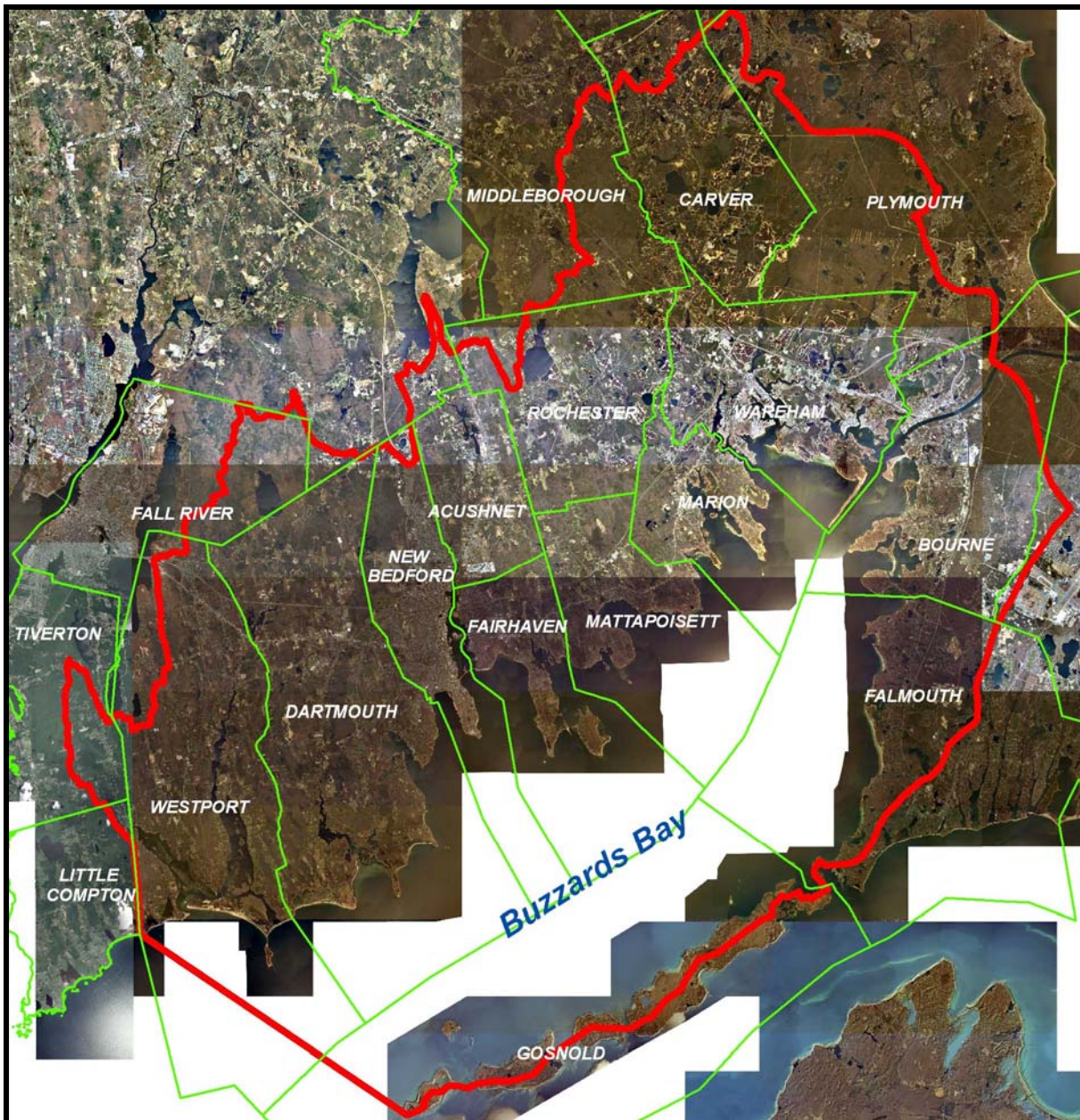


# The Buzzards Bay Comprehensive Conservation and Management Plan: 2011

Prepared by the  
Buzzards Bay National Estuary Program

Commonwealth of Massachusetts  
Executive Office of Energy and Environmental Affairs  
Massachusetts Office of Coastal Zone Management



DRAFT October 20, 2011



# Table of Contents

*Table of Contents i*

*List of Figures .... iii*

*List of Tables ..... vii*

<b>Chapter 1. ....</b>	<b>The Buzzards Bay NEP and CCMP: Then and Now .....</b>	<b>1</b>
<b>Chapter 2. ....</b>	<b>Buzzards Bay: Its Watershed, Living Resources, and Governance .....</b>	<b>9</b>
<b>Chapter 3. ....</b>	<b>Characterization of Pollution Sources .....</b>	<b>35</b>
<b>Chapter 4. ....</b>	<b>Action Plan Introduction and Organization.....</b>	<b>57</b>
<i>Action Plan 1.....</i>	<i>Managing Nitrogen-Sensitive Embayments.....</i>	<i>59</i>
<i>Action Plan 2.....</i>	<i>Protecting and Enhancing Shellfish Resources .....</i>	<i>69</i>
<i>Action Plan 3.....</i>	<i>Managing Stormwater Runoff and Promoting LID .....</i>	<i>77</i>
<i>Action Plan 4.....</i>	<i>Improving Land Use Management and Promoting Smart Growth .....</i>	<i>95</i>
<i>Action Plan 5.....</i>	<i>Managing On-Site Wastewater Disposal Systems .....</i>	<i>107</i>
<i>Action Plan 6.....</i>	<i>Managing Impacts from Boating, Marinas, and Moorings .....</i>	<i>117</i>
<i>Action Plan 7.....</i>	<i>Protecting Wetlands .....</i>	<i>123</i>
<i>Action Plan 8.....</i>	<i>Restoring Migratory Fish Passageways .....</i>	<i>141</i>
<i>Action Plan 9.....</i>	<i>Protecting Bio-Diversity and Rare and Endangered Species Habitat.....</i>	<i>153</i>
<i>Action Plan 10. ...</i>	<i>Managing Water Withdrawals to Protect Wetlands, Habitat, and Water Supplies..</i>	<i>161</i>
<i>Action Plan 11. ...</i>	<i>Managing Invasive and Nuisance Species Problem.....</i>	<i>173</i>
<i>Action Plan 12. ...</i>	<i>Protecting Open Space .....</i>	<i>179</i>
<i>Action Plan 13. ...</i>	<i>Protecting Ponds and Streams.....</i>	<i>191</i>
<i>Action Plan 14. ...</i>	<i>Reducing Beach Debris, Marine Floatables, and Litter in Wetlands .....</i>	<i>197</i>
<i>Action Plan 15. ...</i>	<i>Managing Coastal Watersheets and the Waterfront.....</i>	<i>201</i>
<i>Action Plan 16. ...</i>	<i>Reducing Toxic Pollution .....</i>	<i>215</i>
<i>Action Plan 17. ...</i>	<i>Preventing Oil Pollution .....</i>	<i>227</i>
<i>Action Plan 18. ...</i>	<i>Planning For a Shifting Shoreline and Coastal Storms.....</i>	<i>239</i>

<i>Action Plan 19. ... Protecting Public Health at Swimming Beaches</i> .....	253
<i>Action Plan 20. ... Monitoring Management Action, Status and Trends</i> .....	261
<i>Action Plan 21. ... Enhancing Public Education and Participation</i> .....	267
<b>Chapter 5. .... Implementing the CCMP</b> .....	<b>273</b>
<b>Chapter 6. .... Resources for Financing the CCMP</b> .....	<b>279</b>
<b>Appendix A..... Glossary of Terms, Acronyms, and Abbreviations</b> .....	<b>289</b>

# List of Figures

Figure 1. Buzzards Bay watershed boundary (red) adopted in the 2011 CCMP.....	1
Figure 2. Numbers of recommendations completed in the Buzzards Bay CCMP. ....	3
Figure 3. Massachusetts Ocean Management Planning Area and Massachusetts Ocean Sanctuaries. ....	4
Figure 4. Buzzards Bay topographic map showing watershed (purple line) and municipal boundaries.....	10
Figure 5. Land use in the Buzzards Bay watershed based on 2005 interpretation by MassGIS. ....	12
Figure 6. <i>Spartina</i> salt marshes are an important habitat and nursery around Buzzards Bay. ....	15
Figure 7. A healthy eelgrass bed in a shallow sandy habitat in the Elizabeth Islands. ....	16
Figure 8. Conjectural estimate of eelgrass in pre-developed Buzzards Bay based on bathymetry and presumed water quality compared to 1980s and 2001 eelgrass distribution. ....	17
Figure 9. Massachusetts CZM designated barrier beaches and federal CBRA designated areas in Buzzards Bay. ....	18
Figure 10. Lobster catch in the Massachusetts portion of the Southern New England lobster stock area .....	19
Figure 11. Buzzards Bay shellfish resources. ....	20
Figure 12. The diamondback terrapin ( <i>Malaclemys terrapin</i> ). ....	22
Figure 13. Map of terrapin turtle egg laying habitat in outer Sippican Harbor, Marion. ....	22
Figure 14. Buzzards Bay Colonial Bird Nesting and Feeding Areas. ....	23
Figure 15. Locations and sizes (1 hectare [ha]= 2.5 acres) of the major tern nesting islands in Buzzards Bay, MA. ....	23
Figure 16. A piping plover.....	23
Figure 17. Aquatic Life assessment for coastal embayments and rivers in the Buzzards Bay watershed. ....	24
Figure 18. Aquatic Life use assessment for fresh water ponds in the Buzzards Bay watershed.....	25
Figure 19. Relative Trends of Commercial and Recreation Permits issued in Buzzards Bay.....	29
Figure 20. Commercial catch in Buzzards Bay as a percentage of state catch over time. ....	29
Figure 21. Relative commercial catch by species in Buzzards Bay. ....	29
Figure 22. Census 2000 vacancy versus owner occupancy for Buzzards Bay municipalities. ....	33
Figure 23. Town of Falmouth Wastewater facility. ....	37
Figure 24. Generalized response of shallow coastal embayments to excessive nitrogen loading.....	39
Figure 25. Sources of nitrogen to the Phinneys Harbor-Back River estuary complex in Bourne.....	40
Figure 26. Embayment eutrophication trends from a 2001 Buzzards Bay Coalition State of the Bay report.....	41
Figure 27. Sewered areas of the Buzzards Bay watershed as of 2008. ....	43
Figure 28. Groundwater discharges in the Buzzards Bay watershed. ....	44
Figure 29. Combined sewer overflows in the City of New Bedford.....	45
Figure 30. Freshwater fish consumption impairments in the Buzzards Bay watershed.....	47
Figure 31. New Bedford area fisheries closures as shown on an outreach poster produced by the U.S. EPA in 2003. ....	50
Figure 32. MMR Superfund groundwater plumes on Cape Cod. ....	54
Figure 33. Generalized ecosystem response of a shallow embayment to nitrogen loading. ....	60
Figure 34. Excessive algal growth shading out eelgrass is one of the many adverse impact of nitrogen pollution.....	60
Figure 35. Recent losses of eelgrass in northern Buzzards Bay.....	61
Figure 36. Summary of 13 years of coastal monitoring data collected by the Buzzards Bay Coalition. ....	62

Figure 37. Coastal embayments impaired for nitrogen in the Buzzards Bay watershed (from DEP's 303(d) Integrated List, last updated in December 2008). .....	64
Figure 38. Relative trend of scallop catch in Buzzards Bay. ....	70
Figure 39. Relative trend of soft shell clam catch in Buzzards Bay.....	70
Figure 40. Recent annual commercial lobster catch in NMFS Area 14, which includes Buzzards Bay.....	70
Figure 41. Permanent and rainfall or seasonally conditionally closed shellfish bed acreage in Buzzards Bay. ....	71
Figure 42. Incremental openings in Buttermilk Bay between 2001 and 2007 (closure status as of July 1 for each year).	72
Figure 43. Map of permanent, rainfall, or seasonal conditionally closed shellfish beds in Buzzards Bay as of July 1, 2007. ....	73
Figure 44. A fifty year record of shellfish permits in the Town of Bourne. ....	75
Figure 45. A stormwater discharge pipe in Onset Bay. ....	78
Figure 46. Overview map of stormwater discharges documented in the <i>Atlas of Stormwater Discharges in the Buzzards Bay Watershed</i> . ....	79
Figure 47. Buzzards Bay waters on the Massachusetts Section 303(d) listed as impaired or threatened by pathogens. ....	81
Figure 48. Newly defined urbanized areas from the 2000 U.S. Census.....	82
Figure 49. Conventional versus Low Impact Development.....	83
Figure 50. Graphical representation of degree of runoff in lightly developed watersheds as compared to urbanized watersheds.....	85
Figure 51. Posters developed by the Buzzards Bay NEP for a LID workshop. ....	90
Figure 52. Watershed population changes - City of New Bedford versus watershed towns.....	96
Figure 53. Expected development patterns in Southeastern Massachusetts, with and without Smart Growth techniques adopted.....	97
Figure 54. Population trends in key Buzzards Bay watershed municipalities versus changes in residential land use.....	97
Figure 55. A conventional septic system in MA consists of a septic tank, distribution box, and a soil absorption system (“leaching field”). ....	108
Figure 56. 1996 Aerial view of the Buzzards Bay watershed showing U.S. Census 2000 population blocks.....	109
Figure 57. Photo of the Massachusetts Alternative Septic System Test Center.....	111
Figure 58. Oblique aerial photograph of a portion of Sippican Harbor, Marion, MA. ....	118
Figure 59. Impacts of traditional anchor systems and benefits of alternative systems. ....	119
Figure 60. Pressure washing at a marina with a water collection and treatment system.....	119
Figure 61. Location of boat-pumpouts in Buzzards Bay.....	120
Figure 62. Core vegetated wetlands in the Buzzards Bay watershed.....	125
Figure 63. Communities with non-zoning wetland bylaws as of 2006. ....	127
Figure 64. Map and summary sites of wetland loss in the Buzzards Bay watershed.....	129
Figure 65. The Blueback herring, <i>Alosa aestivalis</i> . ....	141
Figure 66. Map of major herring runs in the mainland portion of the Buzzards Bay watershed (top) and on Cape Cod (bottom). ....	142
Figure 67. Counts of herring passing upstream as measured by a counter at Snipatuit Pond. Data courtesy of Alewives Anonymous.....	143
Figure 68. Herring counts in three Buzzards Bay area fish runs plotted against the geometric mean of fish abundance during the period 1990-2000.....	143

Figure 69. This water level control structure at Cockeast Pond Westport was modified to enhance herring passage...	146
Figure 70. Location of certified vernal pools and rare and endangered species wildlife (green) and plant species only (yellow) in the Buzzards Bay watershed.....	155
Figure 71. Additional habitat and supporting habitat areas mapped in support of NHESP mission.....	156
Figure 72. Principal rivers and subbasins of the Buzzards Bay watershed. ....	162
Figure 73. Illustration of the water cycle. ....	163
Figure 74. Major public surface water supplies (blue), ground water wells (red dots), and groundwater well recharge Zone 2s (green cross hatched) in the Buzzards Bay watershed. ....	164
Figure 75. Public water supply service areas of the Buzzards Bay watershed.....	165
Figure 76. Combined water use in the towns of Marion, Mattapoisett, and Fairhaven. ....	166
Figure 77. More than a 1000 feet of the Mattapoisett River ran dry in October 2007.....	167
Figure 78. Invasive species identification card for the Asian shore crab, developed by MCZM. ....	175
Figure 79. Various public education graphics and signs relating to introducing exotic species. ....	176
Figure 80. Protected open space in the Buzzards Bay watershed as of 2011.....	181
Figure 81. Top: Open space protected annually with some level of assistance from the Buzzards Bay NEP or Coalition as reported in GPRA reports to EPA. Bottom: Total Buzzards Bay open space as % of watershed. ....	182
Figure 82. Greenway proposed by the Coalition in 1995.....	183
Figure 83. Water bodies included in the integrated list five categories. ....	192
Figure 84. Litter accumulating on a storm drain grate. ....	197
Figure 85. Top ten beach litter types collected in Massachusetts as part of Coast Sweeps. ....	198
Figure 86. Residents may find large accumulations of litter along rivers and at the headwaters of some bays. ....	198
Figure 87. Buzzards Bay municipal jurisdictional boundaries of Buzzards Bay. ....	203
Figure 88. Jurisdictional boundary of the 2008 Ocean Act.....	204
Figure 89. Former location of the Cleveland Ledge Disposal site. ....	206
Figure 90. Commodity transport through the Cape Cod Canal.....	228
Figure 91. Heavy viscous oils, like the No. 6 fuel oil that spilled from the Bouchard Tank Barge 120 into Buzzards Bay in 2003, primarily killed birds, plants, and animals by physical contact. ....	231
Figure 92. Mean Sea Level Trend at NOAA tidal station 8447930 Woods Hole, Massachusetts.....	241
Figure 93. Aerial photograph of Sippewisset Marsh showing salt marsh peat offshore, remnants from a period, hundreds of years ago, of lower sea level and a more westward barrier beach. ....	242
Figure 94. Salt marshes having been migrating inland for thousands of years as illustrated by the figure on the left. ....	242
Figure 95. Frequency of major hurricanes (greater or equal to category 3) striking U.S. during the past 150 years.....	243
Figure 96. SLOSH model map of Marion, MA produced the U.S. Army Corps of Engineers.....	250
Figure 97. Beaches of Buzzards Bay. ....	254
Figure 98. Selected Buzzards Bay beach monitoring site results compared to the safe swimming standards.....	256
Figure 99. Sign posted by Massachusetts DCR at state parks and beaches. ....	257
Figure 100. Dog waste bag dispenser in Bourne.....	257
Figure 101. Portion of a poster prepared by the Buzzards Bay NEP for the Buzzards Bay Coalition, showing 13 years of water quality results collected through the citizen monitoring program.....	265
Figure 102. The Buzzards Bay Coalition's watershed bike ride and bay swim help build public awareness of Buzzards	

Bay as a place and a watershed ecosystem. ....	268
Figure 103. It is essential that residents understand the sources of pollution in their watershed, where there drinking water comes from, and where their wastewater is disposed. As a cost savings measure, the state removed these signs in 2008. ....	273
Figure 104. EPA funded DEP 319 non-point source pollution grants to Buzzards Bay related initiatives. ....	279
Figure 105. CZM CPR Pollution remediation grants awarded, 1996-2008. ....	280

# List of Tables

Table 1. Summary of Town Areas within the Buzzards Bay watershed.....	11
Table 2. Summary of Land Use in the Buzzards Bay watershed by municipality.....	13
Table 3. Summary of wetland resource area type within each watershed municipality. ....	14
Table 4. Percent of Buzzards Bay watershed municipal population living within 1/2 mile of Buzzards Bay.....	15
Table 5. Census 2000 Demographic Composition: Southeastern Massachusetts vs. State and Nation .....	26
Table 6. 2004 Domestic Travel Impact on Southeastern Massachusetts. ....	27
Table 7. Annual Value of Some Marine-related and Other Industries in Massachusetts.....	27
Table 8 Buzzards Bay Watershed Municipal Demographics from 2000 U.S. Census fact sheets.....	30
Table 9. Buzzards Bay watershed municipal governance.....	34
Table 10. Buzzards Bay Municipal Major Publicly Operated Treatment Facilities(1).....	36
Table 11. Other Wastewater Groundwater Permits in the Buzzards Bay Watershed over 10,000 gpd. ....	37
Table 12. Freshwater Fish Consumption Advisories in the Buzzards Bay Watershed. ....	51
Table 13. The Difference Between Goals and Objectives .....	57
Table 14. Some successes and timeline related to the 1991 CCMP Nitrogen Management Action Plan.....	63
Table 15. Shellfish permit fees in Buzzards Bay Municipalities (data from 2011). ....	72
Table 16. Summary of discharges by town showing numbers of basins tied to treatment system .....	78
Table 17. Four key criteria for managing stormwater: "Reduce Runoff, Slow It Down, Spread It Out, Soak It In" .....	82
Table 18. Slide from a presentation Smart Growth presentation developed by the Massachusetts EEA. ....	99
Table 19. Onset Village, is a traditional Buzzards Bay watershed village center.....	100
Table 20. Summary of wetlands in the Buzzards Bay watershed. ....	126
Table 21. Summary wetland loss sites by town shown in Figure 64. ....	129
Table 22. Conservation Commission actions, staffing, regulatory framework, and related information in 2011, permit data for about 2006 .....	131
Table 23. Stream and herring restoration efforts in the Buzzards Bay watershed funded by the Buzzards Bay NEP...	144
Table 24. Acreage of existing Buzzards Bay alewife pond habitat.....	145
Table 25. General recommendations for Massachusetts herring restoration. ....	149
Table 26. List of potential alewife pond habitat and acreage in the Buzzards Bay watershed. ....	151
Table 27. 2009 Certified Vernal Pools versus a 1999 study of potential vernal pools. ....	157
Table 28. Average residential per capita water use for Buzzards Bay public water supplies as reported in 2007.....	168
Table 29. Drought restrictions enacted by Buzzards Bay watershed municipalities.....	169
Table 30. Rates and customers of Buzzards bay Water providers. ....	170
Table 31. Protected Lands in the Watershed Summarized by Municipality (as of September 2011).....	180
Table 32. Commonwealth Capital Scores for 2005 - 2009 .....	184
Table 33. Commonwealth Capital Scores that Achieve Goals in the Buzzards Bay CCMP (2006 status).....	185
Table 34. Sample parcel acquisition rating matrix proposed in the Buzzards Bay NEP's Regional Open Space Plan..	188
Table 35. Water Quality Assessment for Category 2 Freshwaters in the Buzzards Bay Watershed.....	194
Table 36. Water Quality Assessment for Category 2 and 3 Freshwaters in the Buzzards Bay Watershed.....	195

Table 37. Category 5 Freshwaters from the MA 2008 Integrated List of Waters in the Buzzards Bay Watershed.....	196
Table 38. Litter and Trash regulations in the Falmouth Town Code .....	199
Table 39. Past oil spills in Buzzards Bay.....	229
Table 40. 1991 Oil Spill Action Plan Accomplishments up to the 2003 Bouchard oil spill .....	232
Table 41. National Flood insurance losses in the Buzzards Bay watershed since 1978 and policy values.....	244
Table 42. Select Community Rating System Activities that may benefit the environment. ....	245
Table 43. Municipal Beach Parking Sticker Costs.....	255
Table 44. Number of marine beach testing exceedances in Buzzards Bay in 2006 and 2007. ....	256
Table 45. Primary lead entities that must implement the CCMP Action Plans .....	274
Table 46. Summary of costs (approximate mid-range estimates) by Action Plan. ....	281

## Acknowledgments

The Buzzards Bay Comprehensive Conservation and Management Plan (CCMP): 2011 was built upon the original 1991 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 the new Buzzards Bay CCMP, Buzzards Bay NEP Executive Director Dr. Joe Costa was the lead writer and managing editor. Special thanks are due to Buzzards Bay NEP staff Tracy Warncke and Sarah Williams, who were the principal editorial reviewers. Key contributors to the new management plan include John Rockwell and Sarah Williams 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, who was detailed to the Buzzards Bay NEP as our storm water 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 graphics contained in DEP's *Buzzards Bay Watershed 2000 Water Quality Assessment* prepared by Katie O'Brien and Andrea Langhauser<sup>1</sup>. This report provides an excellent summary of the conditions and regulatory status of resources in the Buzzards Bay watershed and was the foundation of the Chapters 2 and 3 and several action plans.

Many others provided invaluable assistance in reviewing, revising and contributing text, or preparing or updating Action Plans in the new 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, Dennis Ducsik, Rebecca Haney, and Robin Lacey. Mark Rasmussen, Executive Director at Buzzards Bay Coalition and staffers Korrin Petersen and Tony Williams also provided valuable input and comments. The Buzzards Bay Action Committee provided an excellent forum to develop and discuss the new and revised action plans in the updated CCMP.

Finally, thanks to all scientists, planners, town, state and federal officials, and interested citizens who contributed ideas and have made the update of the management plan a success.

---

<sup>1</sup> DEP. 2003. Buzzards Bay Watershed 2000 Water Quality Assessment. Rep. No. 95-AC-2, DWM Control Number: 085.0. Massachusetts Department of Environmental Protection. Division of Watershed Management.