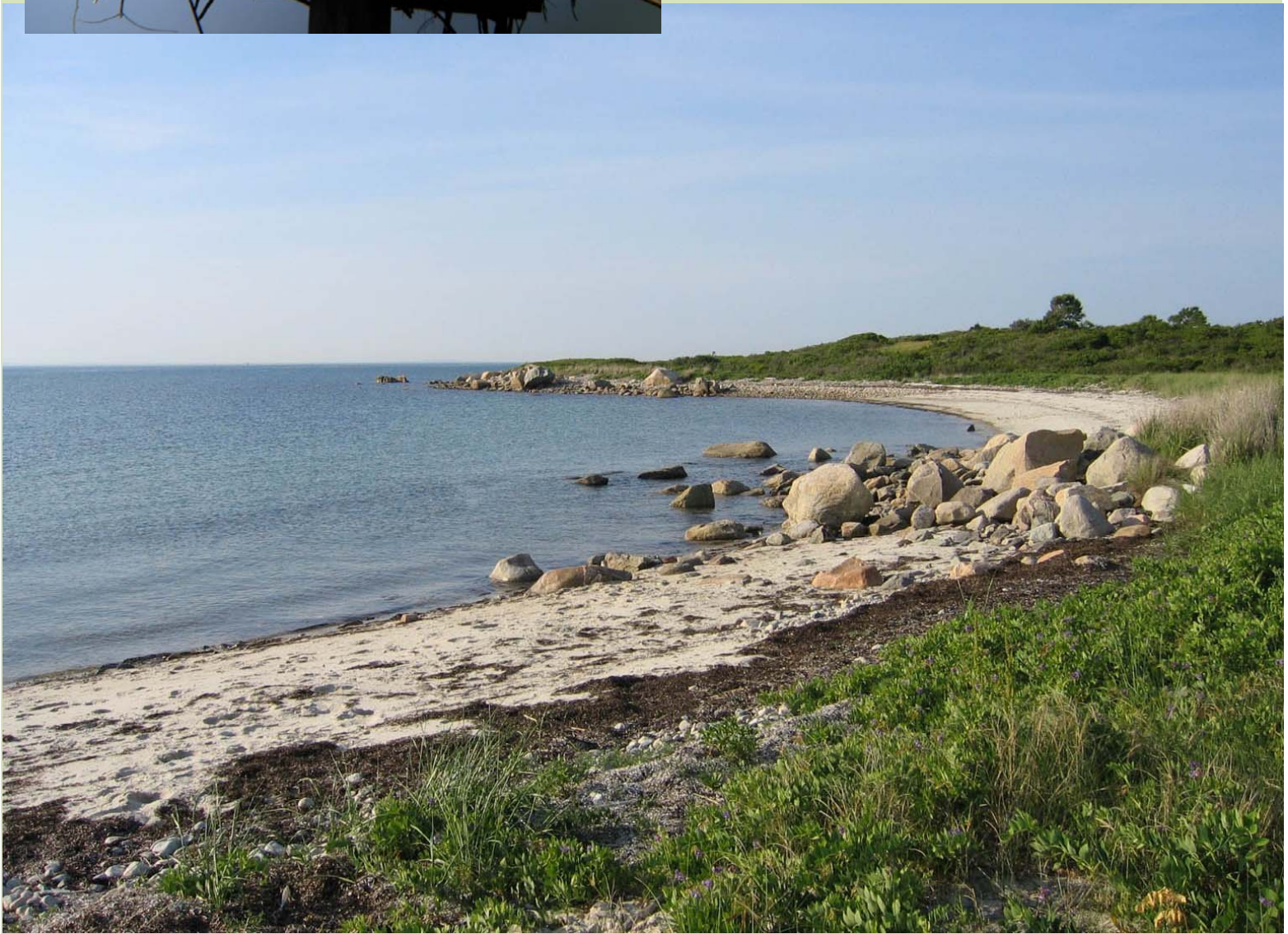




Buzzards Bay
Comprehensive Conservation
and Management Plan
2013 Update
Executive Summary



November 26, 2013
Prepared by the Buzzards Bay National Estuary Program
Executive Office of Energy and Environmental Affairs
Massachusetts Office of Coastal Zone Management

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Acknowledgments

The 2013 update to the Buzzards Bay Comprehensive Conservation and Management Plan (CCMP) was built upon the original 1991 Buzzards Bay CCMP, which itself was the product of dozens of individuals, including Buzzards Bay NEP staff, state, and federal agency personnel, and numerous non-governmental contributors. In that regard, a special credit is needed for Bruce Rosinoff, the lead CCMP writer of the 1991 document (and later EPA project manager to the Buzzards Bay NEP until 2004), for designing a well organized and well thought out document that lasted two decades, and which became the template for the current document.

In the new Buzzards Bay CCMP, again many individuals contributed to the update and review of the document. Buzzards Bay NEP Executive Director Dr. Joe Costa was the lead writer and managing editor for the effort. Special thanks to Buzzards Bay NEP staff Tracy Warncke and Sarah Williams, who were the principal editorial reviewers. A special recognition is also needed for the members of the Buzzards Bay Steering Committee, past and present, who defined the overall approach of the 2013 document, and guiding revisions to the goals and objectives of the plan. These individuals include Bruce Carlisle (CZM), Mel Cote (EPA), Steve Halterman and Dave Delorenzo (DEP), Vandana Rao (EEA), Steve Smith and Bill Napolitano (SRPEDD), for the Buzzards Bay Coalition, Mark Rasmussen, Tom Gidwitz, John Ross, and John Bullard, and for the Buzzards Bay Action Committee Elizabeth Leidhold, Jeff Osuch, Jennifer McKay, and Dave Pichette. Other contributors of text to the new management plan include Sarah Williams and John Rockwell of the Buzzards Bay NEP, South Coastal Regional Coordinator David Janik of the Massachusetts Office of Coastal Zone Management, and Bernadette Taber of the USDA Natural Resources Conservation Service (and detailed to the Buzzards Bay NEP as our stormwater specialist). In 2006, with financial support from the Massachusetts Executive Office of Energy and Environmental Affairs, the Buzzards Bay National Estuary Program awarded a contract to the Horsley Witten Group, Inc. to update several key sections of the management plan. These updates included the overview chapter, and action plans for stormwater management, low impact development, smart growth, waterfront management, and managing water withdrawals. Throughout this document, we utilize information and graphics contained in DEP's *Buzzards Bay Watershed 2000 Water Quality Assessment* prepared by Katie O'Brien and Andrea Langhauser at DEP¹. This report provides an excellent summary of the conditions and regulatory status of resources in the Buzzards Bay watershed, and was the foundation of Chapters 2 and 3, and several action plans.

Many others provided invaluable assistance in reviewing, revising, contributing text or data, or in preparing or updating action plans in the new Buzzards Bay CCMP. Massachusetts Coastal Zone Management staff provided invaluable support in developing and refining action plans. Key participants included CZM Director, Bruce Carlisle, and CZM staffers Jay Baker, Todd Callahan, Ann Donovan, Dennis Ducsik, Rebecca Haney, and Robin Lacey. Mark Rasmussen and Buzzards Bay Coalition staffers Korrin Petersen, Brendan Annett, and Tony Williams also provided valuable input, insight, and comments. The Buzzards Bay Action Committee provided an excellent forum to develop and discuss the new and revised action plans in the updated Buzzards Bay CCMP.

The Buzzards Bay NEP would not have been possible without the visionary development and passage of Section 320 of the Clean Water Act of which the late Senator Edward Kennedy and the late Congressman Gerry Studds were key architects and supporters, along with subsequent support by Congressmen Barney Frank, William Delahunt, and Senator John Kerry. Since the inception of the program, about \$15 million of federal funds have been awarded to the Buzzards Bay NEP. These funds, together with cash and in-kind contributions from the state, Buzzards Bay Coalition, Buzzards Bay Action Committee, and municipalities have been the lifeblood for the sustained effort by municipalities and other partners, to protect and restore Buzzards Bay. All through this effort, EPA Project Officers Bruce Rosinoff, Mary Jo Feuerbach, and Ann Rodney were exceptional guides in the implementation of the program, and the update of the plan. They also helped direct millions of dollars in Section 319 and other EPA grants toward actions contained in the Buzzards Bay CCMP. This work was completed pursuant to EPA Cooperative Agreements CE98164503 and CE96144201.

Finally, thanks to all scientists, planners, town, state, federal officials, and interested residents who, over the years, contributed many new ideas and novel approaches that have made the update of the management plan a success, and more importantly, took action to implement the original management plan.

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¹ O'Brien, K., and A. Langhauser. 2003. Buzzards Bay 2000 Water Quality Assessment Report. Department of Environmental Protection Division of Watershed Management Report Number: 95-AC-2 DWM Control Number: 085.0 Massachusetts Department of Environmental Protection Division of Watershed Management. Worcester, Massachusetts. November 2003.

Foreword

Since our inception, the primary goal of the Buzzards Bay National Estuary Program (NEP) has been to “restore and maintain the chemical, physical, and biological integrity of the estuary” (Section 320[b] of the Clean Water Act, our authorizing legislation). In 1991, we completed our original Buzzards Bay Comprehensive Conservation and Management Plan (CCMP), a landmark document providing a blueprint for the forthcoming efforts to protect and restore the water quality and living resources of Buzzards Bay and its surrounding watershed. The CCMP introduced many new concepts to local planners including the need to establish watershed limits on the discharge of nitrogen from wastewater (including septic systems and other nitrogen sources), the importance of stormwater discharges to bathing beach and shellfish bed closures, and the recognition that the climate was changing.

The Buzzards Bay NEP has now updated the CCMP to reflect the progress achieved, new problems facing the bay and its surrounding watershed, and the ongoing unresolved problems that remain since the original plan was finalized. This updated Buzzards Bay CCMP includes existing, new, and revised goals that relate to 21 key issues facing the bay and watershed. In each of the 21 “Action Plans,” we identify management strategies for government, citizens groups, and the public to employ to meet the continuing challenges we face.

While the updated Buzzards Bay CCMP is not a regulatory document, it lays out a vision that we hope will continue to guide municipalities in their ongoing efforts to protect and restore the environment. It will also help state and federal agencies direct grants and technical assistance programs, and update policies and regulations, to benefit the bay and watershed for years to come.

Joseph E. Costa, PhD
Executive Director
Buzzards Bay National Estuary Program

Steering Committee Approval

Buzzards Bay
Comprehensive Conservation and Management Plan
2013 Update

The Buzzards Bay Project began in 1985 as an initiative to characterize and understand pollution threats to water quality and living resources in Buzzards Bay. Within a few years, the Buzzards Bay Project became part of the National Estuary Program (NEP). Under the guidance of a Management Committee, the program completed its Comprehensive Conservation and Management Plan (CCMP) for Buzzards Bay.

The citizens advisory committee to the project evolved into two separate non-profit organizations, the Buzzards Bay Coalition, and the Buzzards Bay Action Committee. These two organizations, together with other core agencies that participated in oversight of the program formed the Buzzards Bay National Estuary Program Steering Committee. The Steering Committee continues to provide oversight and guidance to the Buzzards Bay Program in its efforts to implement the recommendations in the CCMP document.

In the ensuing years, the Buzzards Bay NEP has had many successes and faced new challenges. Throughout this period, the original 1991 management plan proved to be accurate in assessing the problems of Buzzards Bay and had remarkable foresight in identifying solutions to those problems. Nonetheless, it was clear the management plan needed to be updated to address new information and the evolving regulatory framework of environmental management. Therefore, the Steering Committee directed the Buzzards Bay NEP staff to work with its partners to reevaluate the threats to the bay and watershed, and reexamine the potential solutions to these problems. The culmination of this effort is the *Buzzards Bay Comprehensive Conservation and Management Plan 2013 Update*.

It is our hope that this current document refocuses program activities and renews interest and enthusiasm for ongoing and future efforts to protect and restore Buzzards Bay and its surrounding watershed.

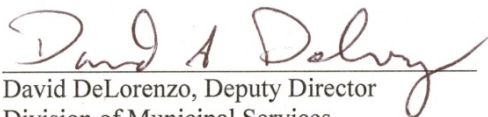
The *Buzzards Bay Comprehensive Conservation and Management Plan 2013 Update* was approved by the Steering Committee of the Buzzards Bay National Estuary Program on November 26, 2013.



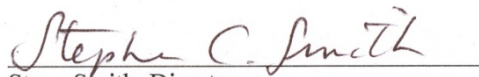
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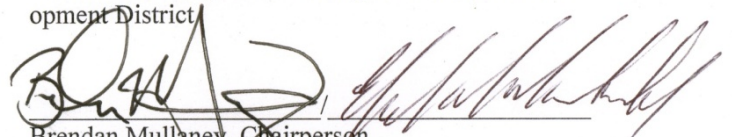
Bruce Carlisle, Director
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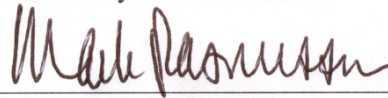
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Brendan Mullaney, Chairperson
Elizabeth Leidhold, Executive Director
Buzzards Bay Action Committee



Mark Rasmussen, President
The Buzzards Bay Coalition

Buzzards Bay Action Committee Resolution

Whereas the member municipalities of the Buzzards Bay Action Committee recognize the importance of good water quality and healthy living resources in Buzzards Bay and its surrounding watershed, and that these values are important to the residents of the Buzzards Bay watershed, and vital to the region's economic vitality,

Whereas we recognize the serious threats to Buzzards Bay and its watershed from deteriorating water quality, habitat loss, declining natural resources, storms, sea level rise and future climate change, and the associated threats to public and environmental health, the local economy, and the quality of life,

Whereas we further recognize that the drainage basin of Buzzards Bay crosses municipal boundaries; that the future of the Bay depends on the ability of neighboring communities to control the quality of their environment through regional communication and cooperation among municipal, state, and federal agencies responsible for managing the Bay and its watershed,

Be it therefore resolved that the membership of the Buzzards Bay Action Committee unanimously agree to continue to support the voluntary, regional organization of local governments known as the Buzzards Bay Action Committee. The BBAC members agree to exchange information and ideas that will expedite the region's ability to implement sound environmental policies, regulations, and by-laws to protect and enhance our mutual resource of the Buzzards Bay and its watershed. We further agree to review and update our individual town by-laws and regulations so as to voluntarily:

- reduce nitrogen pollution to sensitive embayments
- protect and enhance shellfish resources
- control stormwater runoff and promote low impact development
- improve land use management and promote smart growth
- manage on-site wastewater disposal systems
- manage impacts from boating, marinas and moorings
- protect and restore wetlands
- restore migratory fish passages
- protect bio-diversity and rare and endangered species habitat
- manage water withdrawals to protect wetlands, habitat, and water supplies
- manage invasive and nuisance species
- protect open space
- protect ponds and streams
- reduce beach debris, marine floatables, and litter
- manage coastal watersheds and the water front
- reduce toxic pollution
- prevent oil pollution
- plan for a shifting shoreline and coastal storms
- protect public health at swimming beaches
- monitor management actions, and the status and trends of water quality and living resources
- promote public education and participation in these activities
- encourage other organizations and agencies to take action in support of the goals and objectives of the CCMP.

These goals are contained in the Buzzards Bay Comprehensive Conservation and Management Plan 2013 Update.

Acushnet *Heather Kelly*
 Bourne *[Signature]*
 Dartmouth *[Signature]*
 Fairhaven *Jeffrey W. Church*
 Falmouth *[Signature]*
 Gosnold *[Signature]*
 Marion *Paul J. Sampson*
 Mattapoisett *[Signature]*
 New Bedford *[Signature]*
 Rochester *[Signature]*
 Wareham *Claudio Pichetto*
 Westport *[Signature]*

Approved by a vote of the BBAC this 21st day of November, 2013

Action Plan 1 Managing Nitrogen Sensitive Embayments

Problem

Impairments to water quality and living resources caused by excessive nitrogen inputs to Buzzards Bay are one of the most pressing issues identified in this Buzzards Bay CCMP. Nitrogen total maximum daily load (TMDL) studies have not been completed for all embayments, but impairments are apparent in all the somewhat less well-flushed embayments that fringe Buzzards Bay. Loss of eelgrass beds, accumulation of benthic algae smothering shellfish beds, and low oxygen concentrations and resulting fish kills are among the impacts that must be remedied. Elimination of excessive nitrogen loads will ensure that all designated uses for those embayments are met⁴⁷. Wastewater discharges are typically the largest source in most watersheds. While state and federal agencies regulate permitted discharges like outfall pipes, some sources of pollution like cumulative loadings from septic systems are difficult to regulate. Solutions typically focus on municipal sewer expansion or nitrogen removing onsite systems, both of which have high costs.

Goals

Goal 1.1. Ensure that no designated uses will be lost, nor ecosystems adversely affected by excessive contributions of nitrogen to any area of Buzzards Bay.

Goal 1.2. Restore lost designated uses and adversely affected ecosystems impaired by the excessive contribution of nitrogen to any area within Buzzards Bay.

Objectives

Objective 1.1. To develop and adopt scientifically based nitrogen total maximum daily loads (TMDLs) for nitrogen impaired areas of Buzzards Bay.

Objective 1.2. To reduce the amount of nitrogen currently entering nitrogen-impacted embayments, including all areas identified on 303(d) and Integrated Lists, according to limits specified in approved TMDLs.

Objective 1.3. To ensure new additions of nitrogen to coastal waters do not cause, or contribute to, a violation of state surface water quality standards, or exceed federally approved TMDLs.

Objective 1.4. To ensure that state and federal discharge permits meet nitrogen loading limits and waste load allocations specified in approved TMDLs.

Objective 1.5. To promote the development and implementation of local plans to manage nitrogen sources to meet TMDLs and waste load allocations.

⁴⁷ Unless additional impairments are caused by other pollutants. "Designated Uses" are those listed in Massachusetts Water Quality Standards, see entry in Glossary.

Objective 1.6. To promote the development and support the use of alternative and advanced nitrogen reducing wastewater treatment technologies at all scales of flow.

Objective 1.7. Monitor water quality and natural resources like eelgrass beds at a sufficient frequency to document management needs, assess the effectiveness of actions taken, and to document ongoing changes and variability in water quality and ecosystems health.

Approaches

Municipalities should take action to reduce nitrogen inputs to impaired waters. In most watersheds, sewerage with disposal at centralized or satellite wastewater treatment systems with nitrogen removal will often be the most viable solution for reducing wastewater nitrogen inputs from areas with dense development. In less developed areas, advanced nitrogen removal onsite systems and small community scale systems may be part of a solution, as well non-structural alternatives. To ensure action, it is imperative that DEP develop, and for the U.S. EPA to adopt TMDL nitrogen limits and waste load allocations for all impaired areas. These limits only directly affect discharges requiring a federal permit, so municipalities must develop comprehensive strategies to manage all nitrogen sources to meet adopted TMDLs.

In some watersheds, better management of agricultural fertilizer release or manure management is needed. In the case of the cranberry bogs, nitrogen reductions can be achieved in part through various water use BMPs. Although typically a secondary source, stormwater discharges and residential fertilizer use can be locally important. All stakeholders should work closely with municipalities to reduce nitrogen to meet TMDLs, and implement comprehensive strategies, including managing or offsetting nitrogen inputs from new development.

Costs and Financing

Preliminary estimates by the Buzzards Bay NEP suggest that sewer expansion in the Buzzards Bay watershed may exceed \$2 billion. Because of the costs and scale of the effort, meeting TMDLs will remain one of the most formidable political, financial, and management challenges facing municipalities in this CCMP. Implementation will likely take decades and require more state and federal support.

Measuring Success

The issuance of TMDLs, compliance with loading limits, and the area of impaired waters will be the management measures tracked. Restoring water quality and recovery of habitat will be the long-term tracking measure. These will be assessed through the Coalition's Water Quality Monitoring Program and the state's eelgrass mapping and listings of impaired waters.

Action Plan 2 Protecting and Enhancing Shellfish Resources

Problem

Shellfish (molluscs and crustaceans) are an important but diminishing resource in Buzzards Bay. Catch statistics suggest that populations of many mollusk species and lobster populations are declining. Declining catch of lobster may be related to disease and water quality degradation. Mollusk catch declines are the result of habitat declines and sanitary closures. Although the acreage of shellfish bed permanent closures has declined in Buzzards Bay in recent years, numerous areas remain permanently closed. Exacerbating the problem, funding for shellfish propagation and relay programs has been cut back appreciably in recent years.

The Massachusetts Division of Marine Fisheries (DMF) implements shellfish bed management based on ambient water quality in shellfish beds and a mostly visual evaluation of potential pollution sources along the coast (Shellfish Sanitation Survey Program). Additional coordination and collaboration is needed between DMF and municipalities to reduce closures further.

This action plan narrowly addresses steps to enhance the availability and productivity of shellfish resource areas. It compliments other action plans that target specific pollutants and impacts, especially Action Plan 3 Managing Stormwater Runoff and Promoting LID, and Action Plan 1 Managing Nitrogen Sensitive Embayments.

Goals

Goal 2.1. Increase availability of shellfish resources for recreational and commercial use.

Goal 2.2. Restore habitat to increase the abundance and distribution of shellfish resources.

Objectives

Objective 2.1. To keep open all shellfish resource areas now open, and to open priority resource areas that are now closed.

Objective 2.2. To increase the ability of DMF to carry out the sanitary survey program and provide technical assistance to municipalities to better manage shellfish resources.

Objective 2.3. To increase the capacity and commitment of municipalities to remediate pollution sources that are contributing to shellfish bed closures.

Objective 2.4. To expand the use of the conditionally approved classification for shellfish areas.

Objective 2.5. To eliminate pollution sources and disturbances contributing to the permanent loss of shellfish habitat and enhance and restore shellfish habitat.

Objective 2.6. Expand programs to propagate, seed, and relay shellfish.

Approaches

To achieve the goals and objectives of this action plan requires improved coordination and collaboration between the DMF and municipalities. To reduce bacteria concentrations, both municipalities and DMF must better monitor and document upstream pollution sources contributing to shellfish bed closures and take action to eliminate these pollution sources or minimize their impact. State sanitary surveys should be posted online to assist town boards and committees establish pollution remediation priorities. Solutions relating to shellfish habitat loss are addressed in other action plans.

Additional monitoring is essential, because “end of the pipe” solutions are expensive, and upstream source reduction strategies can often achieve the same benefits at less cost. Such monitoring can also help establish priorities to target available programs and funds to address the most problematic discharges contributing to shellfish bed closures. Additional water quality data can also enable the state to expand conditionally approved areas, or reduce the extent of permanently closed shellfish areas. These outcomes may also depend on municipalities eliminating identified pollution discharges.

Expansion of propagation or seeding programs can provide benefits to the public in the absence of broader water quality or habitat improvements. Towns can construct shellfish upwellers to meet these needs.

Costs and Financing

The legislature and local government need to provide funds for staff to implement this action plan. A watershed-scale upstream source identification program could be established at a cost of \$100,000 per year if it utilized existing staff and a volunteer monitoring program like that established by the Buzzards Bay Coalition in their nitrogen pollution water quality monitoring program. Programs like EPA’s 604(b) can assist with these watershed assessments. Funding for shellfish propagation seeding (including upwellers) and habitat creation programs can be included in state and local budgets. Tackling pollution like treating stormwater discharges to open shellfish beds or reducing nitrogen to restore shellfish habitat will cost billions over decades. Those costs and issues relating to these efforts are addressed in other action plans.

Measuring Success

Acres of shellfish beds permanently closed, and commercial shellfish catch will be the principal long-term tracking measures to evaluate progress toward the goals of this action plan.

Action Plan 3 Managing Stormwater Runoff and Promoting LID

Problem

Thousands of stormwater pipes and overland flows discharge contaminated runoff into Buzzards Bay and its tributaries. Connected to these pipes are tens of thousands of catch basins and hundreds of miles of pipes that convey numerous allowed and illicit pollution discharges. New development adds stormwater to this discharge network. These stormwater discharges pose many threats to the environment, not the least of which is the closure of shellfish beds and swimming beaches in Buzzards Bay. Federal permit programs that may require compliance with daily load limits for bacteria, and other requirements for municipal stormwater programs, could cost more than a \$1 billion in the coming decades. These efforts, while costly and politically challenging, will dramatically reduce shellfish bed closures in Buzzards Bay and restore habitat in many areas to conditions not seen for decades⁷⁸.

The ongoing development and redevelopment of land in the Buzzards Bay watershed must be better managed and reprogrammed to minimize new impacts and mitigate existing problems caused by stormwater discharges. This new approach, called low impact development (LID), can restore hydrological balances in watersheds and reduce water quality impairments.

Goals

Goal 3.1. Prevent new or increased untreated stormwater flows to Buzzards Bay and contributing watershed areas that would adversely affect shellfishing areas, swimming beaches, water quality, and wetlands.

Goal 3.2. Correct existing stormwater runoff flows to Buzzards Bay and contributing watershed areas that are adversely affecting shellfishing areas, swimming beaches, water quality, and wetlands, or exceeding watershed total pollutant load limits.

Goal 3.3. Maintain and restore natural hydrologic conditions to provide base flow conditions to streams, wetlands, and estuaries.

Goal 3.4. To encourage low impact development (LID) techniques in new development and redevelopment, in order to minimize impacts from stormwater.

Objectives

Objective 3.1. To adopt and implement local and state stormwater LID laws and regulations.

Objective 3.2. To implement effective stormwater pollution remediation projects that include proper design, construction, operation, and maintenance.

Objective 3.3. To provide guidance and incentives for LID that reduces and re-uses stormwater runoff, and reduces the need for structural practices.

Objective 3.4. To improve compliance with federal, state, and local stormwater regulations and meet watershed total pollutant load limits.

Approaches

LID approaches are best implemented through local bylaws and ordinances that regulate subdivisions, and commercial development, through new municipal stormwater permit programs, and will require additional training of regulatory and technical assistance staff.

The elimination of water quality impairments caused by existing stormwater discharges is a major undertaking that will require actions and expenditures by all levels of government. EPA must enforce compliance with the Buzzards Bay pathogen TMDL through MS4 stormwater permits. DEP must upgrade state stormwater policy to include treatment standards for nitrogen and bacteria, and EEA must promote policies and regulations that foster low impact development techniques. The largest burden rests with municipalities, which will need to develop and implement meaningful stormwater management programs for themselves and the private sector supported by sound local laws, regulations, and policies.

Costs and Financing

LID approaches have modest costs for government to implement, and some approaches can even reduce development and long-term maintenance costs borne by residents. The most daunting costs will be to treat existing discharges causing degradation and to implement municipal stormwater programs that support these goals. This effort will likely cost more than \$1 billion over several decades. The costs will likely be met through federal and state SRF loan programs, or through local financing like stormwater utilities.

Measuring Success

LID and stormwater goals will be tracked principally by programmatic actions such as the adoption of necessary laws and regulations. More importantly, documenting compliance with EPA stormwater permits and stormwater TMDLs including constructing stormwater treatment systems, or eliminating stormwater discharges, and implementing good housekeeping programs will be key measures. A key measure of success will be improvements to water quality, as evidenced by reductions in the extent or duration of shellfish closures.

⁷⁸ The success of these efforts will also partly depend on actions contained in Action Plan 1 Managing Nitrogen Sensitive Embayments, because of relationship between bacterial and nutrient discharges.

Action Plan 4 Improving Land Use Management and Promoting Smart Growth

Problem

Past building and development practices, coupled with poorly planned local zoning and development requirements, have resulted in sprawl, increased pollution discharges, and many other unintentional injurious effects to the environment. Whereas the Promoting LID action plan focuses principally on stormwater management and restoring the natural hydrology of sites, “Smart Growth” and similar growth management principles address the broader and indirect environmental impacts of growth and sprawl. Smart growth strategies include planning, zoning, protection of open space, preserving natural landscapes, encouraging village centers, and promoting clustering of development and other actions that cannot be directly addressed through conventional environmental regulations. Implementation of these plans, practices, and policies will not only benefit the environment, but also save government infrastructure construction and maintenance, and ultimately benefit the public with reduced government tax burdens.

Goal

Goal 4.1. To improve land use management through the use of smart growth strategies in the Buzzards Bay watershed to maintain and improve the natural resources and ecology of Buzzards Bay.

Objectives

Objective 4.1. To encourage smart growth techniques in less developed Buzzards Bay watershed communities to preserve open space, revitalize urban and village centers, focus development on growth centers, and protect natural resources and the environment.

Objective 4.2. To improve local zoning, subdivision, health, and wetlands regulations to manage future growth in a way that protects the environment of Buzzards Bay and its watershed.

Objective 4.3. Promote sustainable agriculture that does not adversely affect water quality.

Approaches

Municipalities have a responsibility for regulating and managing the impacts of future growth to minimize potential environmental impacts. Besides project specific permitting requirements, tools available to municipalities include master plans, open space plans, industrial and economic incentive zones, zoning, clustering of development rules, parking space regulations, and decisions about the placement of public infrastructure and public facilities, are all tools that shape and define future patterns of development. How these tools are used also effect the cumulative impacts of growth on the environment. One of the biggest local challenges, however, is

simply defining the goals for the preferred patterns of development and redevelopment. Once the goals are better defined, these tools can be used more effectively and in a complimentary way.

The first step is to evaluate local regulations that need to be reexamined. Regulatory strategies may include revisions to zoning bylaws, general bylaws, and local wetland regulations. However, a vision of smart growth strategies and goals must be included in long-term planning documents like municipal master plans, open space plans, and municipal stormwater plans⁸⁴.

Each municipality must decide which smart growth techniques work best for them, and implement those that optimally protect their critical resources and minimize growth impacts on water quality and habitat special to their community. Certain techniques, like cluster zoning, should be universally adopted. Other techniques are more town-specific. The transfer of development rights (TDRs) is a technique underutilized by rural municipalities. For the TDR process to work as desired, municipalities must identify sensitive resource areas (sending areas) and growth centers (receiving areas). Defining the sending and receiving areas can be informed by science (e.g. receiving areas should not adversely affect another area), but assigning these areas may require political and economic considerations.

Other levels of government need to support municipalities through technical and financial assistance programs. Where appropriate, state, and federal government must also change regulations and laws governing new growth and redevelopment to both support smart growth principles, and to lead by example. Regional planning and regulatory agencies, the Buzzards Bay NEP, and state agencies all have important roles to play through training, education, and in the review of projects that meet certain state and regional thresholds.

Costs and Financing

Many of the necessary regulatory changes to implement this action plan have negligible cost to government. More importantly, some smart growth approaches (like clustering of development) also reduce costs to developers and tax burdens to residents because of lesser infrastructure maintenance costs.

Measuring Success

This action plan requires tracking of programmatic measures such as adoption of laws and regulations that achieve the goals of this action plan. This action plan attempts to lessen numerous effects of new development; no one environmental outcome can be tracked directly.

⁸⁴ See Action Plan 3 Managing Stormwater Runoff and Promoting LID.

Action Plan 5 Managing Onsite Wastewater Disposal Systems

Problem

The preponderance of the use of conventional septic systems poses a threat to many embayments and fresh-water ponds in the Buzzards Bay watershed. Failed and inadequate septic systems also remain a source of pathogens contributing to water quality impairments. The 1996 updates to Title 5 required that both new standards and the inspection and replacement of inadequate systems at time of property transfer. These regulations have eliminated many problem systems. However, many properties have not changed hands since 1995, and many inadequate systems remain in place. Moreover, local regulations need to be adopted to address special local environmental needs. This action plan addresses the need for improved and more effective designs for onsite wastewater treatment systems to meet the needs of protecting sensitive areas of Buzzards Bay.

The nutrient impacts of septic systems remain a significant problem, and controlling these eutrophication impacts are addressed in Action Plan 1 Managing Nitrogen Sensitive Embayments. While there will be a push to sewer many more areas in the Buzzards Bay watershed, homes in the less densely developed areas will continue to use onsite septic systems for years to come, and in some cases may need to be upgraded to nitrogen removing septic systems. The increased use of onsite wastewater systems with alternative designs will pose a management challenge for local and state government.

Goal

Goal 5.1. Prevent public health threats and environmental degradation from on-site wastewater disposal systems.

Objectives

Objective 5.1. Enforce the provisions contained in Title 5 regulations such as, siting and design, inspection and upgrades, training, maintenance, mapping and designation of nitrogen sensitive areas, etc.

Objective 5.2. Where special local conditions exist, encourage boards of health to adopt local regulations to ensure and/or improve environmental and public health protection.

Objective 5.3. Improve management and oversight by municipalities of onsite wastewater disposal systems.

Objective 5.4. In areas where advanced nutrient removal is required, encourage community scale alternative technology systems as a preference over individual alternative systems.

Approaches

To meet the goals of this action plan, installed or upgraded onsite systems must meet all state and local regulations. When appropriate, municipalities must adopt local regulations to meet special local needs to protect public health, safety, and the environment. Some of these local requirements could include more stringent setbacks, or accounting for sea level rise in nearshore areas by increasing separation to groundwater.

For watersheds of embayments listed as nitrogen impaired on the state impaired waters list, or where warranted by TMDL, or as part of local Comprehensive Water Management Plans (CWMPs) local government can require the use of nitrogen removal septic systems. Such an approach could include nitrogen discharge standards more stringent than the state specified minimum of 19 ppm. As an interim measure, towns could request that DEP designate nitrogen sensitive embayments pursuant to [310 CMR 15.000](#), Section 15.215(2).

Costs and Financing

Most of the solutions identified in this action plan have negligible costs to government, although some initiatives would increase the workload for staff, or new staff may be required. Some initiatives, like a regional online innovative system tracking system would likely cost less than \$10,000 to create, and may cost \$10,000 per town to annually staff thereafter. Management solutions that incorporate the use of innovative onsite treatment systems can add to the costs incurred by developers and property owners, but these costs will need to be evaluated and weighed against the costs of conventional sewerage.

Measuring Success

For this action plan, programmatic actions are the chief measure to track progress toward the goals of this action plan. Evaluating the effectiveness of local regulations is subjective, and each municipality must assess its needs and define the most effective regulatory solution.

Action Plan 6 Managing Impacts from Boating, Marinas, and Moorings

Problem⁹⁷

One of the significant accomplishments of the Buzzards Bay Action Committee, on behalf of the watershed municipalities, and with technical assistance from the Buzzards Bay NEP, was the designation of Buzzards Bay as a No Discharge Area for boat sewage in 2000, the first large area to be designated in Massachusetts. However, boats, boat moorings, and marinas can still adversely affect water quality and habitats of Buzzards Bay. These impacts are most pronounced where boat density is greatest or where there are sensitive resources. Boat use and maintenance, and the infrastructure to support those activities, all have potential impacts associated with the release of contaminants, and through physical alterations like propeller wash and anchor chain scour, and through shading of the bottom. Some harbors in Buzzards Bay have more than 1000 moorings. Mooring chains scour the bottom, remove eelgrass, and destroy habitat for benthic fauna. These chains, bouncing on the bottom with waves, resuspend bottom sediments greatly reducing water clarity that can shade out eelgrass beds over large areas and elevate bacteria levels. Some marinas have illicit discharges associated with boat cleaning operations, and 95% of the marinas in Buzzards Bay have not complied with EPA's Multi-Sector General Permit for managing stormwater discharges. Education is needed about the broader impacts associated with boats, moorings and marinas and how they can be minimized.

Goals

Goal 6.1. Eliminate the discharge of wastewater from all boats in Buzzards Bay.

Goal 6.2. Eliminate or minimize impacts of discharges from marina operations.

Goal 6.3. Eliminate adverse environmental impacts associated with mooring fields.

Objectives

Objective 6.1. To ensure there is an adequate number of pumpout facilities in Buzzards Bay.

Objective 6.2. To promote the use of pumpout facilities by educating boaters, making facilities more accessible, and enforcing the regulations.

⁹⁷ This action plan differs considerably from the boat sewage action plan in the 1991 CCMP. It only addresses physical impacts and pollutant discharges associated with boats, marinas, and mooring fields. Broader impacts associated with managing development of the waterfront, managing usages of the watersheet, and watersheet zoning are addressed in Action Plan 6 Managing Impacts from Boating, Marinas, and Moorings. Some boating impacts are also addressed in Action Plan 17 Preventing Oil Pollution.

Objective 6.3. Achieve full compliance of marinas with the Phase II stormwater and MSGP discharge permits.

Objective 6.4. Ensure compliance of marina power washing activities with applicable state and federal laws.

Objective 6.5. Deploy mooring systems that minimize environmental impacts to habitat and water quality.

Approaches

Goals can be achieved through education efforts, such as the distribution of newsletters, factsheets, and posting of notices or signs. Improved compliance by marinas with the MSGP stormwater permit program will require notification and enforcement by the U.S. EPA, with supporting technical assistance from DEP and CZM. Marina operators must also cease discharges associated with bottom cleaning operations on their properties that result in direct discharges.

Eventually most conventional mooring anchors should be replaced with helical anchors and elastic rodes. Requirements for mooring gear replacement to environmentally friendly types can be mandated through regulations or policies and could be phased in over time to minimize hardships. For example, the Town of Marion now requires helical anchor systems only on vessels over 25 feet (but elastic rodes are not yet required). Environmental moorings have an added benefit of increased boat densities, the same number of boats can be confined to a smaller area of the estuary. Municipalities can lead by example by replacing all municipal owned moorings with these environmentally beneficial mooring systems.

Costs and Financing

Many elements of this action plan require modest or negligible expenditures of public funds, as most relate to education, adoption of regulations, or better enforcement of existing regulations. Most of the necessary flyers and notices can be produced in-house by towns, and disseminated with mooring permits and through marinas.

The most expensive element of this action plan is born by boat owners, and that is the cost of the new mooring system. While these environmentally friendly mooring systems are somewhat higher in price to a conventional mooring system (\$4-7,000), unless the mooring is new, this is an added cost. Mooring upgrades can be phased in over a period of years. Municipalities should pursue funding for municipal owned mooring replacements from habitat restoration programs.

Measuring Success

The success of this action plan will be documented principally with programmatic actions, the volume of boat waste collected, regulatory compliance, and the extent of use of environmentally friendly moorings.

Action Plan 7 Protecting and Restoring Wetlands

Problem

Marine and freshwater wetlands continue to be lost and degraded. Although the rate of loss has diminished greatly in recent years, reductions in future wetland losses and wetland habitat degradation will only be achieved through increased local training and enforcement, education of property owners, and the adoption of local wetland regulations to address shortcomings of state and federal laws.

The management of stormwater discharges has become an increased responsibility of conservation commissions. These stormwater treatment requirements must be strengthened to better achieve water quality goals (like open shellfish beds), and conservation commissions need to better coordinate with other boards to ensure comprehensive and consistent town-wide stormwater management requirements.

Additional efforts are needed to restore existing degraded wetlands and remedy past wetland violations. This requires a more robust enforcement approach and additional public funding for restoration projects.

This action plan principally relates to the enforcement of existing laws and regulations, and the need to adopt municipal laws and regulations that address local needs and conditions. Additional issues relating to wetlands protection and restoration can be found in many other action plans in this Buzzards Bay CCMP¹⁰⁵.

Goal

Goal 7.1 Long-term increase of high-quality wetlands in Buzzards Bay and its surrounding watershed.

Objectives

Objective 7.1. To protect existing wetlands.

Objective 7.2. To encourage restoration of degraded wetlands.

Objective 7.3. To improve enforcement of wetlands laws.

Objective 7.4. To upgrade the effectiveness of local conservation commissions to protect wetlands.

Objective 7.5. To create new wetlands habitat, especially habitat that can be used by threatened, rare and endangered coastal species and anadromous and catadromous fish.

Approaches

Most of the action needed to achieve the goals of this action plan relate to improved enforcement of existing regulations, or the need to adopt municipal laws and regulations that supplement the minimum standards imposed by state and federal laws. Improved enforcement, monitoring wetland loss using aerial photography, and implementation of new local wetlands laws and regulations are the key actions. Continued training of municipal staff (conservation agents) and municipal conservation commission members will facilitate these actions. Wetlands regulations are among the most complex that are enforced locally, and there is a steep learning curve for municipal officials in their successful implementation. Because local conservation commissioners are volunteer appointees with little training in wetland science, it is important that state and regional agencies (like the Buzzards Bay NEP) provide training and support.

The two most challenging aspects of enforcing wetlands regulations are the accurate delineation of wetland boundaries, and the adequacy of stormwater treatment designs (which has a primary benefit to water quality). Municipal boards must carefully review these elements for accuracy and adequateness. These can be assured through improved training of commissioners and staff, utilization of free technical services (like the Buzzards Bay NEP), and for complex projects, hiring consultants, paid for by the applicant, as provided under state laws.

Municipalities can reduce future threats to wetlands by promoting open space acquisition and conservation restrictions on lands with appreciable wetland habitat, and by helping restore filled or impaired wetlands.

Costs and Financing

The cost of adoption of regulations is negligible to government, but the staff to implement and enforce additional regulations is an added cost. Most of the training courses are available at no or little cost. Other needed actions, like the restoration of wetlands, or the permanent protection of wetlands and habitat will only be achieved through additional government funding. For example, a funding level of \$1 million per year could leverage the protection or restoration of many hundreds of acres annually.

Measuring Success

Most of the elements of this action plan can be addressed through tracking programmatic actions, like the adoption or update of bylaws and regulations. Some actions, like numbers of acres lost, restored, or protected are useful metrics, and are already being tracked by DEP or the Buzzards Bay NEP.

¹⁰⁵ Action Plan 8 Restoring Migratory Fish Passage, Action Plan 9 Protecting Bio-Diversity and Rare and Endangered Species Habitat, and Action Plan 12 Protecting Open Space have many goals, objectives, and suggested actions that compliment this action plan.

Action Plan 8 Restoring Migratory Fish Passage and Populations

Problem¹¹¹

In the Buzzards Bay watershed, there are more than 8,000 acres of ponds and hundreds of stream miles. Prior to colonial settlements most of these ponds and streams were likely important habitat for fish species that spent portions of their life cycle in both fresh and marine waters. These diadromous species include river herring (bluebacks and alewife), historically the most predominate species, in many rivers. Other locally important diadromous fish are the eel, white perch, rainbow smelt, and sea run brook trout. All these species have declined dramatically in the Buzzards Bay watershed during the past 200 years. Historically, the declines were largely caused by river obstructions, particularly the widespread construction of milldams during the 19th century, but culvert installation, channelization of streams, loss of bordering tree and shrub vegetation, and pollution and sediment discharges have all been contributing factors. The loss of suitable river spawning habitat (gravel bottom streams with fast moving cool water, for example) has affected many species. Water diversion and pumping for agricultural purposes can impede migrations and result in juvenile fish mortality.

All these species will benefit most appreciably from the elimination of obstructions to migration and the creation of more suitable river and stream spawning habitat. In many cases, dam removal may be the best management option, in other cases, new fish ladder installations may be the only practical solution. Improved water management practices by cranberry growers, and preventing excessive drawdowns by municipal water supplies during drought years is important to avoid placing adult and juvenile populations at risk.

In the case of river herring, while there were some modest improvements in certain populations toward the end of the twentieth century, offshore fishing pressures, and bycatch takings have resulted in new dramatic declines. Restoration of river herring populations will require rigorous controls of offshore catch.

Goals

Goal 8.1. Ensure that the migration of fish species between salt and fresh water is unimpeded.

Goal 8.2. To restore degraded stream habitat and stream functions to ensure the diversity and abundance of fish in Buzzards Bay streams.

Goal 8.3. To manage fishing pressures on anadromous fish populations to ensure the fish harvest and bycatch are sustainable.

¹¹¹ In the 1991 Buzzards Bay CCMP, objectives and recommendations relating to fish migration were found in the "Protecting Wetlands" action plan.

Objectives

Objective 8.1. Ensure adequate funding of state fisheries restoration programs.

Objective 8.2. Ensure that local, state, and federal fisheries regulators manage better the catch and bycatch of river herring and other diadromous fish to promote their recovery and population sustainability.

Objective 8.3. Improve passageways and remove impediments and obstructions to fish migration.

Objective 8.4. Ensure adequate stream flow for fish migration.

Approaches

State and local managers must identify and restore priority fish habitat sites and remove obstructions to fish migration. Many smaller herring runs need to be elevated as a priority for restoration because of their cumulative benefits. A special focus of the state and towns should be a coordinated restoration of fish habitat along the entire length of the Weweantic River. While these river restoration efforts are underway, the National Marine Fisheries Service, Regional Fisheries Management Councils, and the Atlantic States Marine Fisheries Commission should limit the catch and bycatch of river herring in offshore waters and take other measures. DEP could require, as a condition in all state water withdrawal permits, that there is adequate flow in rivers during adult and juvenile migration periods for species in the stream. Permittees should always be required to use appropriate screening of water withdrawal intakes to prevent stranding, mutilation, entrainment, or impingement of young herring.

Costs and Financing

Developing and implementing designs to repair fish passageway structures in the watershed, and to remove obstacles, including dams, may cost millions. Federal grants can cover some of these costs but state and local government may need to provide additional funding for natural resource staff. Regulatory solutions have negligible costs to government. The installation of a fish counter on a particular stream may cost \$10,000 or more.

Measuring Success

The number of restoration efforts undertaken, or quantifying the number of upstream or downstream river miles or pond acres newly accessible or restored are easily tracked. Different management actions may benefit some species and not others. Ultimately, the size of the fish species population will be the best measure of success and can be determined through automated fish counters, observations by volunteers, direct capture, or through catch, mark, and release programs.

Action Plan 9 Protecting Bio-Diversity and Rare and Endangered Species Habitat

Problem

The biodiversity of Buzzards Bay and its watershed, particularly populations of locally rare and endangered species, are threatened by habitat loss, alteration, and stresses caused by human activity and pollution discharges. Vital habitats include those that support protected plants and animals, wetlands, fish nursery and spawning areas, submerged aquatic vegetation, and shellfish beds. Protection of these areas can only be achieved by adequate evaluation of threatened species, mapping their habitat, enforcing existing laws, adoption of new laws to create buffers around these habitats, and education of the public and government officials about their importance. The mapped distribution of listed species and vernal pools suggest that not all areas of the watershed have experienced the same level of baseline mapping effort.

The adoption of municipal conservation plans may be another approach to go beyond project permit review and to achieve more comprehensive and effective strategies to protect key wildlife habitat, and to build necessary public support.

Recommendations and discussions related to this action plan are included in Action Plan 7 Protecting and Restoring Wetlands; Action Plan 8 Restoring Migratory Fish Passage; Action Plan 10 Managing Water Withdrawals to Protect Wetlands, Habitat, and Water Supplies; Action Plan 11 Managing Invasive and Nuisance Species; and Action Plan 12 Protecting Open Space. This action plan addresses problems not discussed in those action plans, especially those issues relating to the Massachusetts Natural Heritage and Endangered Species Program.

Goal

Goal 9.1. Conserve and protect vital fish and wildlife habitats of Buzzards Bay and in its surrounding watershed.

Objectives

Objective 9.1. Ensure that rare and endangered species areas and vernal pools continue to be mapped and this information made publicly available.

Objective 9.2. Ensure that rare and endangered species habitat is considered in the relevant permit review process.

Objective 9.3. Ensure that important biological and core habitat is protected and conserved.

Objective 9.4. Ensure that the public and government officials are aware of the importance of rare and endangered species and core bio-habitat through effective education efforts.

Approaches

The primary mechanism to permanently protecting the most important habitats in the Buzzards Bay watershed is the purchase or donation of lands for open space protection, or the purchase or donation of conservation restrictions. Municipal conservation commissions and area land trusts should coordinate to both ensure municipal open space plans remain current, and contain clear goals and priorities in targeting the acquisition of priority habitat. Each open space plan update should include the latest information of rare and endangered species habitat, and where appropriate fund inventories to fill data gaps. To provide sufficient funds to meet municipal acquisition goals, all municipalities should consider adopting the Community Preservation Act.

The second most important strategy to protect rare and endangered species habitat is to map accurately these resources. In this regard, municipalities and non-profits should help map listed species habitat and certify vernal pools throughout their community. With technical oversight, volunteers can be trained to map and gather the necessary information to certify vernal pools. Some site investigations can be undertaken by trained individuals using online NHESP reporting tools and species information. Other important habitat types must be mapped by trained wetlands and wildlife biologists. Federal agency staff could provide some assistance to the state in such an effort.

Costs and Financing

Certain costs, like providing trained staff to help organize efforts to certify vernal pools, or update open space plans are relatively modest, and some free technical assistance could be provided by the Buzzards Bay NEP. However, the real cost associated with this action plan is the acquisition of open space and it would be easy for watershed municipalities to utilize several million dollars per year for open space protection. Fortunately, because much of the most desirable land, from an environmental protection point of view, contains considerable areas of wetlands and they are often difficult to build upon, they often have the lowest costs per acre of land available for sale.

Measuring Success

Several direct measures can be tracked for this action plan, with total acres of habitat permanently protected being the most important. Other measures, like the number of vernal pools that have been certified, or species inventoried, are easy to track programmatically. Some species populations within Buzzards Bay or the watershed can be tracked, as is the case with nesting pairs of certain bird species, such as the Roseate Tern and Piping Plover.

Action Plan 10 Managing Water Withdrawals to Protect Wetlands, Habitat, and Water Supplies

Problem¹³⁵

As growth in the region has increased in recent decades, both the quantity and quality of Buzzards Bay public water supplies have been threatened. In some cases, both public and private water withdrawals are cumulatively affecting wetlands, anadromous fish runs, and other wildlife habitat, particularly during droughts. Buzzards Bay's growing population is creating a need for additional water supplies, but available land to develop future water supplies is disappearing because of the intensity of land use and the loss of open space.

Goals

Goal 10.1. Protect and preserve groundwater and surface water supplies in order to ensure a sustainable supply of high quality drinking water.

Goal 10.2. Protect and restore the natural flows of rivers and the natural waters of ponds, lakes, and wetlands and the habitat that depend on them.

Goal 10.3. Maintain natural hydrology.

Goal 10.4. Protect and preserve estuarine and brackish surface water habitats in river mixing zones.

Objectives

Objective 10.1. Encourage water use conservation and increase utilization efficiency to minimize water withdrawals, system losses, and associated impacts.

Objective 10.2. Encourage water reuse for irrigation, industrial process water, and other non-potable uses within public health constraints.

Objective 10.3. Update state regulations to reduce the potential of affecting wetlands, surface waters, and other public water supplies.

Objective 10.4. Encourage LID techniques for enhanced stormwater recharge to maximize groundwater recharge.

Objective 10.5. Manage water withdrawals and wastewater discharges from existing and new development to help maintain recharge to the aquifers.

Objective 10.6. Manage equally both public and private water withdrawals in a subwatershed, including the adoption of water use rates that encourage conservation.

Objective 10.7. Limit non-essential water use during droughts.

Objective 10.8. Develop new water supplies and improve infrastructure to improve distribution and reduce redundancy to avoid over utilization of existing wells.

Objective 10.9. Identify and protect open space for future water supplies, when needed, located as far from significant surface water resources as possible to minimize potential impacts on natural water resources.

Objective 10.10. Incorporate new information, when available, from ongoing or planned state studies on water budgets and sustainable yields into local water resources planning and regulation.

Objective 10.11. Encourage accurate tracking of water use by agricultural users and promote agricultural BMP practices for water conservation.

Objective 10.12. If and when desalinization occupies a water supply role in the watershed, encourage control technologies and operational measures that minimize entrainment and impingement impacts at intakes and preserve the natural salinity structure of receiving water bodies at outlets.

Objective 10.13. Collect and maintain water use data in support of this action plan and for tracking success.

Approaches

Managing water withdrawals to minimize environmental impacts is complicated and politically challenging and will require the implementation of long-term strategies. The objectives articulated above provide a clear road map for the approach needed. Some of the strategies require adoption of new state or local regulations to meet one of the listed objectives, and DEP must prevent new withdrawals from subwatersheds with flow stressed rivers.

Costs and Financing

The costs of these solutions and the mechanisms to finance will vary with each community, and financing options will be dependent on the strategy chosen.

Measuring Success

Tracking stream flow in stressed stream watersheds, together with tracking municipal water withdrawals and agricultural withdrawals in those stressed stream recharge areas will be the principal environmental measures that need to be tracked for this action plan. Regulatory action and outreach efforts can be used to track programmatic actions.

¹³⁵ This action plan was not in the 1991 CCMP.

Action Plan 11 Managing Invasive and Nuisance Species

Problem

Aquatic and terrestrial nuisance and invasive species represent a threat to endemic natural ecosystems of Buzzards Bay and its surrounding watershed. Once invasive species become established in an ecosystem, they are virtually impossible to eliminate. Therefore, management emphasis must be placed on regulatory controls and increased public awareness to prevent new introductions. Monitoring existing and identifying new invasives is an important tool in this effort by potentially helping elucidate transport pathways, and by identifying new introductions at an early stage where there may be a slight potential to eradicate them.

Goals

Goal 11.1. Minimize the potential introduction of new invasive and nuisance species to Buzzards Bay and its surrounding watershed.

Goal 11.2. Reduce the extent and limit the spread of existing invasive and nuisance species that are degrading habitats of Buzzards Bay and its surrounding watershed.

Objectives

Objective 11.1. Adopt and enforce laws, regulations, and policies that will reduce the potential spread of invasive species.

Objective 11.2. Educate the public, farmers, nursery owners, fisherman, pet storeowners, shipping industry, and other relevant sectors about individual actions that can be taken to reduce the threat of introducing invasive and nuisance species to the environment.

Objective 11.3. Fund and promote actions and studies to control and reduce existing populations of invasive and nuisance species.

Objective 11.4. Monitor existing and new invasives in order to help discern introduction pathways and to identify species in early stages of introduction where there may be a slight potential for containment.

Approaches

For the most part, once an invasive species has entered a region, little can be done to reverse its presence or control its population. Therefore, management action should focus on preventing new introductions, and to monitor existing conditions. Monitoring for the presence of introduced species is important so that scientists and managers can better discern whether shifts in naturally occurring species are likely the result of human perturbations, like pollution, or are possibly caused by predation or competition with introduced species. Monitoring can

also document trends and help discern pathways of invasive migrations. This information can help inform policy decisions and regulatory formulation.

Posting maps and information about introduced species and enabling easy online reporting by residents can help achieve the objectives of this action plan. CZM and the MassBays Program have already established websites for information on marine aquatic invasives in Massachusetts¹⁴⁰, and residents and municipal officials of Buzzards Bay should be encouraged to use the available online tracking and reporting forms.

The most effective approach to avoiding new introductions is through education and the enforcement of existing laws, regulations, and through adoption and enforcement of new preventative measures. These efforts will not succeed unless there is increased awareness and acceptance of the problem by the public, businesses, and educational institutions. In this way, all these groups can take voluntary measures or implement best management practices to minimize the threat of introducing non-natives into the environment.

Because pathways, impacts, and the extent of introduced species has not been well documented or understood, monitoring and research is needed not only to evaluate success of control measures, but is a fundamental need to better define the extent of the problem and the viability of proposed solutions.

Costs and Financing

Better tracking, mapping, and monitoring of key invasive aquatic and terrestrial species could be achieved with annual expenditures in the tens of thousands of dollars utilizing resident volunteers, online reporting with oversight and review by wildlife scientists and biologists. More comprehensive mapping efforts, together with research into the pathways and impacts of invasives, can cost millions of dollars. Measures to control species through eradication efforts can cost thousands to hundreds of thousands of dollars per site. There is a cost to government to enforce compliance with new regulations in terms of staff, and compliance of industry with these regulations can range from negligible (e.g. species import bans) to substantial (e.g. ballast water treatment).

Measuring Success

Tracking the extent and abundance of introduced species, together with documentation of the rate of new species introductions will be the measure of the success of this action plan, as well as programmatic measures like the adoption of new regulations.

¹⁴⁰ At www.mass.gov/eea/agencies/czm/program-areas/aquatic-invasive-species/ and mit.sea-grant.net/mitis/.

Action Plan 12 Protecting Open Space

Problem¹⁴⁵

There are many different land uses within the Buzzards Bay watershed, but much of the watershed remains undeveloped. However, undeveloped land has been disappearing at a rapid rate. In 1971, 64.5% of the watershed consisted of open and unperturbed forestlands and only 12.9% was developed¹⁴⁶. By 1999, open and unperturbed forested lands decreased to 56.5% of the watershed, while developed lands increased to 19.8%. The percent of lands classified as developed continues to increase, especially in the more rapidly growing communities.

There are ecological, cultural, and aesthetic reasons to protect open space. Naturally vegetated landscapes control flooding, can protect water supplies, reduce erosion, reduce pollutants from watersheds, and provide upland and wetland habitat. Despite these and other benefits, protection of open space and habitat is a financial and political challenge for most municipalities; several communities in the Buzzards Bay watershed still have not identified protection needs through open space and master plan development and updates. Some municipalities have considerable amounts of open space; some have modest amounts of open space.

Goal

Goal 12.1. Preserve the ecological integrity of Buzzards Bay and its watershed by increasing the amount of permanently protected open space.

Objectives:

Objective 12.1. Improve and protect coastal and inland surface water quality through land protection.

Objective 12.2. Protect biodiversity in the watershed.

Objective 12.3. Protect the region's groundwater supplies.

Objective 12.4. Improve the land conservation community's ability to protect open space.

Approaches

Meeting the goals of this action requires that towns and land trusts acquire properties for conservation purposes, or property owners agree to protect permanently their properties for conservation purposes, or in the case of farmlands and surrounding habitat, for farming purposes. Because the acquisition of open space can be expensive, even for properties mostly wet, the use of conservation restrictions and agricultural preservation restrictions are important tools to encourage private open space protection. These private land protection strategies are driven by financial and tax benefit incentives offered by government.

Because the purchase of open space can be costly, and state and local governments typical have limited funds for these purchases, it is important that municipalities develop broad strategies and goals for open space protection. These can be articulated in municipal open space plans. These plans must be updated every seven years to remain valid and ensure that the municipality is eligible to receive state grants for open space protection.

Another mechanism to generate local funds is for municipalities to adopt the Community Preservation Act. By adopting this legislation, municipalities can levy a tax fee on property transfer, and some of this revenue is matched by a state fund.

Finally, open space can be protected at no cost to government by allowing cluster development and transfer of development rights. These innovative approaches require approval by the municipal legislative body and planning boards.

Costs and Financing

The preparation and updating of open space plans can be done in-house by municipalities with assistance from the Buzzards Bay NEP or land trusts, or completed by a contractor to the municipality (perhaps a cost of \$20,000). Raising money for land acquisitions can be met by donations, municipal appropriations, or by grants. Local adoption of the Community Preservation Act is the best approach to ensure a local revenue stream. Often land acquisitions are complex and may involve funding from multiple sources.

Measuring Success

Ultimately, the number of acres of wetlands and habitat protected (by communities and in the watershed) is the principal mechanism of tracking the success of this action plan. Programmatic tracking of municipal actions, like the approval of open space plans, adopting the Community Preservation Act, and tracking the number of towns without valid open space plans may also be used.

¹⁴⁵ This is a new action plan not in the 1991 CCMP, although the earlier document did have specific recommendations to protect open space and valuable habitat. Related recommendations are contained in the LID, Stormwater, and Nitrogen Management Action Plans.

¹⁴⁶ Estimated from the MassGIS coverage "Land Use (1951-1999)" using the categories of Mining, Residential, Commercial, Industrial, Transportation, and Waste Disposal land uses for "developed land." Land use for 2005 is available, but a different methodology was used, so it is not directly comparable. Other methodologies can yield higher estimates of forested land, especially if tree cover on developed lots is included.

Action Plan 13 Protecting and Restoring Ponds and Streams

Problem¹⁴⁹

Many rivers and ponds in the Buzzards Bay watershed are impaired because of toxic contaminants, bacteria, nutrients, sediments, nuisance species, temperature changes, barriers to fish migration, water withdrawals, alterations of flow, and other problems. The Massachusetts Department of Environmental Protection (DEP) reports these impairments to the U.S. EPA as required by the Clean Water Act, in its “Integrated List of Waters” reports. These integrated lists classify bodies of waters into different categories. For example, Category 5 waters are impaired, and Category 3 waters are unassessed. As shown in Table 45, these impaired freshwaters (Category 5) total 959.8 acres (of the 4,376 acres listed) and 16.0 linear miles of streams (of the 64.9 miles listed).

To restore these waters will require considerable effort. The Clean Water Act requires that states identify those waterbodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and to prioritize and schedule them for the development of a total maximum daily load (TMDL). These TMDLs establish the maximum amount of a pollutant that may be introduced into a water body and still ensure attainment and maintenance of water quality standards. TMDLs and restoration of these bodies of waters may require a local watershed plan. The effort to characterize and assess all these bodies of water, and to restore impaired ones, represents an immense challenge to both local and state managers.

Goals

Goal 13.1. Ensure that beneficial water uses¹⁵⁰ will not be lost, nor ecosystems adversely affected, by pollution discharges, nuisance species, or alterations of flow to fresh surface waters in the Buzzards Bay watershed.

Goal 13.2. Restore any beneficial water uses and ecosystem functions lost in watershed freshwater systems caused by pollution discharges, nuisance species, or alterations of flow and volume.

Objectives

Objective 13.1. Help adopt TMDLs for all freshwaters.

Objective 13.2. Help ensure that plans are developed and implemented to meet recommended TMDLs.

Objective 13.3. Help restore impaired wetlands habitat.

Objective 13.4. Protect open space that enhances and protects lakes, ponds, and streams.

Approaches

This action plan requires complying with the Clean Water Act. To achieve its goal, pollution sources in the watershed of each impaired body must be characterized, and where appropriate, a site-specific TMDL adopted. This is complex, and an immense task, because dozens of local subwatershed plans need to be developed. Moreover, many bodies of waters and tributary segments have never been assessed, so the scope of the environmental challenge remains unresolved.

DEP will need to develop TMDLs for each impaired water body identified on the 303(d) and Integrated Lists in a timely way. Similarly, DEP will need to evaluate eventually all unassessed waters (those not included on the integrated list).

Despite these challenges and prolonged timeline, and the lack of funds and staffing to solve this problem, municipalities should establish local priorities and implement common sense measures to reduce existing impairments. Municipalities should establish water quality task forces for priority freshwater systems and have these workgroups develop management strategies. Municipal legislative bodies (town meeting or city council) should authorize new funding to evaluate and develop priorities for restoration, and to implement specific remedial actions, like treating or eliminating stormwater discharges. Interested residents should become involved in protecting and monitoring these freshwater systems. Local laws and regulations are also needed to reduce the impacts of new development and to prevent new impairments.

Costs and Financing

The development of watershed characterizations, local watershed plans, and TMDLs for impaired waters, all have substantial costs (possibly millions over a decade). State, federal, and local government must all contribute. Costs that are more substantial will be borne by local government and property owners, and state and federal government funds could leverage action.

Measuring Success

The percent of systems impaired, the total number of impaired systems, and the percent of unimpaired systems are all key measures for tracking progress towards the goals of this action plan. Development of local watershed plans and strategies; TMDLs, and number of systems removed from the impaired waters list are other metrics for tracking progress.

¹⁴⁹ This action plan was not in the 1991 CCMP, but elements were broadly covered in the original Wetlands Protection action plan. Impairments of marine waters are addressed in several other action plans. Other action plans support the goals and objectives here, especially the Action Plans Managing Stormwater Runoff, and Protecting Wetlands.

¹⁵⁰ Beneficial uses are those listed in Massachusetts Water Quality Standards, see entry in Glossary.

Action Plan 14 Reducing Beach Debris, Marine Floatables, and Litter in Wetlands

Problem

Each year, thousands of residents and visitors enjoy Buzzards Bay for boating, swimming, fishing, hiking, and birding. Many also visit the extensive inland wetlands, waterways, and open space throughout the watershed. Increasingly, litter, marine debris, and disposal of hazardous and non-hazardous waste have degraded these areas. Litter and debris may be conveyed by stormwater systems (Figure 94), and debris can wash ashore with tide (Figure 95). Although litter and debris in wetlands and the marine environment may seem to be a less serious problem than some others facing Buzzards Bay, it is in fact a problem that cuts across many action plans, and contributes to the ever growing garbage patches appearing in ocean gyres, consisting of fine plastic particles and other materials. Litter collection also involves residents and visitors in assuming responsibility and ownership of open space and wetlands they use.

Goal

Goal 14.1. To ensure that Buzzards Bay beaches, coastal waters, and inland wetlands habitat are clear of harmful and degrading levels of marine debris.

Objectives

Objective 14.1. Ensure an adequate number and capacity of waste disposal barrels be provided at public beaches and public and private marinas, and boat haul-outs.

Objective 14.2. Stormwater discharge BMPs should include strategies to reduce or eliminate discharges of debris and floatables.

Objective 14.3. Encourage fishermen to not dispose of fishing lines, nets, cables, and trash at sea or on shore.

Objective 14.4. Educate the public and businesses on the importance of reducing litter and marine debris discharges and involve them in the potential solutions.

Objective 14.5. Ensure that state and local officials work in concert to reduce litter on public lands, beach debris, and marine floatables.

Objective 14.6. Identify and map important debris location sites, natural collection points, and potential remediation strategies.

Approaches

Reducing litter and trash in the environment is complex; it will require better education of the public, property owners, and businesses, and improved collaboration of local government with neighborhood associations, and non-profit organizations. Implementation of this management plan involves three core strategies: undertaking periodic cleanups, implementing litter preventions pro-

grams to ensure both proper trash disposal and encourage waste reduction, and adopting any needed laws and regulations to increase awareness and accountability of litter generators. Government can also set an example in purchasing programs to focus on biodegradables and items less likely to enter litter waste streams.

Costs and Financing

The costs to implement this action plan are nominal; and the focus is to encourage individuals and businesses to take responsibility for the problem, and encourage volunteerism to solve the problem. There are some costs associated with cleanups, expendable supplies, signage, trash removal, and staff time, but some of these costs can be met through adopt a road or wetland programs with businesses and non-profit organizations.

Measuring Success

Measuring success in this action plan is difficult because the amount of litter collected is a function of collection effort. Assessments that are more complex could include evaluations of extent of littering; however, programmatic achievements might be easier to track. These could include extent of areas adopted for cleanup; length of beaches cleaned each year, and the number of cleanup events held.

Action Plan 15 Managing Coastal Watersheets, Tidelands, and the Waterfront

Problem¹⁶²

In coastal waters, new docks, increased boating, new waterfront development, and dredging and coastal armoring to support those activities, continue to degrade water quality, destroy habitat, and affect marine plant and animal populations. Other activities, like aquaculture, are also expanding. All levels of government have some jurisdiction over activities on the water's surface (commonly called the watershed), on the seabed (tidelands under Massachusetts law), and on the waterfront. The Massachusetts Ocean Management Plan, adopted in 2009, better regulates activities in areas greater than 1/3 mile offshore. Municipalities, with home rule powers, remain a key manager of nearshore areas not covered by the Ocean Plan (and which includes most of the harbors and embayments; see EEA, 2009). These nearshore areas are now imperfectly managed principally through local and state waterways regulations and wetlands permitting. Most municipalities have failed to undertake comprehensive planning studies of their coastal waters to protect natural resources or address cumulative impacts.

To address these needs, towns must develop local embayment management plans based on spatial planning techniques to characterize conditions and recommend action. These plans must then be implemented through laws, regulations, and policies, together with non-regulatory approaches and education.

This action plan seeks principally to address conflicting uses and management priorities for the waterfront and near coastal watersheets not addressed by the Massachusetts Ocean Management Plan, including nearshore renewable energy facilities. Issues associated with discharges from boat operation and maintenance, and adverse impacts from boat mooring systems are addressed in Action Plan 6 Managing Impacts from Boating, Marinas, and Moorings.

Goals

Goal 15.1. To manage the uses and activities in the waters and on the tidelands of Buzzards Bay in an integrated manner using sound assessments of natural resources, habitat, and water quality, to ensure sustainable recreational and commercial activities while protecting and improving ecosystem health and values.

Goal 15.2. Ensure that the effects of dredging activities are minimized on water quality, physical processes, marine productivity, and public health, and that the beneficial use of dredged sediments is maximized.

¹⁶² This action plan was not in the 1991 CCMP. There was however, a Dredging Action Plan with recommendations relating to dredging and beneficial use of dredged sediments now incorporated here.

Objectives

Objective 15.1. Develop and improve upon geographic databases identifying habitat, natural resources, seabed characteristics, and contamination or impairment hotspots of lands under the ocean to establish a strong technical basis for embayment watershed planning and management.

Objective 15.2. Promote the development and implementation of municipal embayment management plans to manage the watershed, protect water quality, vital natural resources, and tideland habitat, and increase shoreline resilience to storms and rising sea level, while allowing sustainable uses.

Objective 15.3. Ensure that dredging methods and timing be conducted to minimize adverse impacts, and where appropriate, transfer sensitive resources out of areas to be dredged.

Objective 15.4. To maximize the beneficial uses of dredged material by creating opportunities by pre-designating or pre-permitting receiving areas (e.g. beach nourishment zones) to expedite permitting, and through increased funding.

Approaches

Towns must evaluate spatial data and characterize coastal uses to develop comprehensive embayment management plans that define watershed and waterfront protection strategies. These plans will be fulfilled through town zoning, waterways regulations, wetland regulations, or town bylaws and city ordinances and non-regulatory approaches. Such plans may create conservation areas or activity exclusion zones, or create incentives for certain activities. While the cost to develop such plans is a hurdle, the key obstacle to implementation is developing a political consensus to pass the necessary zoning and nonzoning laws or regulations. With respect to dredging, the increased beneficial use of dredged materials could be facilitated by preselecting and pre-permitting receptor sites and through additional funding.

Costs and Financing

Based on recent town efforts, the cost of developing a resource protection based embayment plan is typically \$50-\$100,000 per embayment. Some state and federal grant programs can be used to fund these efforts, but most often municipal legislative bodies appropriate the necessary funds.

Measuring Success

This action plan is evaluated by programmatic actions by towns developing and adopting needed waterfront and watershed management plans and policies.

Action Plan 16 Reducing Toxic Pollution

Problem

Toxics enter Buzzards Bay from many sources and via numerous pathways. The largest single toxic pollution management problem remains the cleanup of the U.S. EPA Superfund site in New Bedford Harbor, which at the current rate of cleanup may take another 40 years to complete. There are 4 additional Superfund sites in the Buzzards Bay watershed, and 102 hazardous waste sites altogether on the state's Chapter 21E list. All these sites may be cleaned up in a timelier manner.

Beside these known hazardous waste sites, there are many past and ongoing inputs and pathways of toxic contamination to Buzzards Bay and its watershed. A number of embayments are identified in the states 303(d) Integrated List, and will require the development of TMDLs to manage chronic inputs. Some of the environmental impacts of these contaminants are not fully understood, and will require further study. The cleanup of the existing hazardous waste sites and controlling the numerous nonpoint inputs to the environment remains one of the most complicated challenges that must be addressed in the Buzzards Bay CCMP.

This action plan focuses on reducing and eliminating toxic inputs into the bay in order to improve bay conditions and minimize the costs of cleanup and mitigation. Both point and nonpoint sources are addressed.

Several other action plans provide recommendations that are directly related to this issue, including those for reducing oil pollution, managing dredging and dredged material disposal, managing wastewater industrial discharges, and managing stormwater runoff.

Goal

Goal 16.1. Protect public health and the bay ecosystem from the effects of toxic contamination.

Objectives

Objective 16.1. To reduce the amount of toxic contamination entering Buzzards Bay and water bodies listed under the 303(d) program.

Objective 16.2. To eliminate hazardous discharges of toxic contaminants from point sources into the bay.

Objective 16.3. To reduce the discharge of toxic contaminants and contaminants of emerging concern into wastewater systems (both septic and sewer).

Objective 16.4. To reduce hazardous discharges from nonpoint sources of toxic contaminants into the bay.

Objective 16.5. To meet all state, federal, and local action levels for water and seafood.

Objective 16.6. To improve local, state, and federal regulation and control of seafood and sediment quality to protect human health and the environment.

Approaches

Implementing this action plan is complex because it involves industry, residential activity, the choice of products and compounds used, and regulated and non-regulated business activities. However, across all these activities and sectors of the economy, pollution prevention is one of the most important actions for achieving the goals of the action plan.

The second most important element is to ensure proper disposal and recycling of toxic materials. For example, fishing vessel owners often discharge oily bilge water because existing collection services are too expensive. In this regards, DEP should fund the construction of a facility to collect bilge oil along New Bedford Harbor that accepts oily bilge water for recycling and treats it at an affordable rate to boaters and the fishing fleet. Expansion of hazardous waste collection days, increased conventional recycling programs, and year round availability of facilities to dispose of waste oil, tires, leads and cadmium batteries and fluorescent tubes will offer proper disposal opportunities. The failure to have a speedy cleanup of hazardous waste sites, especially federal superfund sites, remains an important need, as these cleanups have been unacceptably slow.

Costs and Financing

The costs to implement this action plan are as varied as the sectors and pollution sources that must be managed, and the New Bedford Superfund cleanup dwarfs all others. One non-Superfund need is funding for the design, permitting, and construction, of an oily bilge water-collection and treatment facility in New Bedford, which will likely cost \$500,000 to build, and tens of thousands of dollars per year to operate. The construction and operation of this facility could be funded by the Massachusetts Oil Spill Act fund.

There are many other costs associated with this action plan. Hazardous material disposal collections are expensive, and municipalities can often only afford one collection event annually, if at all. There are costs to expand conventional recycling programs as well.

Measuring Success

The success of this action plan can be evaluated by the amount of hazardous materials collected, the concentration of toxic contaminants in wastewater facility discharges, and by various programmatic and management action, measures.

Action Plan 17 Preventing Oil Pollution

Problem

This action plan addresses catastrophic and chronic discharges of oil to Buzzards Bay and its surrounding watershed¹⁹³. These discharges of petroleum products have caused environmental degradation of water quality and habitat. To minimize future catastrophic spills and their impacts, improved navigation protocols need to be implemented, and environmental responses must be made effective through training and planning. The cumulative inputs of small chronic discharges of hydrocarbons from boat engines, stormwater, fishing fleets, and other sources often do not receive the same level of attention as accidental spills, but these inputs are also important.

The 2003 Buzzards Bay oil spill resulted in the passage of the 2004 Massachusetts Oil Spill Prevention and Response Act (MOSPRA) and companion legislation. The Act, required among other things, pilots, tug escorts, and oil delivery fees to fund oil spill response planning and training. Certain legal disputes between the federal government and Commonwealth are unresolved.

Goals

Goal 17.1. Reduce the amount of petroleum hydrocarbons released to Buzzards Bay.

Goal 17.2. Prevent the occurrence of oil spills in Buzzards Bay, both large and small.

Goal 17.3. Minimize the environmental effects from oil inputs to Buzzards Bay.

Objectives

Objective 17.1. To promote a regional strategy for preventing oil spills and hydrocarbon discharges.

Objective 17.2. To promote a coordinated and effective regional strategy for responding to large oil spills.

Objective 17.3. To implement a source-reduction plan for chronic inputs of hydrocarbons into Buzzards Bay.

Objective 17.4. To provide adequate facilities for the collection of waste oil from cars and boats.

Objective 17.5. To take enforcement actions against the illegal discharge of oil.

Approaches

Reducing future hydrocarbon discharges and impacts to Buzzards Bay will require decreasing the likelihood of catastrophic spills, improving the cleanup effectiveness and response time when spills do occur, better monitoring impacts after spills, and reducing chronic hydrocar-

bon release, like those associated with stormwater discharges and vessel operation in Buzzards Bay.

The presence of escort tugs for all oil barges and improved navigation aids and tracking will minimize future oil spills. To reduce future impacts of oil spills that do occur, increased local availability of response equipment, installation of boom anchorages, improved training and coordination among municipalities, and periodic re-evaluation of response plans are continuing needs. Completion by NOAA of a water circulation oil spill trajectory model for Buzzards Bay will greatly improve predictions of the location of oil landings after a major spill. Installation of Physical Oceanographic Real-Time System (PORTS[®]), employed elsewhere around the country, will also assist with navigation, and spill model predictions. The state also needs to develop an oil spill damage assessment-monitoring plan, in collaboration with local universities and research centers, to establish a protocol to collect essential data quickly for the environmental damage assessments after a spill.

With respect to chronic discharges of oil, better treatment of permitted discharges, including stormwater, can further reduce hydrocarbon release. (Stormwater related hydrocarbon discharges are addressed further in Action Plan 3 Managing Stormwater Runoff and Promoting LID.) Strategies to reduce illicit discharges in New Bedford Harbor and Buzzards Bay may include remote camera monitoring of harbor activities and oil sheens, better enforcement, and services or a facility to collect oily bilge water from commercial vessels in the harbor. The increased use of 4-stroke engines will minimize hydrocarbon discharges from recreational boats. Municipalities can set an example by buying 4-stroke engines for harbormaster vessels. Local recycling programs and education remain important strategies.

Costs and Financing

Estimated costs for these approaches are NRDA monitoring plan development, ~\$80,000; NOAA circulation model, ~\$100,000; PORTS[®], \$1 million installation, \$200,000 annual operating costs; program to minimize illicit discharges to New Bedford Harbor, ~\$200,000 in capital and \$200,000 annual operating costs. Some costs might be eligible for MOSPRA funding, others through state and federal grants or appropriations.

Measuring Success

The effectiveness of measures to reduce large spills may take years to evaluate. Numbers of reported sheens and oil recovered from bilge water can be used to track measures to reduce small spills. Adoption of regulations with hydrocarbon BMP requirements can be enumerated. Reductions of nonpoint sources of hydrocarbons can only be evaluated programmatically.

¹⁹³ The stormwater management and toxics reduction action plans compliment the goals and objectives of this action plan.

Action Plan 18 Planning for a Shifting Shoreline and Coastal Storms

Problem²⁰⁵

For millennia, the Buzzards Bay coastline has been subject to the rise in sea level and storms that have continued to erode and shift materials that change the shape, elevation, and position of the shoreline. These processes shift the locations of barrier beaches and alter wetland areas, resulting in the loss of habitat for certain species, and cause the migration of other habitats like salt marshes. Structures built in these hazard-prone areas can not only impede natural processes, but when they are destroyed in storms, they become hazards to public health and the environment. They can also become a financial burden to government. The frequency and intensity of these processes will likely increase in the coming decades due to climate change. Some state and federal programs are creating moral hazards by promoting development in high-risk areas.

The Massachusetts Coastal Zone Management updated its program plan with goals to prevent, eliminate, or significantly reduce threats leading to loss of life, destruction of property, and degradation of environmental resources that result from improper development. They also sought to limit public expenditures in coastal high hazard areas, allow natural physical coastal processes to continue unabated, to the extent feasible, and prioritize public expenditures for acquisition and relocation of structures out of hazardous coastal areas. Unfortunately, current state, federal, and local laws, regulations, and policies are far from achieving these goals.

Goals

Goal 18.1. Protect public health and safety from problems associated with coastal hazards including rising sea level, shifting shorelines, and damage from storms and storm surge.

Goal 18.2. Reduce the public financial burden caused by the destruction of or damage to coastal property.

Goal 18.3. Plan for shifting shorelines and the inland migration of buffering wetlands and shifting sand formations, and the species that utilize these habitats.

Objectives

Objective 18.1. To incorporate sea level rise, increased frequency and intensity of coastal flooding, and shoreline change phenomena into all relevant planning and management programs.

Objective 18.2. To develop a comprehensive strategy for handling existing structures in areas that will be affected by future shoreline changes and other coastal hazards.

Objective 18.3. To adopt regulatory and non-regulatory measures for guiding growth and development in areas that will be influenced by coastal flooding and new shorelines.

Objective 18.4. To encourage continued restructuring of the national flood insurance program to discourage development in flood prone areas.

Objective 18.5. To adopt emergency response plans to reflect additional needs and constraints caused by reduced access and increased flooding potential of developed coastlines.

Approaches

This action plan requires changes in regulations, policies, and actions by all levels of government. Public spending for infrastructure in high risk areas should be avoided, and government should not create incentives for private construction in high-risk zones. The latter problem will require changes in the flood insurance program, and the kinds of actions required by the federal government in the aftermath of disaster relief aid. Municipalities will need to conduct evaluations of new risks caused by rising sea levels. They should adopt hazard mitigation plans, and participate in the FEMA community rating systems. RPAs and CZM should assist in these efforts. They also need to lead by example by not building new public structures in high-risk areas.

Costs and Financing

Much of the expenses associated with this action plan relate to conducting risk assessments, planning, and adopting or amending laws and regulations. These efforts might cost hundreds of thousands of dollars per community and require dedication of staff time. Those measures requiring regulatory or policy changes have nominal costs.

Measuring Success

Because of the rarity of catastrophic storms, and slowness of sea level rise, tracking programmatic actions, like completion of hazard mitigation plans, adoption of changes in the state building code, or adoption of local bylaws, ordinances, and regulations that support climate adaptation, will be the primary measures for tracking success.

²⁰⁵ This action plan was revised and re-written from the original 1991 CCMP. The first four objectives were in the 1991 CCMP, but have had some minor changes in text. [Goals 1 and 2 were in the 1991 CCMP, but have had some changes in text, including concepts relating to coastal hazards. Goal 3 was changed from planning for loss to planning for inland migration of wetlands.]

Action Plan 19 Protecting Public Health at Swimming Beaches

Problem

Public and private beaches are found throughout Buzzards Bay (Figure 109) and are an important recreational, aesthetic, and economic resource to the residents of the Buzzards Bay watershed and surrounding areas, and an important source of revenue for municipalities, both in the collection of fees (Table 51), and through the attraction of tourists.

Bathing beaches for many represent the only direct exposure or use of Buzzards Bay, and as such, the quality and condition of bathing beaches plays an important role in the public perception of the health and condition of Buzzards Bay. These bathing beaches also represent potential human exposure to contaminants discharged to surface waters. Of these contaminants, pathogens in particular represent the most important potential threat to public health. Exposure to pathogens by bathers can occur either by direct contact with, or ingestion of, contaminated waters, and may result in illness.

This action plan identifies ways in which local and state government can minimize threats to human health from the risks of pathogen contamination at swimming beaches. The solution to the problems outlined in this action plan will require better designed testing, improved reporting, education of the public, and action to reduce the most serious forms of pollution.

Goals

Goal 19.1. Reduce or eliminate pollution sources contributing to beach closures.

Goal 19.2. Manage beach use to reduce human exposure and health risks based on site-specific conditions.

Objectives

Objective 19.1. Reduce contaminated stormwater discharges to beach areas.

Objective 19.2. Increase public awareness about areas prone to contamination or conditions that may lead to elevated contaminant levels at beaches.

Objective 19.3. Prohibit pet use of beaches and encourage pet waste collection in stormwater drainage areas.

Objective 19.4. Develop and implement more rapid assays to document existing conditions, and where necessary implement preemptive rainfall closures.

Approaches

To meet the goals of this action plan requires two types of actions. First, pollution sources causing beach closures must be identified and eliminated. Second, beaches should be tested more rigorously to capture poor water quality after adverse conditions, such as af-

ter moderate to heavy rains. Current beach testing practices only catch these by chance. Evaluating beaches during adverse conditions will better protect the public from water borne diseases and minimize health risk. Municipalities with 15% exceedances each summer at their beaches should test their beaches at least twice per week and conduct sampling to identify sources.

Because staff may have to work after hours to collect samples for such an evaluation of adverse conditions at a beach, this creates a burden. Hiring a contractor to conduct a detailed study of the relationship between rainfall and bacteria levels at the beach may be the sound approach that could allow municipal officials to determine if rainfall conditional beach closures are warranted. MA Department of Public Health and other agencies should continue to evaluate and promote rapid assays.

Programs and regulations to eliminate pets from beaches, or to promote pet waste cleanup in coastal drainage areas can help alleviate problems.

Costs and Financing

Remediating pollution sources can be costly, especially for those beaches near a brook or drainage system where many sources may be contributing to elevated pollution loads. Most of these pollution sources will be associated with stormwater discharges, and these costs are addressed more comprehensively in Action Plan 3 Managing Stormwater Runoff and Promoting LID.

The cost of increased monitoring is relatively modest, but because laboratories charge extra fees if samples are taken at times that require processing during non-working hours, sampling analyses costs can be higher and must be budgeted. Dog waste receptacles have minimal costs and are good education tools.

Measuring Success

The final measure of success of this action plan will be the documentation in the reduction of beach closures for any given sampling scheme.

Action Plan 20 Monitoring Management Action, Status, and Trends

Problem

Monitoring is used to track the effectiveness of management action or inaction. For Clean Water Act initiatives like the National Estuary Program, a key question has always been, “Are we making waters more fishable and swimmable?” This question is understood as whether government is preserving and protecting ecosystem health and the integrity of the natural environment, and whether waters meet specified “designated uses.” An especially difficult challenge in all environmental monitoring programs is recognizing that static environmental conditions in the face of new development or pollution inputs is in itself a measurable success.

Increasingly, funding agencies want to know not only whether a project was completed successfully, but also whether it was successful in protecting or restoring the environment. In fact, the 1987 amendments to the Clean Water Act section 320(b)(6) specified that each NEP Management Conference shall “...monitor the effectiveness of actions taken pursuant to the plan,” to meet these two goals: “measure the effectiveness of the management actions and programs implemented under the [CCMP]; and provide essential information that can be used to redirect and refocus the CCMP during implementation.” Implicit in these requirements are programmatic monitoring, environmental monitoring, and some level of research to ensure that selected environmental monitoring is adequately characterizing environmental conditions and risks.

Each action plan in the Buzzards Bay CCMP includes monitoring strategies. This action plan reiterates some of the most important elements of other action plans, but also addresses some broader watershed monitoring and reporting needs to meet the broader goals of the Buzzards Bay CCMP.

Goals

Goal 20.1. To document environmental trends of water quality and living resources in order to assess the effectiveness of management actions taken, or identify the need for new actions.

Goal 20.2. Identify research and monitoring needs to understand more clearly the causes of impairments, reduce uncertainties about health risks, and better define conditions in Buzzards Bay.

Objectives

Objective 20.1. Collect and monitor programmatic actions to document implementation of Buzzards Bay CCMP recommended actions.

Objective 20.2. Ensure that regulatory agencies define essential monitoring requirements and collect data necessary to evaluate program and project success.

Objective 20.3. Ensure that funding is available to implement essential monitoring programs.

Objective 20.4. Revise and adapt monitoring programs to meet changing needs and information gaps.

Objective 20.5. Disseminate data and syntheses of information to scientists, managers, and the public.

Objective 20.6. Encourage scientists and agencies to evaluate emerging contaminants and other stressors to the environment.

Approaches

Shellfish bed closures, eutrophication data, and eelgrass bed cover are some of the key water quality measures that must be tracked, but in the long run, the state’s list of impaired waters (as river miles and water acres) will be the ultimate measure of success of actions taken to comply with the Clean Water Act. This also means considerable effort will be needed to monitor and characterize the many unassessed freshwater and marine bodies in the bay and watershed.

While programmatic and environmental data are collected by the U.S. EPA, the Buzzards Bay Coalition, Buzzards Bay NEP, and DEP, more effort is needed to make this information available on line, and where needed, synthesizing and aggregating data to show watershed comparisons and trends in time.

Programmatic actions by municipalities to comply with permits and watershed TMDL goals are both short-term and long-term measures to be tracked. Government will need to expand funding to research institutions to enable managers to better discern threats from emerging issues and concerns.

Costs and Financing

Tracking programmatic actions has modest costs. The cost of field monitoring described in the various action plans in the Buzzards Bay CCMP may total hundreds of thousands of dollars annually. Some monitoring needs can be met through new permit requirements, research grants may assist in evaluating contaminants of emerging concern, or federal watershed assessment grants (604b), but most monitoring costs must be borne by agencies managing the environment.

Measuring Success

The measure of success for this action plan will be whether sufficient information exists to evaluate the success of each action plan in this Buzzards Bay CCMP.

Action Plan 21 Enhancing Public Education and Participation

Problem²²⁹

Government can be slow to address environmental problems because of work force or financial constraints, political pressures, concerns of potential economic impacts, or failure of legislative and executive bodies to revise or adopt new laws and regulations. In a democracy, the response of government to any problem is strongly driven by the public's concerns and understanding of the issues. While it is true that given the same set of facts, persons can disagree about the proper course of actions depending on individual priorities and values, a common vocabulary in defining problems can facilitate the development of consensus among disparate parties. If the public is ill informed on a particular environmental problem, or if it does not have a clear understanding of important technical and regulatory issues, they may fail to appreciate the costs and benefits of management actions, or inaction. Contributing to the problem, people, first as children, then as adults, may not have been educated about concepts like groundwater flow, pollution pathways in local watersheds, how wastewater is treated and disposed, or the connection between ground and surface waters.

Because many of the recommendations in the Buzzards Bay CCMP are directed toward local government, and may require voter approval or approval by town meeting or local boards, it is particularly important to have an informed citizenry to help make these decisions. Citizen groups and environmental non-governmental organizations can provide a crucial role in educating adults and children that will ultimately lead to the necessary social, political, regulatory, legislative, and legal actions to support efforts to protect and restore Buzzards Bay and surrounding watershed. The contribution of these non-governmental partners will be most important when legislative bodies and governmental boards must make specific planning, regulatory, and budgetary decisions.

Many action plans in this document include elements of outreach and education. This action plan addresses some statewide and regional issues that should be addressed to meet the broader goals of the Buzzards Bay CCMP.

Goals

Goal 21.1. To expand the public's knowledge of the natural resources and water quality of Buzzards Bay and surrounding watershed and the threats they face.

Goal 21.2. To increase public participation in actions that support the goals, objectives, and recommendations in the Buzzards Bay CCMP.

Objectives

Objective 21.1. To better convey concepts of watersheds and the flow of water from precipitation along the land surface and in the ground.

Objective 21.2. To better convey an understanding of pollution sources and pathways in the environment.

Objective 21.3. To improve the public understanding of human and natural effects on plant and animal populations and ecosystems.

Approaches

The Massachusetts education curriculum needs to convey more effectively a basic understanding of local watersheds and the pathways of water and pollution through ground and surface waters. To address this problem, the University of Massachusetts developed a primary school teacher education program called "Our Town, Our City" to help teachers adopt local curriculum that incorporates local history and environmental information into their school programs, including showing local watershed maps. This approach should be emulated throughout the Buzzards Bay watershed and local school districts could teach essential concepts about water and pollution flow through watersheds as part of earth science curricula.

Advocacy and education by leaders and citizen groups will remain a core strategy to promote the adoption of regulatory and non-regulatory actions by local, state, and federal government. Both private groups and public agencies should better utilize alternate strategies for communicating information including videos on local cable access channels and the internet, and social media.

Costs and Financing

Annual public education costs can be appreciable or negligible, depending on the approach and type of campaign. Schools, government agencies, and non-governmental agencies must prioritize outreach programs based on their resources. Potential funding includes various, state, federal, and private sources depending upon initiative.

Measuring Success

There is no simple way to determine if education efforts are successful. One potential method of quantifying the success is to periodically conduct baseline public opinion surveys of attitudes and knowledge. This is a long-term, generational, and unending task.

²²⁹ This action plan was not in the 1991 Buzzards Bay CCMP.