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**BASELINE ASSESSMENT OF THE MASSACHUSETTS
OCEAN PLANNING AREA
NOVEMBER 2008**

24

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118 **1. INTRODUCTION**

119 As directed in the Oceans Act of 2008, the Massachusetts Executive Office of Energy and
120 Environmental Affairs (EEA) is undertaking a first-in-the-nation effort to develop a comprehensive
121 plan to manage development in state ocean waters. The Act requires the establishment of an Ocean
122 Science Advisory Council (SAC) of nine scientists with expertise in marine sciences and data
123 management to support the Secretary of Energy and Environmental Affairs in the development of
124 the ocean management plan. Specifically, the SAC is tasked with: reviewing data sources and
125 identifying other viable data, assisting in the development of the baseline assessment and
126 characterization of the ocean planning area, assisting in the development of set of core indicators of
127 ocean environmental health and plan progress, identifying “big picture” questions to improve
128 understanding of the natural systems and/or human uses and influences, and helping to formulate a
129 long-term strategy for addressing information gaps.

130 This document is the baseline assessment portion of the Massachusetts ocean management plan. It is
131 intended to be an information base for ocean management plan development and implementation
132 and to provide a science-based context for the plan. This introduction covers how the data was
133 assembled for the assessment and the geographic focus for the ocean management plan.

134 **DATA COLLECTION**

135 Many sections of this baseline assessment are informed by The Massachusetts Ocean Management
136 Task Force Technical Report, 2004 (add citation). In addition, the baseline assessment incorporates
137 new information produced by the six ocean management plan working groups that were formed to
138 help inventory and synthesize available data for the development of the ocean management plan (i.e.,
139 the habitat; fisheries; renewable energy; transportation, navigation, and infrastructure; regional
140 sediment resource management; and ocean recreational and cultural services workgroups).

141
142 Data variability is a readily apparent issue with this baseline assessment. Within the ocean
143 management planning area (planning area), available data varies spatially, temporally, and in terms of
144 depth, precision, and accuracy for most subjects covered in this baseline assessment. The discussion
145 of specific issues within the baseline assessment includes, as appropriate, discussion of the
146 importance of data variability in conclusions drawn. In the future, one of the important ocean
147 management activities will be addressing data variability and filling data gaps, particularly for priority
148 issues and management concerns.

149 For purposes of this document, “baseline” is not intended to connote a description of the planning
150 area in an unaltered or undeveloped state. Instead, this baseline assessment is an inventory and
151 characterization of the physical description, natural communities, and human interactions within the
152 planning area as we understand them today, in 2008. It is also important to note the importance of
153 variability in the ocean environment, across various temporal and spatial scales, and to recognize that

154 perturbations such as climate change may be affecting the ocean environment in ways that we do not
155 yet fully understand.

156 **GEOGRAPHIC FOCUS**

157 The geographic focus for this document is the planning area mandated by the Oceans Act (as
158 depicted in Figure 1.1), which in most areas extends from approximately 0.3 nautical miles (nm) from
159 Mean High Water to the seaward extent of state jurisdiction. Certain resources and issues in the
160 planning area are affected by processes and activities outside of the planning area, and vice versa.
161 Therefore, while the baseline assessment focuses on the planning area, the baseline assessment also
162 includes a greater geographical context as appropriate.

163 Pursuant to the Oceans Act of 2008, the ocean management planning area includes waters and
164 associated submerged lands of the ocean, including the seabed and subsoil, lying between the line
165 designated as the “Nearshore Boundary of the Ocean Management Planning Area” and the seaward
166 boundary of the Commonwealth, as defined in 43 U.S.C. § 1312 (Figure 1.1). The nearshore
167 boundary follows the contour of the Massachusetts coast, approximately 0.5 km (0.3 mile) from
168 shore, except across closure areas at the mouths of certain embayments (e.g., Boston Harbor). The
169 total watershed surface area is 5,549 km² (2,142 miles²). With the exception of navigational aids and
170 fishing or research buoys, the planning area does not currently contain permanent emergent or
171 floating structures. With the exception of moorings, fixed fishing gear, and sunken vessels, the ocean
172 bottom in the planning area contains few man-made structures (although three natural gas pipelines
173 and several electrical and communications cables are buried below the surface of the ocean bottom).

174 The following communities have waters and submerged lands in the planning area: Salisbury,
175 Newbury, Newburyport, Rowley, Ipswich, Essex, Rockport, Gloucester, Manchester By The-Sea,
176 Beverly, Salem, Marblehead, Swampscott, Lynn, Nahant, Saugus, Revere, Winthrop, Boston, Hull,
177 Cohasset, Scituate, Marshfield, Duxbury, Plymouth, Sandwich, Barnstable, Yarmouth, Dennis,
178 Brewster, Eastham, Wellfleet, Truro, Provincetown, Orleans, Chatham, Harwich, Mashpee,
179 Falmouth, Gosnold, Bourne, Nantucket, Edgartown, Oak Bluffs, Tisbury, West Tisbury, Chilmark,
180 Wareham, Marion, Mattapoisett, Fairhaven, New Bedford, Dartmouth, and Westport (Figure 1.2).

181 The planning area is located at the intersection of two major biogeographic regions, the Gulf of
182 Maine, which is part of the Acadian province, and the Southern New England-New York Bight,
183 which is part of the Virginian province (Figure 1.3). These two regions have distinct physical
184 characteristics that in turn underpin characteristic biological communities. The waters of
185 Massachusetts north of Cape Cod are influenced by the relatively cold Gulf of Maine currents, while
186 the waters to the south and east of Cape Cod are influenced by the relatively warmer water from the
187 Southern New England-New York Bight.

188

189 **North of Cape Cod—Gulf of Maine, Acadian Province**

190 Two major bays define the planning area north of Cape Cod: Massachusetts and Cape Cod Bays.
191 These bays are found in the southern end of the Acadian Province, in the southwestern Gulf of
192 Maine. The Gulf of Maine is a semi-enclosed sea bordered by Massachusetts, New Hampshire,
193 Maine, New Brunswick, and Nova Scotia (Figure 1.4). In general, the southwestern Gulf of Maine is
194 characterized by cold water flowing in a counter-clockwise circulation west and south along the
195 Maine, New Hampshire, and Massachusetts coasts, called the Western Maine Coastal Current; river
196 inputs, particularly during spring runoff, also influence flow.

197 Massachusetts and Cape Cod Bays are partially isolated from the major circulation patterns of the
198 Gulf of Maine by Stellwagen Bank (Figure 1.5). Two channels separate Stellwagen Bank from Cape
199 Ann in the north and Race Point, Provincetown, in the south. Stellwagen Basin separates the Bank
200 from the western portion of Massachusetts Bay and has the deepest waters north of Cape Cod with a
201 maximum depth of 89 m (292 ft).

202 Massachusetts Bay has a variable seafloor topography with prominent glacial till features, including
203 drumlins (elongated hills formed by glacial action). In Massachusetts Bay, bedrock outcrops are
204 found predominantly off Cape Ann, Boston Harbor, and the South Shore just south of Boston. Cape
205 Cod Bay, the southernmost portion of the Gulf of Maine, has a relatively flat topography with larger
206 expanses of sandy and soft sediments.

207 **South of Cape Cod—Mid-Atlantic Bight, Virginian Province**

208 Southern Massachusetts borders the northern edge of the Mid-Atlantic Bight. This area contains
209 Buzzards Bay, a relatively shallow estuary; Vineyard Sound; Nantucket Sound; and the Great South
210 Channel (Figure 1.6). The islands of Martha's Vineyard and Nantucket mark the southern edge of
211 Nantucket Sound, which is characterized and formed by the marine reworking of the large outwash
212 plain and lake deltas deposited during glacial retreat roughly 18,000 years ago. Sediments within the
213 Sound are a wide mix of well to poorly sorted sand and gravel, while generally softer sediments are
214 common in Buzzards Bay; in both bodies of water, large boulders are common in certain areas.
215 Unlike Massachusetts Bay, no bedrock outcroppings have been identified, but they likely exist.

216 Currents within Nantucket Sound are currently being defined by modeling and groundtruthing
217 studies. The area is dominated by semidiurnal tide-generated currents, and influenced by
218 southwesterly winds. To the east, the Great South Channel carries colder, more saline Gulf of Maine
219 waters southward past the eastern portion of Cape Cod. Buzzards Bay is a relative shallow, tidally
220 dominated, well-mixed estuary.

221 **WEATHER CONDITIONS**

222 Continental air masses from the south and west, and warm air from the Gulf of Mexico, influence
223 the Massachusetts climate. Weather conditions in the North Atlantic region are controlled by the
224 Bermuda high-pressure system. This condition results in frequent showers, thunderstorms, high
225 humidity, and low wind speeds in the spring and summer and, in the winter, can result in frequent
226 and abrupt day-to-day variations in pressure, wind, and weather when combined with faster moving
227 and more intense winter pressure systems (Field 1980). The North Atlantic Oscillation (NAO) is a
228 hemispheric fluctuation in atmospheric mass between the Bermuda high and the Icelandic low. The
229 NAO alters major current patterns throughout the North Atlantic, including Massachusetts waters.

230 Generally, winds vary over seasons in Massachusetts. Summer winds typically are weak from the
231 southwest or southeast and bring warm, moist air that can contribute to fog formation; winds from
232 the north or northwest are typical for autumn and winter (GoMOOS 2008). Spring and summer
233 southwesterlies may drive hurricanes northward from across Atlantic or Caribbean tracks and have
234 the potential to harm the Commonwealth's south-facing shores (e.g. Buzzards Bay and the south
235 coast of Cape Cod). The storms of autumn or winter, "nor'easters," also have particularly strong
236 winds and may drive winter storms into northeastern-facing shores (e.g., Massachusetts Bay and the
237 outer Cape) (MCZM/MME 1992). Storm surge is another hazard characterized by elevated sea level
238 along a coast caused by storms. Coastline shape, nearshore depth and wind strength and direction all
239 determine the severity of storm surges (GoMOOS 2008).

240

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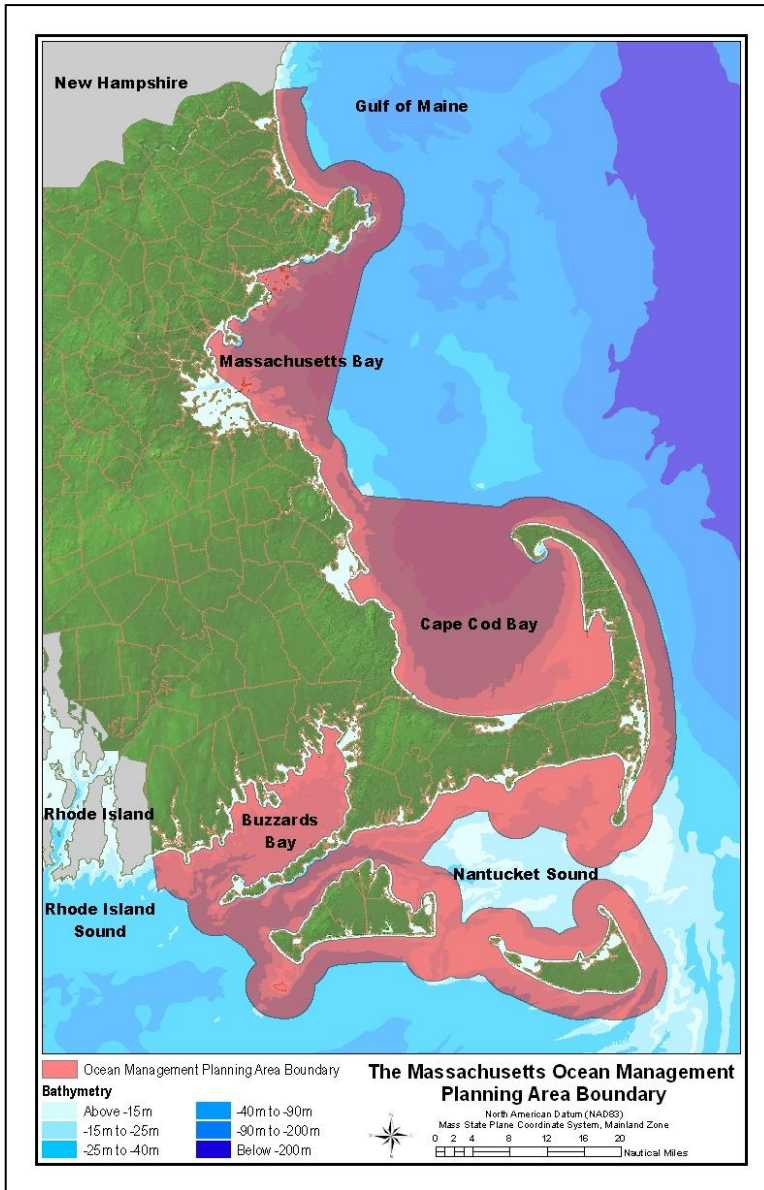
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253 **FIGURES**

254 **FIGURE 1.1** The Massachusetts ocean planning area.

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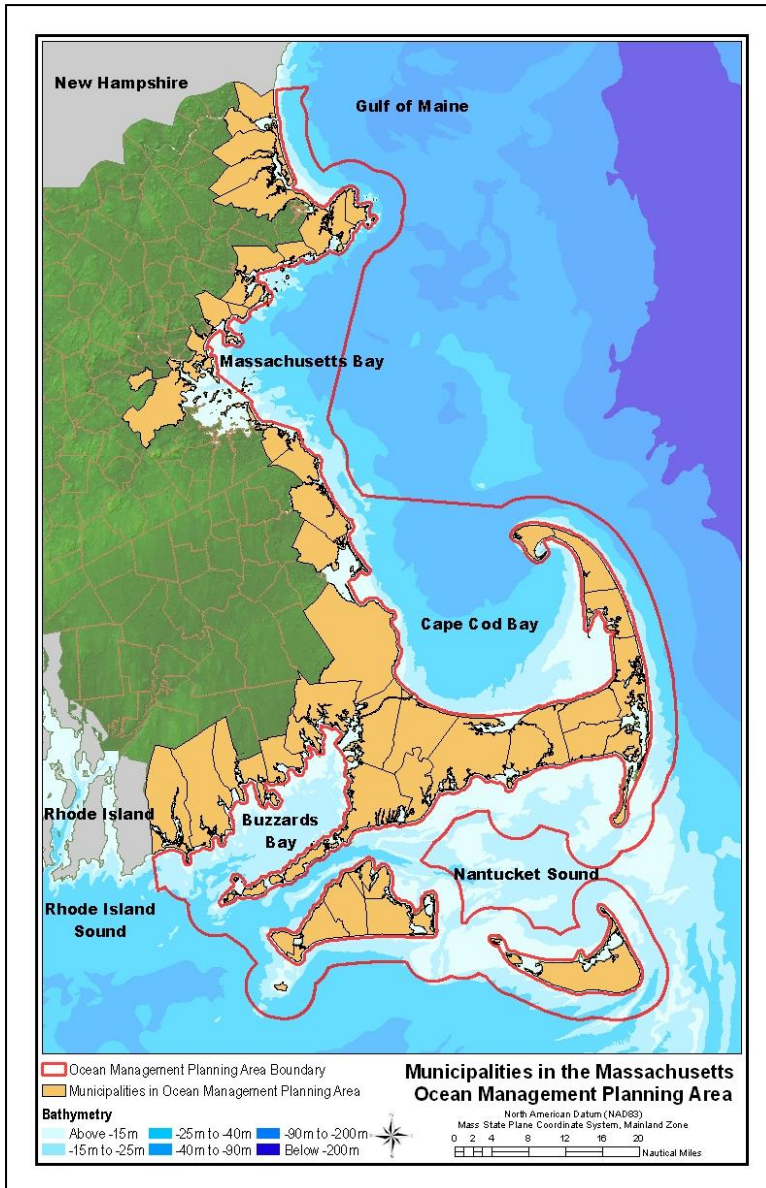
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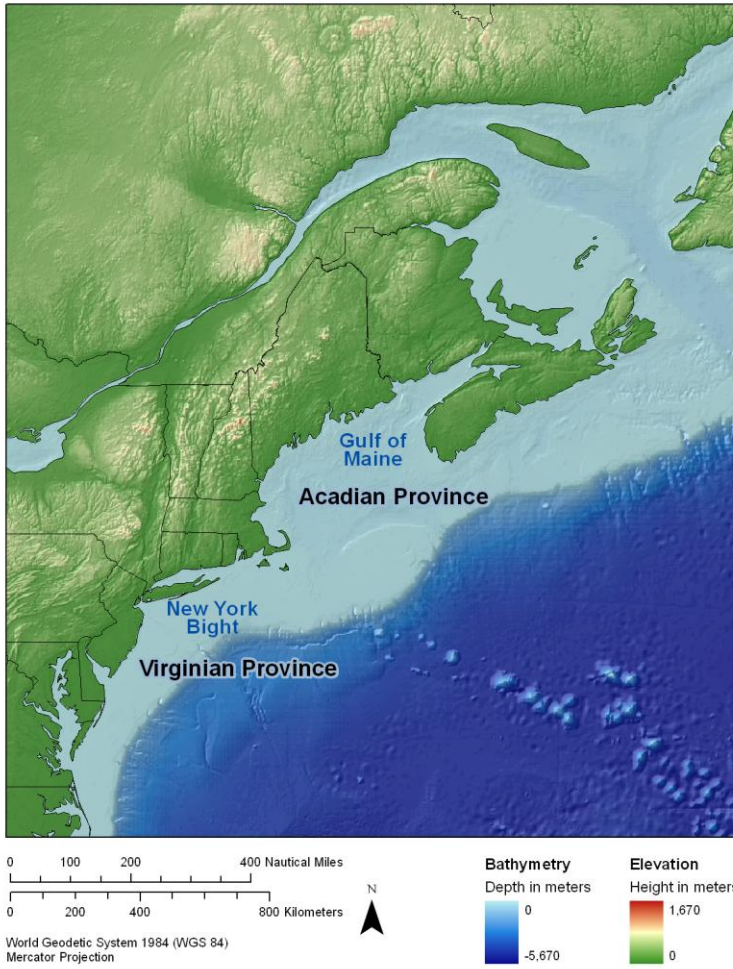
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FIGURE 1.2 Municipalities adjacent to the Massachusetts ocean planning area.



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FIGURE 1.3 Major biogeographic regions within the Massachusetts ocean planning area.



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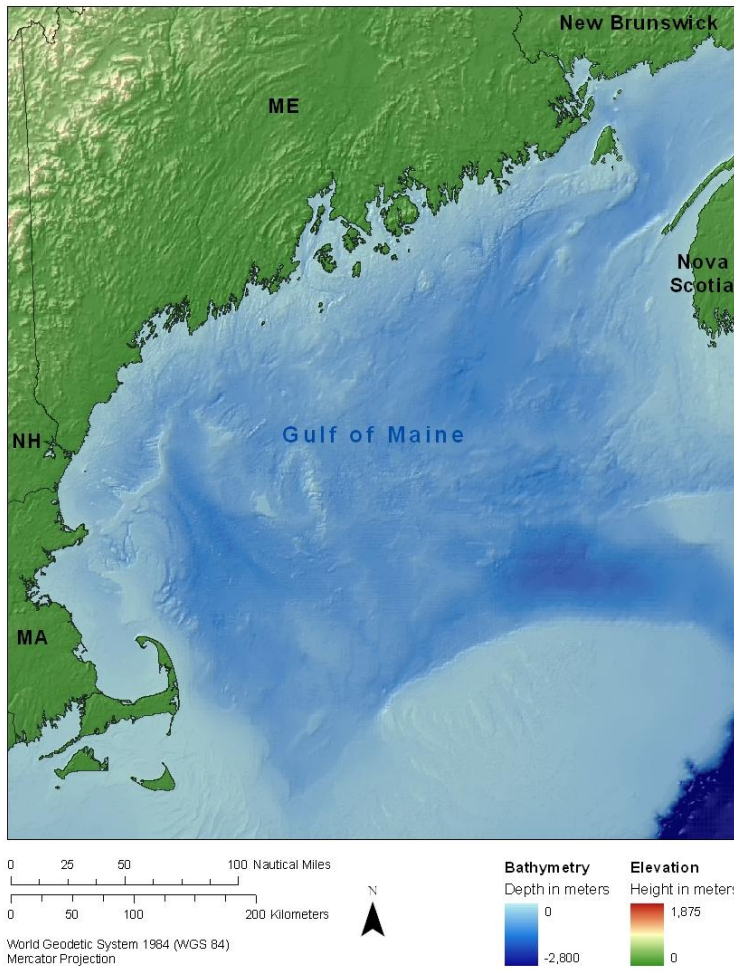
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FIGURE 1.4 The Gulf of Maine.



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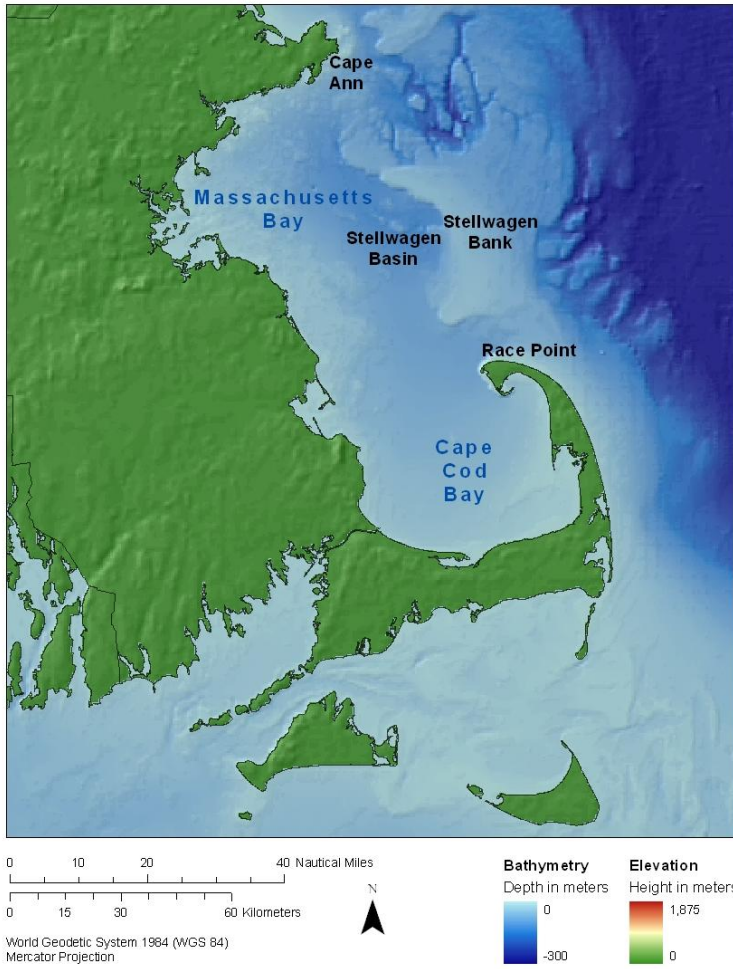
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FIGURE 1.5 Massachusetts waters north of Cape Cod.



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FIGURE 1.6 Massachusetts waters south of Cape Cod.



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