Chapter 12.
Managing Environmental and Safety Impacts from Boating

Summary of Issues and Recommendations

Increasing use of the Bay by boaters, coupled with the sensitivity of the Bay's resources, suggest that stronger management of the Bay's waterways is needed to address the following issues:

- Impacts on natural resources from boating, and in particular motorized vessels, will continue to increase as boating activity intensifies. These impacts include bank erosion, turbidity, loss of vegetation, and affects on water quality from hydrocarbon emissions and marine sanitary waste. Dredging to create or maintain navigational channels can destroy shellfish and vegetation.

- Increased boating activity, coupled with the variety of vessels that use the Bay, tends to exacerbate the Bay's inherent navigational challenges and increase the potential for conflicts among boaters, and between boaters and other Bay users. Violations of waterways regulations are common occurrences that place boaters and other Bay users at risk.

- The number of moorings in the Bay influences the amount of boating activity, and adds pressure to expand landings for parking and dinghy storage. Separate from the boats they secure, some moorings cause damage to surrounding vegetation and marine life. Despite these issues, there is pressure to add more moorings in the Bay.

- Negligent operation of Personal Watercraft (PWC), known as "jet skis", can pose a threat to public safety and natural resources. Rental concessions are of particular concern because they facilitate operation of PWC by individuals who may not have had adequate training or knowledge of the Bay's sensitive resources.

Recommendations to address these issues include:

- Increase enforcement of existing local and state waterways regulations, with emphasis on existing speed limitations and "no wake zones".
- Study the need and feasibility of additional speed controls and "no wake zones" throughout the Bay to increase safety and protect resources.
- Establish a coordinated Bay-wide patrol.
- Designate the Bay a *No Discharge Area* and provide adequate pump-out facilities and services.
- Encourage environmentally-compatible boat maintenance and management practices.
- Enhance navigational aids at known trouble spots.
- Prohibit rental concessions for PWC within the ACEC, and develop a Bay-wide PWC Management Program.
- Establish permanent mooring-free areas in Big Bay, and develop a Bay-wide mooring program.

- Extend the ACEC boundary south to the Chatham Light, provided that improvement dredging projects, and disposal from such projects, are allowed south of Minister's Point.

12.0 Overview

Increasing use of the Bay by a variety of different types of boaters, coupled with the sensitivity of the Bay's resources, suggest that stronger management of the Bay's waterways is needed. The analysis of data on boating trends and resource conditions, along with community input from the community survey and work group process, have identified the following issues that need to be addressed by the resource management plan:

- environmental impacts from motorized vessels, which will increase as boating activity intensifies;
- boating congestion, and conflicts between different types of vessels;
- threats to public safety and natural resources from growing use of personal watercraft (PWC) and other high performance craft;
- growing demand for moorings, and the associated impacts on resources and boating congestion; and
- anticipated needs for dredging projects to maintain existing channels, or to restore or create channels for navigation or Bay flushing.

These issues suggest that a comprehensive and long-term approach to managing the Bay's waterways is needed to sustain resources, and preserve boating access today, and for years to come. The balance of this chapter explores each of the management issues listed above, and provides management recommendations to address them.

12.1 Management Issue: Impacts of Boating on Natural Resources

Boating, and in particular the use of motorized vessels, has been demonstrated to have harmful impacts on marine resources. Impacts of boats on natural resources can be caused by a vessel's motion, as well as emissions and other discharges into the surrounding water and air.

Two-stroke engines commonly used by boaters have been demonstrated to be detrimental to the environment. The U.S. Environmental Protection Agency has promulgated new regulations to address air quality impacts from motorized vessels. The regulations focus on outboard, PWC and jetboat engines because they have been found to emit a high rate of hydrocarbon exhaust into the air.[45] The regulations will require manufacturers to achieve an average reduction in hydrocarbon emissions of seventy-five

[45] United States Environmental Protection Agency. 40 CFR Parts 89, 90, and 91. *Control of Air Pollution; Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts. Summary*.

percent by the year 2006. The average reduction applies to all engine models produced by a manufacturer. This means that a manufacturer may continue to produce engines that exceed emissions standards as long as excess emissions are offset by other engine models that achieve emissions levels below the standard. [46]

The EPA's regulations do not address impacts of two-stroke engines or other motorized vessels on water quality or other aspects of aquatic life. Numerous scientific studies have demonstrated the range of impacts on the aquatic environment caused by boats and, in particular, motorized boats. These impacts can be caused by a boat's motion, emissions of fuel waste, sewage disposal, chemical leaching, and noise.[47] The nature of these impacts, and other impacts from boating, are discussed below.

12.1.1 Motion-induced Impacts of Boating on the Aquatic Environment

A moving vessel transfers energy to the surrounding water. As the vessel moves forward, the rising and subsequent falling of the water level forms a displacement-induced wave. Wash is the water thrust downward by the spinning of a propeller. Waves, wakes, and wash have a variety of direct and indirect impacts on the surrounding environment.[48]

- *Bank Erosion.* Persistent displacement-induced waves can erode coastal banking. The energy from the wave action is influenced primarily by water depth and distance from the shore, and also by speed, and hull configuration. The ability of a bank to resist erosion depends upon the amount of vegetation, soil type, bank profile, and type and amount of other human activity on it.

- *Turbidity.* Vessel-induced turbidity caused by "prop wash" and displacement-induced waves is often cited as a principal factor limiting the growth and survival of aquatic vegetation. Although a single boat can cause turbidity, the cumulative impacts of many boats over prolonged periods causes significant increases in turbidity. Turbidity essentially is a clouding of the water with sediments re-suspended by vessel motion. Re-suspended sediments may stay in the water column for an extended period depending on the depth of water and type of soil involved. The clouding effect from turbidity interrupts the flow of sunlight to the bottom which is needed for the survival of aquatic vegetation. Re-suspension of sediments from the bottom can also cause phytoplankton blooms in the water column, and lead to suspension of toxic particles that may have settled in the bottom.

[46]United States Environmental Protection Agency. 40 CFR Parts 89, 90, and 91. *Control of Air Pollution; Final Rule for New Gasoline Spark-Ignition Marine Engines; Exemptions for New Nonroad Compression-Ignition Engines at or Above 37 Kilowatts and New Nonroad Spark-Ignition Engines at or Below 19 Kilowatts. Summary*

[47]Barr, Bradley W.. *Environmental Impacts of Small Boat Navigation: Vessel/Sediment Interactions and Management Implications*. Massachusetts Coastal Zone Management. Boston, Massachusetts. 1993.

[48]Barr, Bradley W.. *Environmental Impacts of Small Boat Navigation: Vessel/Sediment Interactions and Management Implications*. Massachusetts Coastal Zone Management. Boston, Massachusetts. 1993.

- *De-Vegetation*. Boating and related activities such as moorings, dredging and dinghy access, can harm aquatic vegetation. Dredging needed to create or maintain navigational channels can destroy vegetation that provides important shellfish habitat. On a smaller scale, inadvertent dredging from boat propellers caught in a bank or bottom can create de-vegetated tracts in beds of submerged aquatic vegetation. Vegetation, as well as shellfish and other marine life, can be destroyed by the scouring effects of some types of moorings and tackle. Marsh vegetation can be trampled through the storage and use of dinghies needed to reach moorings.

12.1.2 Impacts on the Aquatic Environment from Boat Emissions and Discharges

Boats can emit a range of chemicals and other pollutants into the water column through leaking of petroleum products, leaching of paint or other surface treatments, and the direct or treated disposal of sanitary waste. Aside from the normal operation of motorized boats, there is an added danger from oil spills from fueling operations or from vessels damaged during a storm.

- *Hydrocarbons and other toxic pollutants.* Nationwide it has been estimated that recreational boats discharge between 150 and 420 gallons of unspent fuel each year, and produce more airborne hydrocarbon pollution than all of the cars, trucks and buses in America. A major source of unspent fuel is the use of two-stroke engines which constitute many of the smaller outboard motors used in Pleasant Bay. As noted above, two-stroke engines are being regulated by the EPA, but are not expected to be completely out of use for twenty years or more. Two-stroke engines may release benzene from gasoline, and other chemicals that can be toxic in the short-term The burning of fuel creates another class of compounds known as polycyclic aromatic hydrocarbons that can stay in the environment much longer. [49]

- *Sanitary waste disposal*. Currently any vessel is prohibited by Federal law from discharging untreated sewage within three miles of shore. Alternatively, boats may be fitted with a toilet or marine head that must be certified by the Coast Guard as a marine sanitation device (MSD). There are three types of MSD's. Types I and II treat sewage with chemicals or maceration before it is discharged. A common example of a type III device is a holding tank. Porta-potties are not considered MSD's. Of all boats moored in Pleasant Bay, less than five per cent have any form of MSD or porta-potty. Presently, Pleasant Bay is not a designated No Discharge Area (NDA). In an NDA, the discharge of waste, even from a certified MSD, is prohibited.[50] Waste must be removed at a pump-out station. Among residents surveyed, eighty-three per cent support requiring boats to use pump-out facilities. However, pump-out facilities in the Bay are extremely limited. A portable pump-out is available on request at Nauset Marine East. Orleans and Chatham each have one pump-out facility located in

[49]Hilchey, Tim. "E.P.A. Studies How to Clean Up the Wakes of Motorboats." *New York Times*. May, 17, 1994.
[50]*Marine Sanitation Devices on Boats*. Coast Guard Consumer Fact Sheet #13. U.S. Coast Guard, Office of Boating, Public , and Consumer Affairs. Washington, D.C. January, 1986.

Pleasant Bay on a part-time basis, and Harwich obtained a pump-out boat in October,1997 to be shared among the town's water bodies.

PERCENTAGE OF MOORED VESSELS IN PLEASANT BAY WITH MARINE SANITATION DEVICES (MSD)

MOORING LOCATION	ANY MSD	TYPE 1-2	HOLDING TANK	PORTA-POTTY
ORLEANS	7.4%	2.4%	1.6%	3.5%
CHATHAM	2.4%	*	2.1%	*
HARWICH	3.8*	--	3.0%	*
BAY-WIDE	4.8%	1.2%	2.0%	1.7%

Source: Harbormasters of Orleans, Chatham, Harwich *Less than 1%

12.2 Recommendations to Address Impacts of Boating on the Aquatic Environment

12.2.1 Enhance Waterways Regulations and Enforcement

Summary: A significant proportion of the Bay's sensitive natural resources -- fringe marsh, shellfish, eelgrass, and inter-tidal habitats -- are subject to damage from the impacts of boating, including turbidity, wave-induced bank erosion, and prop dredging. To reduce the impacts of boating on sensitive natural resources, and enhance public safety, the harbormasters of Orleans, Chatham and Harwich are requested to increase enforcement of existing local and state waterways regulations with emphasis on:

- all current no wake zones and five-mile-per-hour zones, including those requiring that vessels maintain a speed of no greater than five miles per hour within one hundred fifty feet of the shore, or of bathers, divers, piers, docks, floats, small vessels propelled by other than machinery, or vessels not underway.
- current prohibitions of vessels circling, wake jumping, rearing, bucking or undertaking similar maneuvers in any marked channel, designated no wake zone, or within one hundred fifty feet of the shore, or of bathers, divers, piers, docks, floats, small vessels propelled by other than machinery, or vessels not underway.

In addition to increased enforcement of existing regulations, further study should be undertaken to assess the need and feasibility for changes in local waterways regulations. Potential regulatory changes that should be evaluated include:

- ensuring that local regulations encompass the most recent state regulations;
- increasing the distance from shore within which vessels must travel at no greater than five miles per hour;
  establishing speed limits in all or parts of the Bay;
- increasing fines and penalties for frequent offenders.

Implementation: Greater enforcement is to be achieved through the implementation of the Bay-wide patrol (see 12.4.1). The Alliance Steering and Technical

Resource Committees would work with harbormasters, the Massachusetts Division of Environmental Law Enforcement, and the boating community to study potential changes in local waterways by-laws or regulations.

Funding: Funding for studying regulatory changes is included in the FY1999 budget for the Alliance. Additional funding for enforcement is addressed in recommendation, 12.4.1.

Time Frame: Increased enforcement is proposed to begin in the 1998 boating season. An evaluation of changes in waterways regulations should be completed within 18 months of the adoption of the plan by the towns and the state.

12.2.2 Establish the Bay as a No Discharge Area (NDA), and Provided Adequate Pump-out Facilities

Summary: An application should be submitted to the U.S. Environmental Protection Agency to designate the Pleasant Bay estuary a NDA. Within a NDA, discharge of treated or untreated marine sanitary waste is prohibited. All marine sanitary waste must be stored in a holding tank or porta-potty and removed from the vessel via a pump-out facility or other septic removal system.

To ensure the success of the NDA, the towns of Orleans, Chatham and Harwich, should:

- Coordinate the use of public pump-out facilities to ensure that adequate facilities are available to boaters in the Bay at all times.

- Explore the addition of pump-out equipment, including large scale pump-out boats as well as portable pump-out carts that may be used at landings and marinas.

- Develop a plan for the storage and disposal of wastes collected by pump-out equipment. The plan should explore the potential for establishing a storage depot to be shared by the three towns.

- Implement a coordinated boater education effort targeted to transient and local boaters, boating-related businesses, private marinas and boatyards, and boating clubs and associations (see Section 12.4.3).

Implementation: The Alliance Steering and Technical Resources Committees would work with local harbormasters, waterways committees, and private boatyards to develop the application, and to develop the necessary support facilities and programs.

Funding: Funding for developing the NDA application is incorporated in the FY 1999 budget for the Alliance. Additional support for application preparation would be sought from the harbormasters, and natural resources officers, for the towns. Subsequent

funding for support facilities and services would be identified through the preparation of the NDA application.

Time Frame: Preparation of the application for the NDA would begin within twelve months of the adoption of the plan by the towns and the state.

12.2.3 Further Assess Polluting Impacts from Boating in Pleasant Bay

Summary: Further research should be undertaken to characterize and quantify the impacts of boating, including PWC, on water quality, habitats, and other aspects of the marine environment in Pleasant Bay. This research should assess:

- emissions from motorized vessels and, in particular, whether the impacts of two-stroke engines in the Bay will be adequately addressed by the new EPA emissions standards;
- extent of loss of vegetation;
- extent of bank erosion;
- loss of habitat due to noise or loss of vegetation;
- impacts of chemical leaching from anti-fouling paints, and from treated lumber used for shoreline structures; and
- impacts from moorings on bottom vegetation and shellfish.

The research would be available to the towns to use as a basis for reformulating guidelines or regulations to minimize any negative impacts of boating on the natural resources of the Bay.

Implementation: The Alliance Steering and Technical Resource Committees would work with local harbormasters, waterways committees, boaters, and private boatyards to identify research topics, and coordinate research projects. Technical assistance may be requested from regional scientific institutions, and the Massachusetts Executive Office of Environmental Affairs. Changes in local waterways regulations would be pursued according to research findings.

Funding: Funding from private and public sources would be identified as needed.

Time Frame: Initial research topics would be generated by the development of the scope for the inventory and monitoring project (See 9.2.1), within eighteen months of the adoption of the resource management plan by the towns and the state.

12.2.4 Encourage Environmentally-compatible Boat Maintenance and Management Practices

Summary: Rapid transition to four-cycle engines, or other demonstrably cleaner engine technology, should be encouraged among boat owners, boatyards and marinas operating in the Bay. In addition, the following maintenance practices[51] should be encouraged:

- Only products scientifically proven to be environmentally benign, should be used for hull painting;
- A drop cloth, vacuum sander or other form of recovery system should be in place for hull scraping, and all dust and scraps generated should be disposed of in accordance with all applicable laws;
- Only biodegradable, non-toxic boat cleaners should be used. To avoid spills, use of any chemical products should be restricted while a vessel is on the water;
- Boat chemicals, and cleaning materials should be disposed of in accordance with all applicable laws;
- Steam cleaning methods should be used to clean outboard motors, and use of toxic chemical cleaners should be avoided;
- Premium two-cycle oil should be used in outboards. All used motor oil from oil changes should be disposed of in accordance with all applicable laws;
- Propylene glycol mixtures should be used for anti-freeze rather than ethylene glycol mixtures. All used anti-freeze from changes should be disposed of in accordance with all applicable laws;
- A funnel should be used when filling an outboard motor with gas or oil;
- A bilge "pillow" should be used to absorb oil from bilge water before it is pumped overboard.

Implementation: The Alliance Steering and Technical Resource Committees would work with local harbormasters, waterways committees, private boatyards, and marine retailers to communicate the benefits of environmentally compatible practices. The information would be incorporated in the boaters' education campaign (see 12.4.3)

Funding: See Section 12.4.3

Time Frame: See Section 12.4.3

12.3 Management Issue: Boating Safety and Navigation

Increased boating activity, coupled with the variety of sail boats, power boats, PWC, and small non-motorized boats that use the Bay, tends to exacerbate the Bay's many navigational challenges and increase the potential for boating conflicts, particularly in known trouble spots. Lack of adherence to speed controls, and general lack of boating courtesy, are the most often cited reasons for conflicts among boaters. Among residents surveyed, eighty-nine per cent view boating safety and navigation as an important issue to be addressed by the resource management plan.

[51] Based on guidelines found in "Water Watch: What boaters can do to be environmentally friendly". National Marine Manufacturers Association

12.3.1 Navigational Trouble Spots

Local boaters participating in the resource management plan's work group process identified a number of locations that are notorious for vessel conflicts. These include:

- the area north of Namequoit Point to Meeting House Pond is generally narrow and heavily traveled in the summer months. Numerous sailing lessons and races occur in this area. Vessels operating at high speeds, PWC, and vessels towing water skiers are cited as posing added danger in a congested area;
- the Narrows is recognized as an area where tacking sailboats and power boats converge, particularly at low tide when the channel is narrowed;
- Crooked Channel, because of its narrow and winding channel, is an area where conflicts or strandings occur frequently; and
- the areas north, west and south of Strong Island are noted for their difficulty due to shoaling and sand bars.

The narrow channels and obstacles characteristic of these locations reduce the amount of room for maneuverability, or for dodging on-coming vessels. But in addition to these natural challenges, boaters are vexed by a preponderance of negligent operating practices. Sail boaters, particularly students in local sailing programs, are threatened by waking caused by speeding or the erratic operation of power boats and PWC. In turn, power boaters are constrained by numerous sailors tacking across narrow areas. Numerous mishaps could arguably be avoided through stricter adherence to "rules of the road," and local waterways regulations.

12.3.2 Enforcement

The Bay's waterways are regulated by the Harbormasters of Orleans, Harwich, and Chatham. Each town has waterways regulations governing vessel operations, moorings, pollution control, and other health and safety issues For example, each town's waterways regulations have designated certain areas as *No Wake Zones* . In these areas, usually entrance channels or other enclosed areas, speeds are limited to five miles per hour. Activities such as water skiing and operation of PWC at speeds greater than five miles per hour are prohibited in *No Wake Zones* and in marked channels.

Despite the existence of extensive regulations, there is a perception that violations of speed controls, and other prohibitions place boaters and other Bay users at risk. In addition to speeding, frequently cited complaints include the negligent operation of powerboats and PWC, and water skiing in marked channels. Of residents surveyed, seventy-two per cent support increased regulatory enforcement for boating, and sixty-two per cent support the expansion of *No Wake Zones*.

In practice, enforcement by the three towns is constrained by limited resources, and the sheer size of area in the Bay requiring patrolling. Although each town's harbormaster hires additional seasonal enforcement staff during the summer months,

limited patrol staff and boats are shared between Pleasant Bay and other waterways in their respective jurisdictions. Also, none of the towns have reciprocal agreements that allow patrollers to pursue transgressors over town lines.

12.4 Recommendations To Enhance Boating Safety and Navigation

12.4.1 Establish a Coordinated Bay-wide Patrol

Summary: An increase in the resources available to harbormasters' for enforcement of local waterways regulations is supported by the plan. Specifically, the plan recommends that a coordinated Bay-wide patrol be initiated to ensure adequate enforcement of waterways regulations in Pleasant Bay. The patrol is needed to ensure that:

- at least one patrol is dedicated to the entire Bay at all times during the peak boating season (Memorial Day through Labor Day);
- patrol personnel from each town are cross-deputized, enabling them to pursue and take appropriate actions against transgressors, regardless of their location in the Bay;
- where it will enhance enforcement or the protection of natural resources in Pleasant Bay, the respective waterways regulations of the three towns will be expanded or amended to provide consistency; and
- resources used for the Bay-wide patrol will augment and not replace the current level of resources dedicated by the towns to patrol the Bay.

Implementation: The harbormasters of Orleans, Chatham, and Harwich will coordinate the Bay patrol.

Funding: Funding for the Bay patrol has been incorporated in the harbormasters' FY 1999 budgets.

Time Frame: The Bay patrol will be in effect for the 1998 boating season.

12.4.2 Enhance Navigational Aids to Improve Safety and Reduce Resource Impacts

Summary: Harbormasters in Orleans, Chatham, and Harwich are requested to undertake the following actions to improve public safety and to minimize impacts on resources caused by boating activity:

- The existing channel from Namequoit Point to Meeting House Pond should be accentuated with a series of parallel buoys, to prevent boats from drifting outside of the marked channel. Boats should be allowed to travel at safe speeds within the channel. A *No Wake Zone* should be enforced outside the marked channel.

- Additional markers should be placed at the northeast corner of Strong Island where boaters have been known to be troubled by rocks.

- Additional markers are needed to adequately identify the channel from Dogfish Bar to the Chatham Light.

- A lighted junction buoy in the vicinity of Fox Hill, Ryder's Cove and Strong Island is needed to mark the channel.

- The harbormasters should continue to maintain existing channels to enable boats to traverse the length of the Bay, from Meeting House Pond to Chatham Harbor inlet. To avoid confusion among boaters, Harbormasters should coordinate the numbering of markers to be consecutive from one end of the Bay to the other.

Implementation: Placing of navigational aids is under the jurisdiction of the harbormasters of Orleans, Chatham, and Harwich.

Funding: No funding is required in FY 1999.

Time Frame: The additional navigational markers are scheduled to be in effect for the 1998 boating season.

12.4.3 Boaters' Education Campaign

Summary: A public education campaign targeted to local and transient boaters should be undertaken to reinforce the recommendations of the resource management plan. The campaign should address:

- waterways regulations, and penalties for non-compliance;
- operating and maintenance procedures designed to reduce impacts on natural resources;
- unregulated boating protocols;
- procedures concerning aquaculture grant areas;
- appropriate use of town landings; and
- resource sensitive areas.

The campaign should encompass informational brochures, signs at public landings, seminars, media, advertising, and public forums.

Implementation: The Alliance Steering and Technical Committees would work with local harbormasters, waterways committees, boaters, boating associations, instructors, marinas, boatyards, local boat servicers and merchants, and local schools to develop and implement the campaign.

Funding: Participants and businesses would be asked to contribute a portion of the resources they normally apply to public outreach and education to the Pleasant Bay boaters' education campaign.

Time Frame: The preliminary campaign strategy, identifying parties involved, funding mechanisms and outreach activities, would be developed within eighteen months of the adoption of the plan by the towns and the state.

12.5 Management Issue: Impact on Public Safety and Natural Resources From the Operation of Personal Watercraft (PWC)

Although small in number compared to other types of vessels on the Bay, PWC are widely perceived to be a threat to public safety and natural resources. "Operating a PWC" was rated the least popular and least important activity on the Bay in the survey of residents. On the other hand, regulating the use of PWC was supported by eighty-eight per cent of residents surveyed. Participants in the work group process also strongly urged the plan to call for a ban on the operation of PWC in Pleasant Bay.

Concern about PWC and efforts to regulate them is a nation-wide phenomenon. The Center for Disease Control and Prevention reported that the incidence of PWC injuries quadrupled over the past six years, while the number of PWC tripled during this same time period. The incidence of injuries associated with PWC is eight times as frequent as with motorboats. [52] Current accident data from the U.S. Coast Guard indicates that rented PWC have a significantly higher accident rate than owner-operated PWC. Rented PWC are more likely to be operated by individuals with inadequate experience, training, or knowledge of boating protocols and local waterways regulations.[53]

Recently, areas that have successfully banned PWC have done so on the basis of the size of enclosed water bodies. Maine and Vermont have banned PWC on lakes of 200 acres or less. New Hampshire has also imposed state-wide limits on PWC.[54] Prohibitions are also under consideration for Lake Tahoe in California, and the San Juan County, Washington. In Massachusetts, PWC are prohibited from operating on waters of the Commonwealth of less than seventy-five acres. The state regulation has enabled several Cape towns to ban PWC operation on great ponds. Locally -- in Chatham, Harwich, Provincetown, Wellfleet, Barnstable, and Martha's Vineyard -- efforts have been made or are underway to ban or further restrict PWC operations in areas other than great ponds. In Pleasant Bay, residents have expressed a desire to address safety and environmental threats from PWC.

The operation of PWC is controlled by state and local waterways regulations. For the most part local regulations require operators to be sixteen years of age or older,

[52] "Injuries rising on personal watercraft," Reuters, *Boston Globe*, August 27, 1997
[53] "Injuries rising on personal watercraft," Reuters, *Boston Globe*, August 27, 1997
[54] "Personal Watercraft: Education, Regulation, or Both?" *Boating Industry*, January 1997

prohibit negligent operation [55], prohibit towing, prohibit night-time operation, and require headway speeds within 150 feet of bathers. Chatham prohibits the operation of PWC within 150 feet of a public bathing area.

12.5.1 Impacts of PWC on Safety and Resources

Most of the complaints about the operation of PWC in the Pleasant Bay study area focus on threats to public safety from the unlawful operation of the vessels. Specific issues and impacts are:

- *Negligent Operation*. There is ample anecdotal evidence that PWC operators often operate at unsafe speeds, too close to shore or at insufficient distances from other boaters or bathers, and that they attempt maneuvers that classify as negligent operation.

- *Rental of PWC at Town Landings*. The operation of rental concessions for PWC based at town landings has been cited as an issue of special concern because they facilitate operation of PWC by individuals who may not have had adequate training, and may be unfamiliar with local waterways. The U.S. Coast Guard recently cited that people responsible for accidents involving PWC are typically on rented or borrowed craft.[56] Rented craft accounted for more than half of the PWC accidents in Florida in 1995.[57]

Serious concerns have also been raised regarding impacts PWC operations could have on the Bay's resources. These include:

- *Impacts in Shallow Waters.* PWC's use a motorcycle engine to eject water and move the vessel over the water. The absence of a propeller allows the PWC to operate in water that is only a few inches deep. PWCs can traverse marsh areas and tidal flats at high speeds. The turbidity, noise, and erosion impacts from this activity within Pleasant Bay are unknown.

- *Noise*. Noise level on the Bay was deemed an important resource management issue for eighty-two per cent of residents surveyed. Noise from PWC is a complaint often associated with PWC. Excessive noise can be an irritant to shoreline residents, beach-goers, and other boaters. However, it can also disturb wildlife habitats and, ultimately, lead to a displacement of species from the study area.

12.6 Recommendations to Address Impacts on Public Safety and Natural Resources From the Operation of PWC.

[55] The Town of Chatham By-law , Article V Waterways, 5.18-3.G, defines negligent operation as unreasonable jumping or attempting to jump the wake of another vessel, following within 150' of a water skier, weaving through congested vessel traffic, speeding in restricted areas, crossing unreasonably close to another vessel, operating a PWC in such a manner that it endangers the life, limb or property of any person.
[56] "Experts urge safety courses for Jet Ski operators," AP, *Cape Cod Times*, August 10, 1997
[57] "Emotions won't have a role in this PWC accident study," editorial, *Soundings*, March, 1997

12.6.1 Prohibit Rental Concessions of PWC in Pleasant Bay

Summary: Concessions or other businesses offering use of PWC on a rental basis should be prohibited from operating at public or private landings within the Pleasant Bay ACEC.

Implementation: The Alliance Steering and Technical Resource Committees would work with local harbormasters, Boards of Selectmen, local waterways committees, and other applicable local licensing boards to identify and implement any regulatory changes needed to prohibit rental concessions for PWC.

Funding: Funding is incorporated in the FY 1999 budget for the Alliance.

Time Frame: Subject to necessary approvals.

12.6.2 Develop PWC Management Program

Summary: The recommendations in this chapter applicable to PWC are intended to reduce the threats to natural resources and public safety caused by the improper operation of PWC in Pleasant Bay. Information on the sensitive nature of the Bay's natural resources, and overwhelming public sentiment expressed throughout the planning process, indicate that further measures to eliminate these threats are needed. Accordingly, development of a Management Program for the operation of PWC in the Pleasant Bay is recommended to encourage and, where necessary, regulate the safe operation of PWC. The program should emphasize voluntary compliance measures, education, regulation and enforcement. Program elements should include:

- Development of "best operating practices" that address PWC safety, nuisance, and environmental concerns.
- Outreach to operators regarding the content of "best operating practices", and the importance of voluntary compliance. Voluntary best efforts among PWC operators in the Bay are anticipated.
- Greater enforcement of all applicable local and state waterways regulations.
- Development of proposed changes in current local and state waterways regulations to address safety, nuisance and environmental concerns.
- Evaluation of Massachusetts regulations regarding PWC operation vis a vis other states, and development of recommendations for changes in state regulations, including but not limited to, a state-wide requirement for education, and mandatory certification of PWC operators.
- Monitoring of the safety, and environmental affects of PWC's.
- Establishment of goals for the PWC Management Program, and a time frame for assessing progress toward goals.

If goals of the PWC Management Program are not met within the specified time frame, the following measures should be fully explored:

- further regulation of the operation of PWC's in Pleasant Bay;
- prohibitions on PWC operation within the waters of Pleasant Bay, subject to Town Meeting Approvals.

Implementation: The Alliance Steering and Technical Resource Committees would work with harbormasters, PWC operators, concerned residents, and the Massachusetts Division of Environmental Law Enforcement to develop and implement the PWC Management Program.

Funding: Funding to develop the PWC Management Program is included in the FY1999 budget for the Alliance.

Time Frame: The PWC Management Plan should be developed and in place for the 1999 boating season. Regulatory changes should be proposed for Town Meetings in the Spring of 1999.

12.7 Management Issue: Environmental Impacts from Moorings

Moorings and the tackle used to connect a mooring to a vessel can cause impacts on natural resources due to their routine use. These impacts will vary depending on the type of mooring used. In Pleasant Bay, the type of mooring used must be approved by the local harbormaster. All moorings in Orleans are required to be of the mushroom anchor design. In Harwich, mushroom designed moorings are also specified in the town's waterways regulations, but the harbormaster has allowed the use of alternative mooring designs. In Chatham, mushroom and concrete block anchors are allowed. Some of the mooring types allowed or required by the three towns have been demonstrated to have harmful effects on surrounding vegetation and marine life. All three types of anchors displace vegetation and animal life that otherwise could grow where the anchor is located. This threat is perhaps greatest with concrete blocks, which are larger and heavier than other mooring anchors. Concrete blocks are increasingly favored by boaters because of their strength and permanence. However, in many cases blocks used are larger than necessary to secure smaller vessels in protected areas, and collectively displace marine life from a large amount of bottom area. Mooring chains, particularly those attached to mushroom anchors, tend to scour the bottom as the mooring rotates, damaging or destroying vegetation and shellfish for a sizable area around the mooring. Helical screw moorings are a relatively new technology to the area. By using a screw into the bottom rather than an anchor on top of it, the helical mooring may provide adequate strength with a shorter scope, and therefore potentially fewer impacts on bottom vegetation or shellfish.

Regardless of design, every mooring creates an impact on resources by facilitating the use of a vessel. For example, there is concern that helical style moorings could increase the capacity for more moorings of the Bay. As discussed above, the nature of this impact depends on the size of the vessel, and whether it is motorized. The proliferation of moorings in some areas has led to complaints of congestion, particularly in enclosed water bodies. The number of moorings also influences the demand for parking at

town landings, and for storage area for dinghies. Seasonal overcrowding of landings already occurs, with parking extending onto abutting property and local streets. Dinghy storage also can spill onto adjacent land, and can be harmful to shoreline banks and vegetation. In the long-term, the demand for secure moorings in the Bay needs to be tempered with the recognition that moorings can damage natural resources, both directly, and through the boating activity they support. The capacity of the Bay's waterways, and access points to those waterways, to accommodate vessels safely needs to be taken into account, along with the cumulative impacts these boats may have on resources.

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12.8 Recommendations to Address the Environmental Impacts from Moorings

12.8.1 Establish Permanent Mooring -Free Areas

Summary: The following areas of the Bay should be designated as mooring-free areas. The placement of moorings in these areas should be prohibited:

- *Open Area for Recreational and Commercial Access.* The mooring-free area depicted in the following figure is intended for recreational and commercial uses undertaken in a manner that is consistent with the recommendations of the resource management plan.

- *Areas of Critical Marine Habitat*. Placement of additional moorings should be prohibited in areas identified in the plan as *Areas of Critical Marine Habitat* (see Section 9.2.2). Existing moorings should not be affected.

Implementation: The Alliance Steering and Technical Resource Committees would work with local harbormasters, waterways committees, and conservation commissions to develop demarcation and enforcement procedures. Information concerning the areas should be included in the boaters' education campaign (see Section 12.4.3).

Funding: Funding for demarcation and enforcement should be incorporated in the harbormasters' FY1999 budgets.

Time Frame: The open areas should be in effect for the 1998 boating season.

12.8.2 Develop a Bay-wide Mooring Program to Reduce Environmental Impacts of Moorings

Summary: A Bay-wide mooring program should be developed to accommodate a level of demand for moorings that is consistent with the resource management plan. The Bay-wide mooring program should:

- assess the applicability of a variety of mooring technologies, including helical screw-type moorings, in terms of their ability to securely accommodate vessels and minimize negative impacts on natural resources;
- determine whether the current delineation of mooring areas overlay sensitive resources, and whether relocation of moorings or mooring areas is needed;
- assess the need to limit or control the number of moorings in the Bay, or to require certain mooring technologies in sensitive areas of the Bay;
- identify any changes in existing regulations needed to implement the mooring plan.

Pending completion of the mooring program, the harbormasters are requested to implement the following policies for the 1998 boating season:

- maintain the number of mooring permits in the Pleasant Bay study area at the 1997 level
- prohibit the placement or relocation of additional moorings in areas identified in the plan as *Areas of Critical Marine Habitat* (See Section 9.2.2), or "resource sensitive" areas (see 11.2.1)
- prohibit the use of concrete block moorings within the Pleasant Bay study area with the following exceptions: (1) allow the use of concrete moorings south of Minister's Point ; (2) allow the use of concrete block moorings in areas within the study area as required by the harbormaster having jurisdiction
- encourage use of alternative mooring technologies, such as helical screw moorings, that can be demonstrated to reduce impacts on natural resources
- develop testing protocols to monitor the use of new mooring technologies in terms of impacts on bottom vegetation, shellfish, boat security, and boating congestion.

Implementation: The Alliance Steering and Technical Resource Committees would work with local harbormasters and waterways committees to develop the mooring program. The program would be implemented by the local harbormasters.

Funding: Funding for harbormasters' time spent developing the program should be incorporated in the respective budgets for the Orleans, Chatham and Harwich harbormasters.

Time Frame: The program should be in effect for the 1999 boating season.

12.9 Management Issue: Environmental Impacts from Dredging

Channel dredging is undertaken to maintain navigational channels that are narrowed or made shallow by the filling in of sediments. In practice, dredging removes sediments from a specified width and depth of bottom, and disposes of them in a predetermined location. This dramatic alteration in the substrate caused by dredging can have significant impacts on water quality and hydrology, aquatic vegetation, shellfish and

fin fish, and other forms of wildlife. The range of impacts can be caused by the use of heavy equipment during construction, or by the physical displacement of materials and resources. Other impacts associated with dredging include turbidity, sedimentation, changes in aquatic chemistry, and shoreline erosion, and impacts generated by the use of the channel once dredged. Another set of impacts can be caused by the disposal of dredged materials.[58]

The extent of any type of impact, and the ability of resources to recover from the impacts, depends on many factors including the size of area dredged in proportion to the overall water body, the physical characteristics of the environment, and the design and execution of the dredging project. Although most estuarine environments are expected to recover from dredging impacts, the recovery period, and the characteristics of the reconstituted system can vary tremendously. Steps that can be taken to minimize impacts include timing the dredging to avoid peak periods of biological activity.[59]

With the exception of Chatham Harbor where dredging is on-going, most dredging in Pleasant Bay occurred thirty to fifty years ago. Given changes in the profile of uses of the Bay over that time, coupled with changes in hydrology resulting from the Chatham breakthrough, it is reasonable to assume that dredging to maintain previously dredged channels may be necessary within the next decade. If the breakthrough continues to migrate south, it is also conceivable that additional areas may be proposed for dredging, either for navigation or to improve flushing and circulation within the Bay.

Given the heavy use of the Bay by boaters, and the potential impacts dredging has for the Bay's sensitive natural resources, the possible need for dredging within the Bay is a significant management concern. The tremendous variability of conditions throughout the Bay, and the dynamic nature of all resources in the system, suggest that specific impacts and recovery rates from potential dredging projects need to be assessed on a case by case basis. Information from the ecological inventory and monitoring project will be essential for this task. However as a principle the plan recommends that future dredging projects be required to demonstrate that they serve a public need, and do not irreparably diminish or degrade natural resources.

12.10 Recommendations to Address Environmental Impacts from Dredging

12.10.1 Improvement Dredging

Summary: The state Waterways (Chapter 91) Regulations prohibit improvement dredging projects within ACECs . An amendment to the existing Pleasant Bay ACEC designation has been prepared as part of the development of the resource management plan. The amendment seeks to extend the current ACEC boundary southerly to the

[58]Normandeau Associates. *Draft Environmental Impact Report Oyster Pond River Dredging Project Town of Chatham, Massachusetts*. Plymouth, Massachusetts. June, 1995.
[59]Normandeau Associates. *Draft Environmental Impact Report Oyster Pond River Dredging Project Town of Chatham, Massachusetts*. Plymouth, Massachusetts. June, 1995.

Chatham Light and easterly to the eastern-most shore of the Cape Cod National Seashore, and further to allow improvement dredging projects, and the disposal of dredged material from such projects, in the area south of Minister's Point, provided such projects are consistent with the resource management plan and all applicable federal, state, and local permit requirements.

Implementation: An amendment to the ACEC designation as described above will be submitted to the state for review and certification along with the resource management plan. Further, the Alliance Steering and Technical Resource Committees would work with local harbormasters and waterways committees to review proposed dredging projects to ensure their consistency with the resource management plan

Funding: None required.

Time Frame: The state review of the proposed amendment to the ACEC designation will occur simultaneously with the state review the resource management plan.

12.10.2 Maintenance Dredging

Summary: Maintenance dredging projects should continue to be permissible within the Pleasant Bay ACEC provided they meet all state and federal environmental permitting regulations. All maintenance dredging projects within the ACEC or the study area be required to demonstrate consistency with the resource management plan.

Implementation: The Alliance Steering and Technical Resource Committees would work with local harbormasters and waterways committees to review proposed projects to ensure their consistency with the resource management plan.

Funding: None required.

Time Frame: To be determined by project proposals.

12.10.3 Dredge Spoils Disposal

Summary: Regarding the disposal of dredge materials, the state Waterways (Chapter 91) Regulations prohibit the disposal of dredge materials within an ACEC, except for the purposes of beach nourishment; dune reconstruction or stabilization with proper vegetative cover; or the enhancement of fishery or wildlife resources. (310 CMR 9.40 (1)(b)). Any proposals to dispose of materials from dredging projects within the study area should be required to demonstrate consistency with the resource management plan, and to meet all local, state and federal environmental permitting requirements.

Implementation: The Alliance Steering and Technical Resource Committees would work with local harbormasters and waterways committees to review proposed projects to ensure their consistency with the resource management plan.

Funding: None required.

Time Frame: To be determined by project proposals.