing to consider whether the statutes of the Wetlands Protection Act apply.

**Board of Health.** The Wellfleet Board of Health reviews “Variance” requests from the provisions of Title V Environmental Code (310 CMR 15.00 - The Minimum Requirements for the Subsurface Disposal of Sanitary Sewage) and promulgates local regulations under MGL chapter 111 for the protection of public health.

The Wellfleet Board of Health local regulation has amplified the State Code setbacks from septic system leaching facility to wetland resources from 50' to 100' in recognition of unique soil conditions, water quality and shellfish resource values. There is also a local requirement to install denitrification technology advanced septic treatment where any reduction to this resource setback is permitted.

The 'Nitrogen Loading Limitation' amended into the Title V regulations, effective 12/27/96, dictates that any property served by both an on-site septic system and a drinking water well is inherently sensitive to wastewater impact (this situation represents the majority of Wellfleet). Accordingly, intensity of use is restricted to four bedrooms of septic system design flow per acre (or 10,000 square foot lot area per bedroom) with protection afforded to pre-existing uses in excess of the standard. The only allowable expansions must comply with the Nitrogen Loading Limitation, or meet effluent rating with credited advanced treatment technology, without incurring variance. In Wellfleet, this has had the effect of limiting new development to this standard and capping pre-existing development.

Local BOH Regulation 608 further limits lot area available toward calculation of the 'Nitrogen Loading Limitation' by disqualifying salt marsh, filled wetlands or areas subject to tidal action. This is effectively a shoreline land use restriction which reduces buildable lot area in order to protect marine resources.

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### **Appendix 1: Unbuildable / Undeveloped lots to consider for Coastal Access**

Duck & Mayo Creek Shoreline – any undeveloped parcels. This is the traditional social and commercial heart of the maritime community. The development of Wellfleet center occurred because of the historic focus on Duck and Mayo creeks for maritime foods, transportation, service of vessels, etc. This area is still the main attraction in terms of the Town’s aesthetic appeal to residents and visitors, production of shellfish, recreational boating and finfishing. Town should negotiate for control of railroad embankment, to open for improved flushing of Duck Creek. Town should also negotiate for conyrol of all of the former fire station site, at the foot of Bank Street.

Land, including wetlands, subject to tidal restoration – the head of Mayo Creek has already been protected by Land Bank and WCT acquisition.

- Doane’s Creek marsh (between Rt. 6, Pole Dike, Coles Neck and the Library)
- Gull Pond Road swamp and bog (between Rt. 6 and CCNS bound)
- Mill Creek including CYCC and private properties east to Hamblin Farm

- Thimas Bog (south of Lieutenant's Island Road, behind church)
- Mayo Creek landward of Kendrick Avenue and seaward of Chequesset Neck Road)

Upland parcels landward of salt marshes, especially within the ACEC. The objective is to obtain public ownership or conservation restriction / easement to allow marshes to migrate with sea-level rise. Uplands surrounding:

- Fox Island marsh
- The "Run" (Trout Brook, Fresh Brook, Silver Spring – fed estuary in South Wellfleet)
- Blackfish Creek
- Drummer Cove (Map 30, Parcels 88 and 89)

## Chapter 5

### TIDAL RESTORATION (HERRING RIVER AND OTHER RESTRICTED MARSHES)

#### The Public Benefits of Healthy and Functioning Salt Marshes

Healthy and functioning salt marshes are among the most productive areas in nature. Large amounts of organic matter are produced and exported as detritus and dissolved organics to estuarine and coastal waters, where it provides the basis for a large food web that supports many marine organisms, including finfish, shellfish and many bird species. Salt marshes also provide spawning and nursery habitat for several important estuarine forage finfish as well as important food, shelter, breeding areas, and migratory and overwintering areas for many wildlife and bird species. It is estimated that two-thirds of the commercial fish and shellfish taken on the East Coast spend at least part of their lives in salt marshes and estuaries.

Salt marsh plants and sediment remove pollutants from surrounding waters. The network of salt marsh plant roots and rhizomes binds sediments together. Salt marsh sediments absorb chlorinated hydrocarbons and heavy metals such as lead, copper and iron. Salt marshes also retain nitrogen and phosphorous compounds, which in large amounts lead to algal blooms and oxygen depletion in coastal waters. Salt marsh peat serves as a barrier between fresh ground water and saltwater. Salt marsh cordgrass and the underlying peat are resistant to erosion and dissipate wave energy providing a buffer that reduces wave damage to upland properties and providing an environment which promotes settling of suspended sediments onto the marsh surface.

**Wellfleet Harbor.** Healthy salt marshes are crucial to the health and sustainability of estuary systems (see Chs 2&3 of this plan). Currently, Wellfleet Harbor has about 1250 acres of functioning salt marshes. In the past 100 years many of Wellfleet's marshes have been tidally restricted. These restrictions were put into place for many reasons: land reclamation, mosquito control or simply for reasons of cost and convenience during other constructions. A Cape Cod Commission Report (the "Atlas of Tidal Restrictions") issued in 2003 listed the tidal restrictions in Wellfleet – Herring River, Blackfish Creek, Mayo Creek, Duck Creek, Fresh Brook, among others. A copy of the report is available at the Wellfleet Public Library. If all of these restrictions were removed, the area of salt marsh around Wellfleet Harbor would be over 2500 acres.

In the past 100 years, therefore, Wellfleet Harbor has lost about 50% of its salt marshes.

**General recommendations.** The NRAB supports the re-opening and establishment of increased tidal flow in all diked marshes in Wellfleet.

In particular, the NRAB reaffirms its support of restoration of the Herring River estuary, as earlier recommended in the 1995 Wellfleet Harbor Management Plan (page 56). The Herring River restoration project would be the largest salt marsh restoration project ever in the Gulf of Maine.

The NRAB believes that reopening diked marshes to increased tidal flow will accomplish the following:

- Ensure healthy herring runs and eel migration
- Provide additional habitat for baitfish
- Increase shellfish habitat (for wild shellfishery, aquaculture or nursery stock)
- Increase feeding and resting areas for migrating shorebirds
- Increase recreational opportunities, such as kayak and canoeing
- Increased water flow will improve water chemistry flowing into harbor

The net result of such tidal restoration efforts will be an increase in finfish and shellfish resources, improved water quality, and increased recreational opportunities for Wellfleet citizens.

We would recommend for each watershed tidal restriction project, the following:

- A project proposal indicating major steps, timeframes, expected results and critical performance measures. Each project proposal should discuss possible impacts, methods for minimizing adverse effects, and, if necessary, for determining damages (such as flooding, impact on aquaculture and wild fishery, relocation, etc.).
- Federal and state agencies should be involved in providing assistance, professional and financial, in determining the nature of any impacts and for compensating adverse effects. The existence of the Cape Cod National Seashore as a major landowner involves federal interests. The reestablishment of tidal flows has impacts on statewide fishery and wildlife interests. The Town of Wellfleet should not be expected to completely underwrite the expense of such major natural resource restoration initiatives.

**Recommendation:** An advisory committee should be appointed for each watershed project consisting of: representatives of town officers, agencies and boards involved; federal and state agency representatives; and members of the public representing resource users, property owners, and other significant interests. The committee should provide technical advice based only on the best science and engineering. The committee should also create a basic restoration plan. Public hearings should be held at all major steps in the process (Board of Selectmen)

Note: As of September 2005, the Board of Selectmen of Wellfleet and the Cape Cod National Seashore, acting jointly, had appointed advisory committees for the Herring River marsh restoration. A Memorandum of Understanding jointly agreed to by the Board and the Cape Cod National Seashore defined the committee structure and charge.

NRAB recognizes that the process of reopening diked marshes and increasing tidal flow is a complicated one. Similar efforts on the Cape have indicated that there will be a very real transition period that may cause citizens to question the wisdom of the undertaking (for example, phragmites and other fresh water vegetation will die off as salt water increases).

The NRAB believes that reestablishing tidal flows in Wellfleet Harbor is in the best interests of all living organisms calling Wellfleet home.

**The Herring River.** Since the Herring River Dike was constructed in 1908, for the purpose of mosquito control and creation of agricultural land, the public interests and environmental values provided by the salt marshes above the dike have declined precipitously. The following is a brief description of these interests and values and how they are affected by the tidal restriction at the Herring River Dike

Flood control & Storm damage prevention. Healthy and functioning salt marshes provide a natural buffer to storm damage and increase in elevation as sediments settle onto them providing for flood control. Incoming tides carry fine sediments up onto the surface of salt marshes where the flow of water slows down and the “roughness” of salt marsh vegetation promotes the settling of fine sediments that build the elevation of salt marsh peat and also provides nutrients to vegetation. The ability of salt marshes to increase in elevation, and to migrate, is important in the face of evidence of global warming and sea level increase.

The drained soils above the Herring River dike have been subsiding (sinking and compacting) since the tidal flow was restricted, with a total elevation loss of about 80 cm (2.6 feet) since 1909. The soils are currently subsiding at a rate of approximately 3-mm (1/8 in.) per year. It has been demonstrated at Hatches Harbor that impacted salt marshes can recover when tidal flow is restored: this diked marsh has gained over 14 mm (1/2 inch) per year since tides were restored in 1999.

**Adverse impacts to water quality:** The construction of the dike has resulted in a reduction of tidal flow into historic salt marshes. The reduction in tidal flow combined with salt marsh ditching in the early 1900’s reduced the water levels within the marshes. Sulfide, a natural component of salt marsh peat, has converted to acidic sulfate as the peat became exposed to atmospheric oxygen – a direct result of the reduction in water levels. Sulfate concentrations have a significant effect on the pH of the water in the freshened system. The very low pH (often < 4 in drainage ditches) results in the leaching of significant amounts of aluminum from the clay component of the salt marsh peat.

Both low pH (< 4) and dissolved aluminum are toxic to fish. Only 0.3 parts per million (ppm) of aluminum need be present to be fatal to fish. Readings as high as 49 ppm have been found in the ditches behind the dike where the pH is highly acidic. These conditions are not beneficial to wildlife, fisheries, or shellfish in Herring River. This condition exists now and can be reversed by re-introducing tidal flow. Allowing tidal flow into the salt marsh will re-saturate the soils above the dike, reverse the chemical processes and greatly improve the water quality over existing conditions and therefore prevent pollution of this valuable resource to the Town and the Commonwealth.

**Adverse Impacts to Land Containing Shellfish:** The tidelands above the dike once offered productive shellfish habitat. The reduction in the salinity over the area above the dike and the severe degradation of water quality due to the drainage of the marshes has led to a significant loss of shellfish habitat. The model prepared by Malcolm Spaulding indicates that restoring tidal flow to the system would increase the salinity as far as Bound Brook and could support the presence and growth of oysters and crustaceans. When the tide gates at the dike failed in 1968 and tidal flow was partially restored, shellfish re-colonized the area quickly. When the tide gates were repaired, large numbers of shellfish that were present died; those that did not were transplanted to other areas of Town. Shellfish, including soft-shelled clams, blue mussels, and quahogs have successfully re-colonized restored marshes in Truro and Provincetown.

**Physical Detriment to the Passage of Herring:** The restriction of the sluice gate to its current setting creates very high velocity flows which limit the passage of herring to periods of low flow and hence low velocity. This narrows the window of opportunity in which herring can pass the sluiceway. Velocities at the dike have been measured as high as 18-feet per second. Herring traditionally stage in estuaries, areas where the fresh water and saltwater mix, for a period of time to adjust to the freshwater environment prior to ascending to freshwater spawning areas. The construction of the dike has eliminated a large portion of this staging area, i.e. it has replaced a gradual change in salinity over a long reach of the estuary with a more abrupt change in the vicinity of the dike. In the opinion of Phil Brady, the Commonwealth's anadromous fisheries biologist, Division of Marine Fisheries, this may be the most significant adverse impact to the herring fishery.

**Significant loss of habitat for finfish and shellfish:** Large areas of the estuary can no longer support finfish and shellfish populations due to the poor water quality noted above plus frequent summertime oxygen depletions. Fish kills due to low oxygen concentration in the water have been documented. It is estimated that two-thirds of the commercial fish and shellfish taken on the East Coast spend at least part of their lives in salt marshes and estuaries.

**Habitat Loss and Plant Succession to a Less Productive and Diverse Ecosystem:** The reduction in tidal flow and the water level above the dike has resulted in the loss of salt marsh habitat. Upland species of woody trees, shrubs, vines and ground cover have encroached onto the floodplain and degraded salt marsh to the river channel. The result is a contribution of woody organic matter (trees, branches, and leaves) into the river proper. Trees and branches entrap leaves and other materials which may block or impede the passage of herring. According to Phil Brady, herring prefer to travel at the top of the

water column and juveniles returning to sea can become trapped in this detritus and die-off. The encroachment of woody vegetation and detritus may result in blockages which prevent juvenile herring from returning to sea. Plant succession will continue and many areas currently vegetated with shrubs will be replaced by trees.

**Federal Clean Water Act list of Impaired Waters [303(d)]:** The Herring River is currently listed on the State and Federal lists of impaired waterways; those that do not meet federal surface water quality standards. The objective of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. The pollutants identified in the Herring River include presence of low pH, metals and pathogens. The presence of the above conditions is directly related to the presence of the dike and the tidal restriction. While the overall water quality of the Harbor is good, the water quality in the Herring River would be improved by restoring tidal flow to the Herring River.

**Wellfleet Conservation Commission Nomination of Herring River as a "Priority Wetland Restoration Project".** On May 21, 2003, the Wellfleet Conservation Commission voted to support the restoration of the Herring River Salt Marsh. On November 19, 2003, the Conservation Commission voted to nominate the Herring River Salt Marsh as a priority wetland restoration project with the Massachusetts Wetland Restoration Program (WRP). In January 2004, the WRP accepted the project. The WRP coordinates all aspects of wetlands restoration, including assessment of restoration feasibility, development of plans, and oversight of design, engineering, permitting and construction, and confirmation of adequate monitoring. The WRP works in collaboration with restoration project partners and sponsors including State and Federal partners and the Corporate Wetlands Restoration Partnership.

**Possible Regulatory Actions.** As owner of the dike, the Town may be open to regulatory enforcement orders pursuant to the Federal Clean Water Act. The Town is under a 1978 order of the Attorney General of the Commonwealth to maintain a certain level of water flow through the dike. It is not clear what the current status is. The Division of Marine Fisheries also has certain enforcement authority relative to the free passage of migratory herring through the dike.

**Herring River: Recent Studies. Sedimentation.** Concerns have been raised about increased sedimentation in the harbor and stability of the Gut with restoration of Herring River tidal flow. These concerns were studied by Dr. Amy Dougherty, a coastal geologist. Her final report, "Sedimentation Concerns Associated with the Proposed Restoration of the Herring River Marsh, Wellfleet Massachusetts", addressed those concerns. (A copy is available in the Wellfleet Public Library.) A summary of the questions and conclusions follows:

- **Sedimentation of the Lower Herring River – Concern:** That sediment from above and immediately below the dike will be transported into Wellfleet Harbor as the dike is opened incrementally. Conclusion: There is currently greater restriction on flow with the sluice gate partially closed

as there would be with all gates open and/or the removal of the dike (similar to holding a hose with your thumb over it). As the gate is opened incrementally, the velocity of the water through the opening will actually be reduced, thereby lessening the power of the water to pick up and move sediment downstream. Additionally, the velocity of the incoming tide in Wellfleet Harbor is faster than the outgoing tide, and therefore net sediment transport in the river will be upstream, not downstream. The formation of the original salt marsh is a clear indicator of this landward net-transport direction.

- **>Stability of the Gut – Concern:** That the Gut will break through if the tidal flow is restored above the Herring River Dike. Conclusion: The stability of the Gut is dependent on forces along the Cape Cod Bay shoreline and not by tidal flow in and out of the Herring River. The most compelling argument for this is the series of maps and aerial photos of the Herring River mouth adjacent to The Gut which show the river channel in the same place from 1848, when there was no dike, to the present. A temporary overwash of The Gut is possible, as it is for any barrier beach, but formation of an inlet is very unlikely given the wide opening for water exchange provided by Wellfleet Harbor and the net transport of sand alongshore from the north.
- **Groundwater Study:** Concerns have been raised regarding the potential for saltwater intrusion into private water supply wells if tidal flow was reintroduced into the Herring River and Mill Creek areas. John Masterson, of the US Geological Survey (USGS), studied this issue by installing monitoring wells in the Chequessett Neck area and applying a computer model to simulate the effects of increased Herring River tide heights and salinities on the groundwater system. The study concluded that the restoration of tidal flow would not significantly change the salt/fresh groundwater interface and, thus, would not affect private wells.

**Monitoring of Existing Conditions.** The National Park Service began monitoring environmental conditions in the spring of 2004. The conditions include wetland sediment elevation, tide heights above and below the dike, wetland hydroperiod and sediment and water chemistry, water quality, vegetation, fish and crustaceans, benthic invertebrates, shellfish growth, waterbirds and groundwater quality. NPS is also monitoring sediment quality on shellfish grants closest to Herring River and, in 2005, began a study of fecal coliform sources and transport in the lower Herring River, from High Toss Road to the river mouth..

The MA Division of Marine Fisheries is updating the Sanitary Survey for the Town shellfishing areas. Water samples are analyzed for fecal coliform bacteria. The results of the survey determine shellfishing closures. The restricted area on the Herring River has been increased; it has moved seaward toward the harbor.

**Chequessett Yacht & Country Club.** The golf course has shown a great interest in the project and is considering and planning for the relocation of several holes to upland portions of the course. Several holes are now subject to flooding on the golf course which make some portions of the course unplayable at certain times of the year. Action was taken at the 2005 Wellfleet Town Meeting to purchase the affected Mill Creek property with Open Space funds.

**Herring River Studies.** The Wellfleet Public Library Reference section has over twenty publications, studies, reports and papers relative to the Herring River. In addition, a collection of newspaper articles over the past 40 years (Wellfleet Historical Society) has been photocopied by Abby Franklin, and is available in a three-ring binder in the Reference Section of the Wellfleet Public Library.

**Herring River: Restoration Plan.** The development of a Comprehensive Restoration Plan is necessary to evaluate and plan for the project details essential for review of the project as a whole.

All wetland restoration projects must be filed with the Conservation Commission in the form of a Notice of Intent for review of project impacts under the MA Wetlands Protection Act and the Wellfleet Environmental Bylaw. The Conservation Commission will review the restoration plans, mitigation of impacts, proposed monitoring protocol, and will hold a public hearing and accept public comment as it relates to the project's impacts on wetland resource areas. The Commission will ultimately issue an Order of Conditions for the project which specifically identifies conditions that the project must operate under, may request additional information, or may deny the project as it is proposed if it fails to meet performance standards under the applicable environmental laws and regulations.

The project should be reviewed under the Massachusetts Environmental Policy Act. (MEPA). The Cape Cod Commission may review the project as a Development of Regional Impact (DRI). The National Park Service, Cape Cod National Seashore, will prepare either an Environmental Assessment or Environmental Impact Statement for the restoration project to ensure thorough agency and public review.

An assessment of the all flood plain properties is required in order to determine if the restoration project would impact any properties (home, well or septic system). Once this determination is made, plans to mitigate or compensate any impacts could go forward. Mitigation may include relocating septic and well components and flood proofing of the dwelling or other engineering options yet to be determined.

The NRAB believes the installation of box culverts at High Toss Road and Old Kings Highway would be of assistance to the passage of herring, whether or not the dike is modified. Accordingly, we recommend that culvert construction be added to the Town's capital plan.

[This chapter is based on several memoranda prepared by Eric Mitchell, former Assistant Health and Conservation Agent. The NRAB appreciates his work in this regard.

The book "Life and Death of a Salt Marsh" by John & Mildred Teal is an excellent general reference on salt marshes.]

## Chapter 6 -MARINA & BOATING

**Introduction to Boating and the Marina.** The expanse of Wellfleet Harbor offers exceptional opportunities for recreation and boating. The many creeks, small bays and salt marshes are an invitation for exploring and “gunkholing” with sail, power or paddle. A deep water channel is clearly marked from the mooring basin to a point south of Billingsate Island. Many boaters enjoy picnicking on the beaches of the southwest shores.

A private yacht club conducts sailboat races and sailing lessons in the Harbor during the summer. All boats should stay clear of racing boats.

Excellent mooring, launching and other services are provided at the Marina in a small scale, appropriate to the protection of natural resources. Small neighborhood mooring areas are used throughout the Harbor.

To protect persons and property, there are various Harbormaster regulations, Coast Guard regulations and Federal ‘Inland Rules of the Road’ that should be observed by the boating public, published and distributed with slip or mooring leases and available to users of Wellfleet launch sites.

**Marina.** In this section we summarize the facilities and services at the Wellfleet Marina, identify the key issues that concern this area of our harbor and make recommendations for the future. The marina is a focal point of Wellfleet Harbor because it is the primary location where recreational and commercial boaters access the harbor. The marina is subject to a number of critical environmental, economic, public safety and congestion problems.

Our objectives when considering management alternatives in the marina and harbor are:

1. Maintain or improve the quality of the environment (water quality, habitat, wildlife etc.)
2. Maintain a safe and navigable harbor
3. Maintain or improve public access to harbor resources.
4. Balance the above objectives without an undue burden on taxpayers.

Dredging is one of the primary issues of the marina and because of its importance will be considered in a separate sub-chapter.

**Inventory.** The Wellfleet marina consists of an L-shaped pier for commercial vessels, 207± slips and a mooring area. There are two boat launching ramps and a parking lot on Shirttail Point to accommodate the people who use the marina facilities.

Restrooms with five toilets and two showers are provided for public use. Newly upgraded restrooms consist of a recycling sand filtration (RSF) system, low flow flush toilets and restricted showerheads.

Fueling facilities (gas: 6,000 gallons, diesel: 4,000 gallons) are provided on the outer pier.

Facilities for disposal of sanitary waste include a touring pump-out boat and a stationery unit.

There is a 175-gallon waste oil container. Oil pollution containment equipment consists of a 180-foot containment boom and a 100-foot absorbent boom. The Harbor Master and Assistant Harbor Master are trained in the use of the pollution control gear.

### Marina Facilities

<u>Type</u>	<u>Number</u>
Slips	207±
Moorings	291 (present cap of 350)
Boat Launching Ramps	2
Storage	
Dingy	50
Trailer	50
Commercial Fishing Fleet	
<u>Type</u>	<u>Number</u>
Draggers	5
Mini Driggers	10
Sea Clammers	2
Lobster Boats	1
Sport Fishing Boats	3
Head Boat	1

In 2004 there were 192 sailboats and 470 powerboats berthed. There is a great demand for slips and 350 moorings in the Wellfleet Marina. There is a waiting list of 350 for slips and 50 for moorings with an average turnover rate per year of 3% and 5% respectively. The ratio of residents to nonresident slip holders is 84% to 16% and mooring holders is 81% to 19%.

The majority of vessels are between 15 and 25 feet. Docks are not adequately designed nor the mooring deep enough to accommodate vessels in excess of 60 feet in length.

Parking facilities at the marina include 280 spaces for cars. The marina has storage facilities for up to 50 dinghies and 50 trailers.

The town and three private companies (Bay Sails Marine, Inc., Wellfleet Marine Corp. and Small Boat Service) provide services at the marina. Among the services are sail and powerboat rental.

The Marina has, since 1995, operated as an “Enterprise Fund”. At that time, the marina was underfunded through general revenues. The Enterprise Fund has produced sufficient funds to operate the Marina. The Fund also assures that the costs of Marina operations are borne by the users. This mode of operation should continue.

**Recommendation:** Ensure that all fees assessed for services at the marina cover all direct and indirect costs of marina operations. (Harbormaster)

**Planning, Vision/Strategic Plan:** The Harbormaster and Marina Advisory Committee (MAC) have proposed many good concepts for the future of the Marina. These include an increase in transient docking, which would help bring more business to the Town. The plans also include upgrades to the pier itself, to make it more welcoming to visitors and to reduce run-off. These plans include a walkway, benches and provision of shade (trees or structures).

At the same time, NRAB public discussions over the past year have indicated that Wellfleetians have very mixed opinions relative to development of the marina. This echoes a 1993 opinion survey conducted by the Local Comprehensive Plan Committee, which also detected a close split relative to new development at the marina. There remains today a strong feeling for preserving the traditional character of Wellfleet Harbor as a working harbor with a strong shellfish industry. Outside pressure – and money – will continue to pull the Town in other directions. It is important to seek a consensus on this issue.

Besides issues of preserving community character, expansion plans should continue to maintain a balance with other harbor values, such as water quality and shellfishing.

These issues are part and parcel many others which face the Town, as we seek to deal with the explosive growth in summer population and property values in the 1990’s and 2000’s years.

**Recommendation.** The NRAB recommends that the town sponsor several visioning/strategic-planning sessions to determine what the town wants in the marina area and what development, if any, is appropriate for that vision. A venue for this process would be creation of, and approval by the Town, of a Marina Long range Plan by the MAC. This plan should contain estimates of growth in Marina use and revenues. (MAC, Harbormaster)

The NRAB believes that a financial management plan prepared by an independent consulting firm would be of value in determining future direction of the marina. Such a report would test demand and revenue assumptions. The marina is a major asset of the Town, and the application of traditional business techniques would be wise before committing the Town to long-term investments. State grant programs might be available for such an undertaking.

**Capital Planning Process: Recommendation:** The NRAB recommends a local Environmental Impact Statement for marina projects greater than a certain impact (dollars or square feet), with distribution of the proposal to other town agencies and boards similar to the town owned land disposition process recently implemented by the board of selectmen. The NRAB believes that there should be greater public involvement in the review of capital expenditures of the marina. (Harbormaster, MAC)

**Finance. Marina Fees:** Recent state legislation will require a review of all fees assessed for marina services. We recommend that an outside consultant with expertise in marina management review current operations, and competing marinas and harbors, to help determine an appropriate fee structure for the many services rendered. Such a survey and report should be conducted every three years.

The Natural Resources Advisory Board reaffirms its support for its recommendation ten years ago (1995 Harbor Management Plan) that the current number of berths provides an ample opportunity for commercial and recreational boaters to use the resources of Wellfleet Harbor while maintaining water quality, protecting bordering wetlands and insuring a productive shellfish resource. The current mooring area borders the productive natural oyster bed in Chipman's Cove and shellfish grants inside the breakwater. Any expansion of the berthing area would displace these important resources. The area also lies within an Area of Critical Environmental Concern (ACEC).

**Recommendation.** Limit berthing in the dredged basin area of the harbor to a line north of the ACEC boundary of Chipman's Cove. (Harbormaster)

**Facilities for Commercial Boaters: Recommendation:** Commercial fishermen should be given higher priorities on any waiting lists. We believe that every effort should be made to preserve the town's fishing heritage by providing, if necessary, storage, dry-dock, repairs, ice, water unloading, and provision needs. (Harbormaster)

**Waiting lists: Recommendation:** The NRAB is concerned about the increasingly limited access to moorings and slips at the marina. Waiting lists for moorings and slips and the process should be open and understandable. To the extent lawfully allowed, residents should be granted preference versus non-residents. Currently, turnover is very low (5%); a greater percentage of space should annually turn over. A lottery might be established for a certain number of spaces. Transfer provisions should also be reviewed (family, death etc.). The Inspector General's recommendations relative to Harwich last year should be consulted. (Harbormaster)

**General Boating & Harbor Oversight.** Close to the Town of Wellfleet itself with relatively sheltered but open waters, the harbor is a natural location for many boating activities. As it is a shoal harbor, small boats in particular are favored.

However, the growth in use of the harbor and Marina can create conflicts. Some of these are amongst traditional user groups. There can also be safety issues, for example, as more power boats and kayaks use the harbor at the same time. NRAB has a number of recommendations to address these concerns. Some of these explicitly recognize a need to separate some activities to the benefit of all.

**Recommendation.** Education of all boaters in the harbor is the key to safety. All boaters – power boats, sailors, kayakers – need to be aware of traffic and areas of risk. The goal should be that any boater on the harbor should recognize safety as a priority.  
(Harbormaster)

**Boat Launching: Recommendation:** Establish management guidelines for the use of town landings, including, where appropriate, automobile and trailer parking, launching, and dingy storage. All boat launching via trailer should be done at the marina facilities or at launching points designated by the Harbormaster. (Harbormaster, C&PA)

**Recommendation:** Designate appropriate activity areas (as was done with windsurfing) for kayak launching, water skiing / tube pulling, extreme sports, etc and publish ‘right of way’ protocols for distribution through beach sticker program and Harbormasters Department. (Harbormaster, Beach Administrator)

**Recommendation.** We recommend that power boats and deep keel sailing boats be excluded from aquaculture grant areas, to avoid risk of damage to equipment (see Ch 3A)  
(Harbormaster)

**Divers.** All divers must display a diving flag and stay within 100 feet of it. Boaters should observe the divers’ flag and stay more than 100’ from it. Divers must stay 100 feet clear of any aquaculture lease sites, exempting the lease holder. There shall be no diving for shellfish from October 1 to April 1 south of a line from the breakwater to the eastern tip of Great Island. Diving in the channel is prohibited.

It is imperative that all boaters also understand the significance of a diver’s flag and the need to stay clear. (Harbormaster)

**Windsurfing.** The wind exposure in Wellfleet Harbor makes it very attractive to the board-sailing public, and enthusiasts of emerging extreme sports, such as kite-boarding. Many people enjoy sitting near the beach and watching these activities.

Current windsurfing regulations include:

- No windsurfing within the designated swimming area of Mayo Beach,

within 50 feet of a swimmer, or within the mooring basin.

- Because of possible damage to aquaculture structures and gear, windsurfers must stay clear of all buoyed shellfish lease sites, and are prohibited from 3 hours before until 3 hours after low tide in the Mayo beach vicinity.
- At Indian Neck and Burton Baker Beaches, windsurfers must stay at least 50 feet from all swimmers.

**Water Sports.** Water-skiing is prohibited within 500 feet of all town-owned beaches and in the mooring basin. The Herring River basin and Loagy Bay areas of the harbor are popular for water-skiing as they are relatively sheltered from wind chop. These are also important areas for natural resources. This conflict needs monitoring to ensure that there is no damage to the resources.

Jet skiing, or the use of personal watercraft (PWC) is a controversial issue on many waterways. It is undoubtedly good fun and sport for proponents. The noise, however, can be highly annoying to many. The speed can be a danger to slower boats. The same speed produces a wake that can be harmful to fragile shorelines. Jet skiing has been banned in National Seashore waters, is prohibited in most of Wellfleet harbor, and is currently permitted only in the 'No Wake' zones of the channel, launched only at the Marina.

**Recommendation.** Prohibit the use of PWC at high speed everywhere except in the open waters of the south harbor. Elsewhere, 'No Wake' rules should apply. A launching area at Burton Baker Beach would permit PWC to be closer to the south harbor and not have to make a long reach at slow speed to attain a permitted zone. Any PWC in Wellfleet harbor should be registered with the Harbormaster. (Harbormaster)

**No Wake Zones: Recommendation:** After appropriate notice and hearing, the Harbormaster should be authorized to establish appropriate operational restrictions to preserve important natural resource areas of the town (no wake zone in important marsh areas; no landing areas where necessary to protect shorebirds, etc.). (See Chapter 3.) (Harbormaster)

**Kayak/Small Craft: Recommendation:** While the town should encourage the development of the Cape Cod Water Trail for small craft, there is the problem that kayaks contain no sanitation devices, can access special areas of marsh and beach frequented by shorebirds and endangered species which have previously been inaccessible. The marina should ensure that appropriate launch areas are available separate from traditional boat ramps and traffic (need for appropriate signage). Restrooms may need to be expanded for the expected growth in personal watercraft. (Harbormaster)

**Small Boat sailing. Recommendation.** The Chequessett Yacht and Country Club (CYCC) offers lesson and opportunities for small boat sailing in the harbor. Small boat

sailing is especially suited to a shallow, relatively sheltered harbor such as ours. These offer great opportunities for recreation and learning, especially for youth. The Town Recreation Department should work with CYCC to expand small sailboating opportunities in the harbor. (Recreation Director)

**Water Quality.** The Marina is operated in a way that shows a real concern for the environment. A pump-out facility is available for boaters. Care is taken in fuel operations. (None-the-less, there was a small fuel spill of light diesel in 2005; the cause is unknown. In a busy facility, care and education are on-going needs.)

These concerns are on-going and deserve the Town's support. The "Clean Marina" best practices suggested by Coastal Zone management (CZM) are a good summary of needs.

**Pump-out Facilities: Recommendation:** We recommend that the Town fully support the updated sanitary pump-out facility program that the Harbor Master has proposed. We recommend that a sealed head program and an alternate program for transients be established and enhanced. . Above all, an on-going education program for boaters is key to success of this protection effort. Without their active support, the program cannot succeed. (Harbormaster, NRAB)

**Road Runoff/Marina: Recommendation:** To minimize the impact of road runoff from the marina parking lot, we recommend that the Town install catch basins, regrade the surface so that water is directed into the catch basins and regrade and resurface the entire parking lot. Vegetative borders should be established. (Harbormaster, DPW)

**Water Quality: Recommendations:** As indicated in the Water Quality chapter, water quality is a major concern to the many users of Wellfleet Harbor. The marina should implement a standard water quality-testing regimen. Pump outs and fuel facilities should be constantly monitored. Run-off from the pier should be minimized. Oil booms should be easily deployed. The Town should make resources available (for training, personnel and gear) to expand the current oil containment program that the Harbor Master has established. Boat maintenance should be monitored and education efforts directed to minimize use of harmful chemicals. More eco-friendly engines should be encouraged. Protocols should be established for oil spills, chemical spills, biohazards and marine stranding (stranded mammals, when euthanized, may have to be treated as hazardous waste and may be harmful to natural resources). (Harbormaster)

**Alternative Energy: Recommendation:** To the extent possible, the marina should implement "green" technologies such as wind and solar energy, greywater systems, recycling and composting operations. (Harbormaster)

**Public Education: Recommendation:** We recommend that the Chamber of Commerce booklet contain several pages detailing harbor ecology and marina/harbor/shellfish regulations and facilities. (Chamber of Commerce)

We recommend that educational materials also be developed and distributed at the Harbormaster office, and the beach sticker office. The Massachusetts Coastal Zone Management program has many brochures and information sheets available on its website (Harbormaster)

The NRAB has been a prime organizer of the annual “State of Wellfleet Harbor” conferences held in November of 2003 and 2004. We believe that this forum offers an opportunity for citizens, Town staff, committee and board members and other persons with expertise in harbor related issues to discuss Wellfleet Harbor resources and planning.

**Special Events: Recommendation:** In order to celebrate the town’s maritime heritage, efforts should be made to attract visits from tall ships, training vessels or historic vessels. (Harbormaster)

## Chapter 6A -DREDGING

**Introduction.** Wellfleet's Marina is a busy center of activity in the Town, as has always been the case since colonial times. Commercial and recreational boating are key parts of the Town's economy.

Wellfleet Harbor is a shoaling harbor. At no time did deep-water vessels have full access to the harbor. Smaller ships did come into the Duck Creek harbor at high tides, before the RR dike was finished (about 1875). Additionally, old hydrographic charts (from 1850) show depths 1-3 feet greater than at present. In those days, time moved more slowly than today. Commercial boats could come and go with the tide, not driven by marketing schedules. Vacations were measured in weeks, not hours.

It follows that dredging the harbor is necessary to permit any modern, intensive use of the harbor. This harbor is and has been a key economic resource for the Town.

By its very nature, dredging is an environmentally invasive process. Wellfleet Harbor was designated as an Area of Critical Environmental Concern (ACEC) in 1989. The dredged areas were specifically excluded from this designation. The harbor has, none-the-less, to be seen as an integrated system. A plan for dredging must ensure no harm elsewhere in the harbor.

**Dredging History.** Until 1952 Wellfleet operated a tidal harbor with as many as six piers. Whaling ships and fishing schooners moored in the deep water south of Egg Island and came into the piers at high tide to load and unload. The Duck Creek estuary east and north of the northern tip of Indian Neck was a tidal flat dry at low tide but navigable at high tide at least as far as Uncle Tim's Bridge. Piers formerly were also operated on the Herring River both above and below the present site of the Dike.

From the 1950's through 1982 the State (with a 25% contribution from the Town) and the Army Corps of Engineers, at no cost to the Town, maintained a dredged 10-foot channel from deep water (Buoy #12), an 800 x 500-foot mooring basin in Chipman's Cove, a dredged area around and behind the Pier, a 6-foot channel around Shirttail Point, and a 6-foot inner basin north of the Point. The channel and mooring basin have been dredged by the Army Corps of Engineers in 1958, 1972, 1981, and 1995. The State Department of Environmental Management has dredged the inner harbor from the mooring basin around Shirttail Point in 1952, 1955, 1957, 1958, 1969, 1982, and 2002.

In 1994, the mooring basin and entrance channel to the harbor were dredged, and the dredged material was deposited at a state-approved site approximately seven miles out in Cape Cod Bay, in 100 feet of water. The project dredged 107,000 cubic yards, providing a ten-foot depth for the channel and basin at men low water.

In 2001-2002, the channel and the waters surrounding the L-pier at Shirrtail Point, and then the inner slip area all the way to the north bulkhead were dredged. The mooring basins were not dredged, but are expected to be dredged in 2006. Approximately 110,000 cubic yards were taken to an approved dumpsite.

### **Dredge History of Wellfleet Harbor**

Date	Contract	Location
9/52	1271	Dredged to 6 ft. at MLW an area in front of the Town Pier and a 70 ft. channel
3/55	1478	Dredge basin to 6 ft. at MLW on north side of Shirrtail Point and 120 ft. channel around point
7/57	1769	Dredge mooring basin south of Shirrtail Point, 1850 ft. south
1958, 1972, 1981	Army Corps of Engineers	Dredge to 10 ft. a 500 x 800 ft. mooring basin and 125 ft. channel from mooring basin to deep water
3/58	1879	Dredge to 10 ft. from L-shaped Pier to anchorage
10/68	2644	Dredge to 8 ft., channel around Shirrtail Point and around L-shaped Pier
1969	77-111	Mooring basin only
1981- 1982		Channel around Shirrtail Point to gas dock, outer channel and mooring basin
1992, 1993		Dredge around L-shaped Pier and use sediment for beach nourishment on Kellers Corners
1995		Federal portion mooring basin and channel from Buoy #12 to L-Pier
2001		Breakwater channel to complete marina area except for federal and town mooring basin

In the winter of 2006, there are plans to dredge the sand underneath the L-shaped pier. The sand will be used to replenish Mayo Beach at Keller's corners in an attempt to remedy the erosion caused by revetments.

Experience has shown that the dredged area inside the Breakwater fills in rapidly with a black, viscous and semi-fluid muck known as "black mayonnaise". The dredging of this peculiar sediment is complicated because (1) the viscous sediment is difficult to contain; and (2) it flows by gravity from undredged to dredged areas.

Planning for dredging of Wellfleet Harbor is limited to the areas that have been dredged in the past. The ACEC designation prohibits dredging except in those areas previously dredged and already excluded from the ACEC.

**Disposal of Dredge Spoils.** The question of safe disposal of dredged material is critical to the dredging process.

It is becoming common on the Cape to use dredged sand for beach renourishment. In the past, the town has been able to conduct limited beach renourishment taking sand dredged from the L-shaped Pier to renourish the beach at Kellers Corners (the sediments are of comparable grain size). Given all the revetments along Mayo Beach, it is not surprising that this sand moves back east with the littoral currents. However, the aquaculture grants lying just off shore have not been affected. This material could be also used to naturalize revetments currently made of rip-rap or other hardened materials (see Chapter III). This option is consistent with the goals of an ACEC. Similarly, larger grain, clean material from channel dredging could be used in like ways.

**Dredge Spoil: Recommendation:** Dredge spoils can be used to renourish Wellfleet's beaches. Priority should be given to beaches on the north and east sides of the harbor. An appropriate technical study should be completed before any beach is renourished, especially to avoid that the sand is quickly swept off a beach and onto the inter-tidal flats. The Conservation Commission must, of course, approve any renourishment. Costs can be borne by shorefront owners with armored properties under orders of conditions to renourish their beaches. (Harbormaster, Conservation Officer)

In the past dredge spoils (especially "black mayonnaise") have been used to fill wetlands such as the south shore of Chipman's Cove and Baker's Field. However, this was before the enactment of much legislation to protect wetlands and coastal resources. State officials have informed the town that upland disposal on Indian Neck would jeopardize the barrier beach and is in conflict with the Wetlands Protection Act and the ACEC designation in this area. Since all areas immediately landward of the dredge sites are included in the ACEC program and are for the most part wetlands, upland disposal cannot be considered for dredge spoils within the ACEC.

Therefore, disposal of inner harbor, "black mayonnaise" material is more difficult. It is fine grain sized. It is also anoxic, having resided in a deep, quiescent channel for years. One option has been: to use the offshore dumpsite in the middle of Cape Cod Bay west of Great Island. The State continues to allow this option, provided that the dredged materials are shown to be free of contaminants, such as pesticides, toxic metals, PCBs, etc. The offshore site is not, however, without environmental concerns. Cape Cod Bay is habitat for endangered Right Whales.

**Recommendation.** A working group of conservation scientists and the harbormaster's office should convene to identify alternate ways of disposal of "black mayonnaise" spoils. (Harbormaster)

**Harbor Circulation and Sedimentation Study.** The cost of dredging the inner harbor – and the difficulty of spoils disposal – raised the question whether improving tidal circulation in the marina area could be of benefit. In 1992, G.S. Giese, T.R. McSherry and W.D. Spencer of Woods Hole Oceanographic Institute conducted a study to characterize sedimentation and circulation in the inner harbor and to assess management alternatives (see also Ch 2). After gathering data of tidal height and bathymetry (bottom contours) a computer model was created to simulate tidal conditions in the system. The

purpose of the study was to characterize the flushing rate and circulation in the study area and to determine what, if any, changes could be made to the system to alleviate siltation and pollution. Modifications to the harbor could be tested for their effect on current velocities and flushing rates for Duck Creek and Chipman's Cove. Four modifications were simulated:

1. Widen the channel in the RR dike from 70 to 210 feet
2. Open Mayo Creek tide gate
3. Open a 200 ft. canal through the pier parking lot
4. Widen the channel at the end of the pier (remove 140 ft. of the pier)

The Giese study concluded that Wellfleet Harbor is a flood-dominated system where flood tide velocities are greater than ebb tide velocities, which results in import of sediments. Changes in the system like those suggested would have little, if any, effect on the overall sedimentation rate. Water moving from shallow areas across the mooring basin (a flow expansion) will tend to drop sediments into the mooring basin. The study concludes that the inner harbor, because of its fundamental characteristics, acts as a sediment trap. The dredged basins are filling in and it will continue to do so. Dredging the harbor will have to be done on a regular basis to counter the natural tendency to fill in. The basin north of Shirttail Point because of restricted circulation is especially prone to severe sedimentation.

It seems that fundamentally new ideas are needed to reduce siltation in the inner harbor and to have additional options for spoils disposal. There is some evidence from harbor scouring during a failure of the Mayo Creek flapper system that a full re-opening of Mayo Creek may have some benefit.

**Management Alternatives.** The harbor and Marina are important to both the life of the Town and its economy. As the harbor becomes busier and as the environment of the harbor becomes more stressed, the plan for dredging needs to become even more sensitive to those issues.

Any dredging in Wellfleet Harbor requires permitting through Coastal Zone Management (a file is currently open: certification number 18.401). This certification requires review by the local Conservation Commission. Any maintenance dredging within the ACEC boundary would also require MEPA review.

**Recommendation:** A dredging plan should be prepared by the Harbormaster for review by the Marina Advisory Committee, Conservation Committee and Natural Resources Advisory Board. The plan should include:

- description of the dredging process;
- plan for spoils removal;
- pre-testing of sediments, for pollutants (such as heavy metals) and other risk elements;

- proposal for scientific monitoring to determine any effects on adjacent ACEC designated areas and to determine rates of infill following completion of dredging. (Harbormaster)

The basic dredging plan in the following table was proposed in the 1995 Harbor Management Plan. We believe it forms a useful starting point for a formal dredging Plan.

### Proposed Dredging Schedule

Area	#Vessels Affected	Volume cu. yds	Dredge Interval (yrs)	Disposal Area	Responsibility
Channel	All (557 + ramp traffic)	65,000	8	Cape Cod Bay	Army Corps
Mooring Basin	320	70,000	8	Cape Cod Bay	Army Corps
L-Shaped Pier	20	5,000	2	Beach Renourishment	Army Corps
Channel Around Shirttail and Inner Basin	217	110,000	4	Cape Cod Bay	State, County, Town

\*\*\*\*\*

Comment: There is an environmental case for doing “nothing”. Wellfleet Harbor has been filling in since the retreat of the glaciers 10,000 years ago – any dredging effort is a temporary fix. In addition, the marina is located within an Area of Critical Environmental Concern – a state program that protects land of unusual environmental importance. The ACEC designation adds layers of governmental review and concern. Such review takes time, and requires expensive studies. Dredging is an expensive adventure, and while federal and state government have underwritten earlier efforts, if such funds are not available, it is unlikely that current property taxpayers will willingly assume additional tax burden. Disposal sites for dredge spoil are very limited. Land sites are not available due to the ACEC designation. Ocean sites are becoming more restrictive as to location, and time of year (right whales in Cape Cod Bay). The unique mayonnaise of Wellfleet Harbor is difficult to dredge, and moves quickly to refill dredged areas. Finally, there is some evidence that red tide spores spread when disturbed, such as the activity of dredging. All of these issues require further study. The Mass. Office of Coastal Zone Management has developed a series of dredging technical reports, which should be helpful ([www.mass.gov/czm/phpp2.htm](http://www.mass.gov/czm/phpp2.htm)).

In a “do nothing” scenario, the marina would play an important role for smaller boats, with shuttle transportation available to boats moored out in deeper water. Access for larger vessels might occur at high tide, as in the early days of Duck Creek (access generally limited to high tide).

## Chapter 7 - COASTAL ECONOMY

Residents and tourists are drawn to clean beaches and water for recreational activities such as boating, swimming, walking and bird watching. Local fishing, shell fishing and tourism industries depend on the natural resources of the harbor. The clean waters and productive marsh habitat support the area's fish and shellfish populations. The issues of natural resource protection are economic development issues.

The Cape Cod Commission and Cape Cod Economic Development Council's Comprehensive Economic Development Strategy, Annual Report, June 2003, indicated

The environment is such an important component of the Cape's economy that it is considered to be the driving force. People choose to live on the Cape in increasing numbers because of the opportunities to be close to nature. The character of Cape Cod is dependent upon the environment and the first step in working toward economic success is to protect our natural systems and community character. (p 1-2)

This chapter will focus on the economy of the harbor. The specific goals are:

1. To protect water quality and the natural resources of the harbor
2. To preserve traditional and historic uses of the harbor
3. To maintain or improve harbor facilities
4. To promote appropriate economic uses
5. To provide funding for dredging and maintenance of the harbor
6. To ensure, to the extent possible, that town services are economically self-sustaining

All figures are from Cape Cod Commission reports or Wellfleet Annual Town Reports.

### COASTAL PROPERTY

Both permanent and seasonal/second homeowners have invested heavily in coastal real estate. The value of buildable land and existing structures has increased as purchasers bid up prices in order to live near the shoreline.

In a 1995 survey of Cape Cod residents conducted for the Cape Cod Commission, 55% cited proximity to the coast as an important factor in deciding to live on Cape Cod (60% cited air and water quality; 56% cited rural character, 48% cited small town lifestyle). Respondents also suggested that the most serious issues facing the Cape over the next five years were: traffic congestion, population growth, groundwater pollution, pollution of coastal waters, loss of open

space, and tax increases. (Cape Cod Regional Comprehensive Economic Development Strategy, Annual Report Update, July 2004-June 2005).

Wellfleet's year round population has increased from 2,493 (1990) to 3,056 (2002), a ten percent increase. The summer population has increased from 16,000 (1990) to 21,000 (2004).

The number of housing units in Wellfleet increased from 3,576 (1990) to 3,998 (2000), an increase of about 12 %.

Total single-family residential assessed value in FY 1993 was \$469,249,000. In FY 2001, the same category was assessed at \$783,650,000, an increase of 67 % over 8 years ( 8% annual appreciation ).

Average single family residential property in Wellfleet was \$285,000 (FY 2001), which ranked 53<sup>rd</sup> highest across the Commonwealth's 351 cities and towns.

As the number of buildable lots decrease, second homeowners help fuel the construction trades. While aquaculture is an important component of the Town's economy, the building trades remain the most vigorous year-round economic activity and the source of employment. Ancillary to construction activities are the professional trades of architectural services, engineering and consulting, well and septic installation, landscaping design and maintenance, etc.

The 2003 Annual Town Report indicates the value of all new construction in Wellfleet as \$22,201,430 (403 permits), a 39% increase from 2002. Permit fees collected totaled \$74,752, plus fees of \$38,845 in plumbing, wiring and electrical inspections.

Recent residential construction has seen an increase in size and amenities. As the price of buildable land increases, existing structures (cottages) are often more attractive, either to tear down and rebuild, or undertake extensive renovations.

Recently, Paul Sacco, Director of the Massachusetts Office of Travel and Tourism was asked what was the biggest threat facing the Cape's tourism business. He indicated:

One of the biggest is water pollution and nitrogen loading into our bays and estuaries. But this is not just a tourism issue; it is every resident's issue...If our water gets tainted, or our bays and estuaries strangled by nitrogen, the Cape will lose its lure as a tourist destination, and that will hurt every business...[T]ainted water or lost estuaries will also have an impact on property values too, and people's equity will float away. (CAPE Business, "State's Tourism Chief Sees a Glass Half-Full", Feb/Mar 2005, p. 25.)

In the same issue of CAPE Business, John O'Brien, former president of the Cape Cod Chamber of Commerce, indicated:

Water quality is not just a health issue, but also an economic one. Our quality of life, our environment and our economy are all threatened by

burgeoning stress on our peninsula. More than 40 of our embayments show evolving degradation because of excess nitrogen loading. (CAPE Business, "2005: The Year that Wastewater Treatment Became a Priority", Feb/Mar 2005, p. 32).

Tom Bernardo, speaker of the Barnstable County Assembly of Delegates, indicated,

"Residential growth is the biggest culprit in the nitrogen area". (Ibid., p. 32).

Modern technology can create and sustain intense levels of development along the shoreline (see, for example, Atlantic City, NJ and Ocean City, Md). Once technology and public service infrastructure (water and wastewater) initiatives are undertaken, the question facing the community is where will the line be drawn?

There are two alternatives for a coastal community like Wellfleet: 1) Increase the capacity of the system to meet increased demands, or 2) limit demand to the available capacity - otherwise, balance is destroyed and local quality of life is diminished, for humans and all other living species.

## ECONOMIC RESOURCES

**Shellfish Landings.** Shellfish represent a \$3.5 million business annually in Wellfleet Harbor. Quahogs represent the largest business currently; oysters remain an important smaller crop.

The primary shellfish products (aquaculture and wild) from Wellfleet Harbor are quahogs and oysters. Steamers and bay scallops represent much smaller catches.

**Shellfish Department Operations.** The Shellfish Department budget has increased 153% over 14 years, for an average growth of 10% per year.

	FY 1993	FY 2004
Personnel	\$57,259	\$140,025
Operating Expense	5,444	18,965
TOTAL	62,703	158,990

The shellfish conservation and propagation budget has grown 173% over 14 years, for an average growth of 12% annually.

Appropriations for Shellfish conservation and propagation program: FY 2004: \$31,735 (FY 1993: \$11,610).

**Permits and Licenses:** The number of licenses issued in 1993, 2002 and 2005:

License type	Fisheries Permits Issued		
	Issued 1993	Issued 2002	Issued 2005
Eel	5	1	3
Commercial	125	213	206
Junior comm'l	2	7	3
Senior comm'l	101	90	74
Resident			
Recreational	303	310	322
Senior Res. Rec.	111	251	245
Seasonal Res. Rec.	117	169	162
Non-Resident Rec.	243	123	179
Seasonal N-R Rec.		113	137
Total	1,007	1277	1331
Revenues	\$26,505	\$54,438	\$61,249

**Finfish.** The fishing industry in the North Atlantic is in crisis because of depletion of fishing stock. Federal regulations aimed at replenishing the resource have made the fishing business less than viable in the short-term. Local commercial fleets generally land their product at Chatham or Provincetown.

Wellfleet, historically, was a major source of herring. Herring are the basic food source for many fish which are sought after for commercial and recreational purposes (eg. stripers). Herring are anadromous, spawning in freshwater and swimming to the sea to mature. They later return to their birthplace.

The herring fishery once provided a major source of revenue for town operations. Herring are utilized today primarily for bait. There are no reported statistics relative to the economic value to the herring fishery in Wellfleet.

While the demand for herring (bait, roe, sardines) is minimal, the reestablishment of anadromous runs in Wellfleet would be expected to improve fin fishery as a whole. The striped bass fishing industry in Massachusetts is estimated at \$2-3 billion, with Cape Cod accounting for one half to two thirds of that amount.

## **OTHER RESOURCES**

**The Cape Cod National Seashore (CCNS)** is composed of 43,608 acres across the Outer Cape. Total visitors have dropped in recent years to an average of 4.1 million (1992: 5.1 million).

The total budget of CCNS is \$6.1 million. The CCNS employs 77 permanent employees year round; 140 employees are added during the 10-week summer season.

The CCNS maintains 70 units of employee housing.

**The Wellfleet Bay Wildlife Sanctuary**, Massachusetts Audubon Society, owns 1100 acres with numerous trails and a visitor center open to the public. The Sanctuary has an annual usage of approximately 50,000 visitors.

WBWS employs 12 persons year-round; 15 part-time staff, primarily during the Spring, Summer and Fall. WBWS maintains an active educational program for adults (walks, lectures, workshops, natural history field school) and children (summer day camp, after school programs, and field trips involving school groups from across New England and the middle Atlantic states). Approximately 120 marine life cruises are scheduled out of Wellfleet Harbor annually.

**Chequessett Yacht and Country Club (CYCC)** is a semi-private country club providing a nine hole golf course, tennis courts, and sailing club. CYCC is open to the public on a daily use fee basis. CYCC rents sailboats, conducts races on Wellfleet Harbor, and provides sailing lessons.

**Boat Dealers.** There are two boat maintenance operations in Wellfleet (Wellfleet Marine and Bay Sails). There is one boat dealer listed in the telephone directory (Bay Sails), and two boat builders (Old Wharf and Bay Sails).

**Boat Rentals.** The telephone directory lists two boat rental businesses (Wellfleet Marine and Jack's).

**Fishing Businesses.** Several sport fishing boats operate out of Wellfleet Harbor. Currently, there are three fishing supply, bait and tackle shops located in Wellfleet (Gone Fishing, Black Duck and Wellfleet Marine).

## **MARINA ENTERPRISE FUND**

A description of the town marina is contained in chapter 6. This section discusses finances.

The Marina Enterprise Fund was established by Town Meeting (1989: art 12) for the purpose of accounting more accurately the costs and revenues associated with the operation of the marina.

	FY 1993	FY 2004
Operating Revenues	206,651	359,640
Operating Expenses		
Salaries, administrative and depreciation	99,942	283,982
Operating Income	106,709	120,658

Investment Income	8,199	4,316
Transfers In	10,000	2,500
Transfers Out	102,131	45,000
	(83,932)	(42,500)
<b>NET INCOME</b>	<b>22,777</b>	<b>82,474</b>

The net income for the year (ending June 30,2004) \$ 82,474 was added to retained earnings/fund balance which, as of June 30, 2004 totals \$2,251,789.

Comment: During the early 1990's, a larger amount of marina revenue was transferred to the general fund, thereby subsidizing other town programs and activities, or reducing the town's property tax rate. The 1995 Harbor Management Plan identified these transfers as an issue of concern. It is, however, acceptable and appropriate that the town be reimbursed for direct and indirect costs.

#### MARINA SERVICES ENTERPRISE FUND BUDGET (FY 2005)

Salaries	\$	135,710
Expenses (\$45,000 indirect)		65,000
Reserve Fund		90,000
Marina Advisory Board		100
Marina Capital Outlay		65,000
<b>Total for Marina Enterprise Fund</b>	<b>\$</b>	<b>355,810</b>

Note: \$45,000 was appropriated to the General Fund for indirect costs.

#### OTHER TOWN REVENUES (Taxes/Fees)

The Town of Wellfleet in FY 2004 collected the following revenues:

Boat Excise Collections (FY 2000-2003)	\$4,795
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#### WELLFLEET HARBOR ECONOMIC DEVELOPMENT ISSUES

The Town of Wellfleet, like Barnstable County, is known as a tourist and retirement destination.

Approximately 30% of Wellfleet citizens receive social security/retirement income. The median age in Wellfleet is 47 years (which makes it 13<sup>th</sup> oldest in a ranking of all Massachusetts cities and towns). As of 2000, 22% of the town's population is over 65 years old. (Cape Cod Commission).

Barnstable County has seen a population decline in 20-34 year olds (as also the entire Commonwealth). This out migration is seen as due to students going off to college and skilled individuals who find opportunities are not available on the Cape. A recent Cape Cod Commission report indicated

...The retirement population is growing disproportionately to the rest of the population and we are not retaining or bringing in young people and families. This is particularly true for the eight lower Cape towns. This population imbalance helps to create a shortage of workers on Cape Cod and this problem continues to become more severe as the imbalance in our population cohorts increases. (Cape Cod Commission and CCEDE, Comprehensive Economic Development Strategy, Annual Report, June 2003, p. 1-28).

A significant percentage of Lower Cape business operates as small business (95% of all Cape business employ less than 20 employees). Wellfleet has a significant number of sole proprietorships and therefore, are not counted in the many employment statistics collected by the Commonwealth.

A significant proportion of household income in Wellfleet is self-employment (30%). The economy of the lower Cape differs from mid Cape (Hyannis) and Upper Cape (Falmouth), making it more difficult to utilize materials addressing Barnstable County generally. Nevertheless, a survey of recent economic development strategies for Barnstable County indicates the following issues and concerns applicable to Wellfleet.

The Lower Cape has the following business advantages:

- High quality of life
- Unique natural beauty and resources
- Established marine and tourism economy
- Vigorous entrepreneurial spirit
- Environmental niche for small business development
- Strong artistic and creative community
- World class brand – “Cape Cod” one of few regions in US with a universal brand that evokes a strong, emotional reaction with cultural, environmental and historical richness.

The Lower Cape has the following disadvantages:

- Cost of doing business
- Cost of living
- Affordable housing availability (the cost of housing on the Lower Cape is substantially higher than the rest of the nation. Housing affordability indicators indicate a broadening bifurcation of population between those who have a great deal of wealth and those who are increasingly challenged to maintain their standard of living.)

- Cost of transportation
- Lack of transportation infrastructure
- Lack of access to skilled employees
- Rapid growth pressures on roads and water
- Strained access to the mainland (difficult to attract high tech industries due to geographical isolation)

Emerging economic clusters have been identified that may be applicable to future economic development initiatives in the harbor area:

- Value added tourism (such as eco-tourism, “high-touch” activities, unique visitor experiences)
- Arts and Culture
- Information Technology
- Micro/small business/entrepreneurship
- Marine science and technology
- Renewable Energy, energy efficiency, alternative energy
- Education and knowledge based businesses (aquaculture, estuarine research, salt-marsh restoration, water quality studies, marine resources.
- Eco-tourism. Areas that attract migrating birds and other wildlife offer economic opportunities to attract nature lovers or eco-tourists who spend many dollars annually to watch and enjoy wildlife. Wildlife refuges, sanctuaries and preserves attract tourists and their dollars every year. Eco-tourism is a good form of economic development because it requires very little investment in infrastructure. For birders, migratory bird stopover sites, high biodiversity and endangered or threatened species all serve as attractions. In the past decade eco-tourism has experienced faster growth than any other form of tourism. For ecotourism to be a sustainable form of economic development, the natural resources on which the industry depends must be protected.

#### **Marina Recommendations (Harbormaster):**

- Ensure that all fees assessed for services at the marina cover all direct and indirect costs of marina operations.
- Support the marina in developing a long-range business plan. Seek assistance of a marina operations consultant with expertise to establish and test financial projections. Seek state, county or federal grants to finance study
- Ensure that marina enterprise fund has sufficient funds to do regular maintenance, long-term improvements and periodic necessary dredging.
- Establish public “viewing” area with seating, protection from sun and moving vehicles for citizens to watch harbor activities (many citizens travel to Chatham to watch day boats unload).
- Investigate opportunity and viability of high-speed ferry service.

#### **Harbor Resource Recommendations (NRAB):**

- Encourage adoption of sustainable practices so that natural resources of the harbor (shellfish, finfish, etc.) are not exploited beyond their capacity.

- Work with Division of Marine Fisheries and Cape Cod National Seashore to open up tidal flow to restricted marshes for the purpose of assisting passage of herring and other baitfish. Reestablishment of traditional fishery runs would be expected to improve finfish in harbor for commercial and recreational fishery.

**Economic Development Recommendations (for Long Range Plan):**

- Encourage establishment and expansion of water dependent and water related uses along the waterfront, consistent with regulations that protect the ACEC. One approach is to reserve the harbor shoreline for coastal dependent activities (those that must be performed in the coastal zone – marina services, water transport, etc.). Coast linked activities (such as marine science research) and coastal activities serving residents (real estate services, restaurants, retail stores) would have lesser priority.
- Promote public access to the waterfront where such access will not conflict with water dependent uses.
- Seek grants and partners for construction of marine science laboratory, aquaculture, shellfish hatchery, maritime history and coastal education center near the harbor. Seek a partner (Cape Cod Community College, Suffolk University, U Mass. Dartmouth, Mass. Maritime, or other academic institution).
- Create a Town of Wellfleet economic development committee to assist in partnering with private and public agencies to assist development of marine technologies employment.
- Work with Lower Cape Cod Development Corporation to develop seafood coops, joint marketing plans, and small business assistance programs for Wellfleet businesses. Support firms entering or expanding international markets.
- Support a town-wide marketing program to “eat local” (fish, shellfish, produce, etc.)

## Chapter 8 – HARBOR OVERSIGHT

Wellfleet Harbor is home to many users groups, as we have seen. Each of these groups independently has Town resources to help advance its interests:

Shellfishers – Shellfish Constable & Shellfish Advisory Committee

Boaters – Harbormaster & Marina Advisory Committee

Beachers – Beach Officer

Conservationists – Conservation Officer & conservation organizations (Cape Cod National Seashore, Massachusetts Audubon, conservation trusts).

It is important to keep balanced the needs of the many harbor users after a time of great population and use growth in the Town.

The only body which attempts view the harbor as a whole is the Natural Resources Advisory Board (NRAB) , through the Harbor Management Plan. NRAB has other duties in addition to the harbor. It is the intent of the current membership that the harbor will continue to be a main focus of the committee.

In Town government, however, there is no single office which has an holistic approach to harbor issues. We believe that harbor stewardship, as envisioned by the ACEC designation, necessitates this approach. We believe that maintaining a balanced, healthy harbor requires either a single office or a process which can deal with broad harbor issues, linked to the citizen’s committee which is NRAB.

Two examples of issues that might benefit from this co-ordination are water quality and safety of those using or working in the harbor.

**Recommendation:** Create an office or a process, linked to NRAB, that oversees overall harbor oversight issues. (Town Administrator, Board of Selectmen)

**Recommendation:** Independent watershed groups (“Friends of...”) should be formed by local citizens to monitor developments and help keep local residents informed. (Interested Citizens of Wellfleet)

