

Appendix 2 - Data Used in Plan Development

The following table lists the data used in development of the draft Massachusetts Ocean Management Plan. It includes the datalayer name used in MORIS, the Massachusetts Ocean Resource Information System (available at www.mass.gov/czm/mapping/index.htm), the original source of the data (labeled “originator”), and a brief description of the data. More detailed information about specific datalayers can be found in the layer’s metadata record, which can be viewed in MORIS by clicking on the ‘Layer Info’ tab.

Datalayer Name	Originator	Description
Active Disposal Sites	Massachusetts Office of Coastal Zone Management (CZM) and National Oceanic and Atmospheric Administration (NOAA)	These data were created by combining the Cape Cod Bay disposal site created by CZM and active disposal sites (Cape Cod Canal, Cleveland Ledge, and Massachusetts Bay) selected from the dumping grounds data layer extracted from NOAA’s Electronic Navigational Charts (ENC) Direct to GIS web portal.
Anchorage Areas	Massachusetts Office of Geographic and Environmental Information (MassGIS)/CZM and NOAA	This layer was created by combining an anchorage berth dataset digitized from NOAA nautical charts by MassGIS/CZM and selected anchorage areas extracted from NOAA’s ENC Direct to GIS web portal.
Automatic Identification System (AIS)	Stellwagen Bank National Marine Sanctuary (raw data)	This dataset documents the density of vessel tracks during 2008 in the Massachusetts ocean management planning area for commercial vessels greater than 299 tons. CZM digitized polygons from this dataset to represent areas where greater than 50 vessels were recorded over the duration of the year 2008 in a 250 x 250-meter grid cell.
Bathymetry	CZM	These data represent a mosaic of bathymetric datasets of waters off the coast of Massachusetts derived from the most current and accurate sources, including U.S. Geological Survey (USGS) Open File Reports, NOAA Estuarine Bathymetry, and the NOAA Coastal Relief Model. Contour lines for display and analysis were derived from these data.
Cable Areas	NOAA	Cable areas in Massachusetts were extracted from NOAA’s ENC Direct to GIS web portal.

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Cables	CZM	To create this layer, the CZM datasets, “Harwich Port to Nantucket Harbor electric supply cable (National Grid Nantucket Cable No. 1), Nantucket Sound, Massachusetts, 2005” and “Hyannis to Nantucket Harbor electric supply cable (National Grid Nantucket Cable No. 2), Nantucket Sound, Massachusetts, 2005,” were combined with cables CZM digitized from NOAA nautical charts.
Colonial Nesting Waterbirds	Massachusetts Division of Fisheries and Wildlife (DFW), Natural Heritage and Endangered Species Program (NHESP)	These sites represent areas where more than 100 pairs of the following species of colonial nesting waterbirds were observed during surveys in 1994 and 2006: Common Terns, Least Terns, Roseate Terns, Arctic Terns, Leach’s Storm-petrels, Double-crested Cormorants, Herring Gulls, Great Black-backed Gulls, Laughing Gulls, Black Skimmers, Great Egrets, Snowy Egrets, Cattle Egrets, Little Blue Herons, Black-crowned Night Herons, and Glossy Ibis. The Important Habitat areas are the nesting sites buffered 0.3 nautical miles.
Commercial Fisheries Activity	Massachusetts Division of Marine Fisheries (DMF)	These data represent areas important to Massachusetts commercial fisheries in terms of fishing effort and landings value. These data were derived from DMF fishermen catch reports, Standard Atlantic Fisheries Information System dealer transaction reports, and National Marine Fisheries Service vessel trip reports. The fishing effort and landings value from all sources were combined and reclassified into top 25%, middle 50%, and bottom 25%. For the ocean management plan, high commercial fishing areas by effort and value were extracted.
Eelgrass	Massachusetts Department of Environmental Protection (DEP) Wetlands Conservancy Program (WCP)	The DEP eelgrass layer was produced from data collected, using similar methodologies, in 2001 and 1995. DEP staff interpreted 1:20,000 aerial photography at low tide during summer months (high eelgrass biomass) to delineate eelgrass polygons and then field-verified the polygons. Since this dataset incorporates other seagrass species which are found outside of the planning area, eelgrass polygons were extracted for use in the ocean management plan.
Ferry Routes	Massachusetts Department of Transportation (MassDOT)	This layer is the MassDOT dataset, “Ferry Routes” (updated December 2008).
Fin Whales	NOAA National Centers for Coastal Ocean Science (NCCOS)	This dataset is drawn from a NOAA NCCOS report that characterizes cetacean sightings for the years 1970-2005 in the southern Gulf of Maine. The report includes records from dedicated aerial surveys and other platforms, and bias from uneven allocation of survey effort (temporally or spatially) was corrected using a sighting-per-unit-effort (SPUE) algorithm. SPUE values for each 5 x 5 minute grid cell were then interpolated spatially. The resulting interpolations were classified into quantiles and exported as filled contour polygon shapefiles. NOAA binned the data into five classes, and NHESP biologists and CZM extracted the top two classes to represent “core” habitat.

Datalayer Name	Originator	Description
Fisheries Resources	DMF	This dataset was derived from the DMF Resource Assessment Trawl Survey collected from 1978-2007. To create this layer, 22 species were selected for consideration. See the fisheries work group report for the description of the methodology used to identify high, medium, and low categories. For the ocean management plan, high resource areas were extracted.
Gas Pipelines	CZM	CZM acquired original engineering plans to create these data.
Hard/Complex Bottom	CZM	<p>Hard/complex bottom is seafloor that is characterized by any combination of the following: 1) areas of exposed bedrock or concentrations of boulder, cobble, or other similar hard bottom distinguished from surrounding unconsolidated sediments, 2) a morphologically rugged seafloor characterized by high variability in bathymetric aspect and gradient, or 3) man-made structures, such as artificial reefs, wrecks, or other functionally equivalent structures that provide additional suitable substrate for development of hard bottom biological communities. On a project-specific basis, proponents will be responsible for the data and analysis to delineate hard/complex bottom, pursuant to Secretary scoping requirements in the MEPA process. Guidance will be developed by the EEA Ocean Team to further define this SSU and how it should be identified by proponents on a project-specific basis. Issues to be addressed will include descriptions of scale, biogenic reefs, definitions of terms (e.g. cobble), biological communities with vertical relief, and energetic stability.</p> <p>Hard/complex seafloor serves as refuge and nursery areas for a variety of life stages of demersal species. Various substrates are conducive to the development of biological communities which add to seafloor complexity, including colonizing algae, sponges, cnidarians, mollusks, bryozoans, polychaete worms, and tunicates. These communities in turn further support a diverse assemblage of fish, echinoderms, and crustaceans.</p> <p>For the ocean management plan, EEA created a map of hard/complex bottom by combining three data sources. First, a statewide bathymetry data set was created by combining the highest resolution bathymetric data sets available and then calculating rugosity, a measure of bathymetric heterogeneity. Highly rugose areas were then combined with seafloor delineated as hard bottom in USGS interpreted seafloor maps. Finally, the combination of these two data sets were added to points coded as hard bottom in an augmented usSEABED sediment database. The resultant map is representative of hard/complex bottom, in that it is based upon the highest resolution data available, and a specific project may obtain higher resolution data for project planning purposes.</p>

Datalayer Name	Originator	Description
Humpback Whales	NCCOS	This dataset is drawn from a NOAA NCCOS report that characterizes cetacean sightings for the years 1970-2005 in the southern Gulf of Maine. The report includes records from dedicated aerial surveys and other platforms, and bias from uneven allocation of survey effort (temporally or spatially) was corrected using a sighting-per-unit-effort (SPUE) algorithm. SPUE values for each 5 x 5 minute grid cell were then interpolated spatially. The resulting interpolations were classified into quantiles and exported as filled contour polygon shapefiles. NOAA binned the data into five classes and NHESP biologists and CZM extracted the top two classes to represent “core” habitat.
Inactive Disposal Sites	NOAA	These data were extracted from NOAA’s ENC Direct to GIS web portal.
Intertidal Flats	DEP-WCP	This dataset originated with the Massachusetts DEP and is part of a broader wetlands dataset. Wetland areas were interpreted from 1:12,000 scale, stereo color-infrared photography by staff at UMASS Amherst and then field checked by DEP-WCP. A WCP consultant scanned completed interpretations and converted them into rectified polygons and lines using standard photogrammetric techniques. WCP GIS staff performed final quality control. Intertidal flat polygons were extracted for use in the ocean management plan.
Land Use and Land Cover	NOAA, National Park Service (NPS), and U.S. Fish and Wildlife Service (FWS)	This dataset was created by combining reclassified National Oceanic and Atmospheric Administration Coastal Change Analysis Program (C-CAP) data, the National Park Service’s Cape Cod National Seashore data layer, and the U.S. Fish and Wildlife Service’s National Wildlife Refuges dataset. CZM grouped the C-CAP data into three classes (from more to less developed): high and medium intensity developed; low intensity developed, open spaces developed, cultivated land, and pasture/hay; and all other land use and land cover classes. The Cape Cod National Seashore and National Wildlife Refuges were overlaid on the reclassified C-CAP data as the least developed land cover class, and these four classes were displayed. The data were clipped to within a half mile of the coast.
Leach’s Storm-Petrels	DFW/ NHESP	Leach’s Storm-petrel is a state-listed endangered species that breeds at two locations in Massachusetts (Nomans Land Island and Penikese Island) as observed by DFW biologists. The Important Habitat areas are these breeding areas buffered 0.3 nautical miles.

Datalayer Name	Originator	Description
Long-tailed Ducks	Massachusetts Audubon Society (Mass Audubon) and NHESP	This dataset originated with MassAudubon with additional analysis by the NHESP. MassAudubon provided radio telemetry data from Long-tailed Ducks tagged in Nantucket Sound, and from this data MA NHESP developed the spatial representation of their core habitat. The core habitat represented in the planning area includes night-time concentration areas north of Nantucket and the area of concentrated commutes to the south of Nantucket. Long-tailed Ducks have a unique winter behavior where they make a daily “commute” from Nantucket Sound, where they concentrate in particular areas at night, across Nantucket Island to Nantucket Shoals, where they disperse to feed during the day. Because this behavior and Long-tailed Duck spatial distribution on Nantucket Shoals is being studied, the plan does not indicate core habitat for Long-tailed Ducks south of the planning area.
Massachusetts Aeronautics Commission (MAC) Aviation Buffers	CZM	CZM created this layer by buffering a 10,000-foot radius around the MassDOT “Airports” (current as of June 2006) data layer.
MMTA Recreational Fishing and Boating Survey	Massachusetts Marine Trades Association (MMTA)	This data layer represents recreational fishing and boating areas identified by MMTA in the Massachusetts ocean management planning area. MMTA marked NOAA charts with boat routes, recreational fishing areas, recreational boating areas, and sail boat race areas as specified by MMTA members.
National Register of Historic Places (NRHP)	NPS	This dataset contains the locations and basic attributes of sites, buildings, objects, structures, and districts listed on the National Register of Historic Places (NRHP). *NOTE: Only properties LISTED prior to the date of this dataset (“beginning of 2007”) are contained in this layer. Properties determined eligible, pending nomination, or pending owner objection do not appear in this dataset.
North Atlantic Right Whales	NCCOS	This dataset is drawn from a NOAA NCCOS report that characterizes cetacean sightings for the years 1970-2005 in the southern Gulf of Maine. The report includes records from dedicated aerial surveys and other platforms, and bias from uneven allocation of survey effort (temporally or spatially) was corrected using a sighting-per-unit-effort (SPUE) algorithm. SPUE values for each 5 x 5 minute grid cell were then interpolated spatially. The resulting interpolations were classified into quantiles and exported as filled contour polygon shapefiles. NOAA binned the data into five classes and NHESP biologists and CZM extracted the top two classes to represent “core” habitat.
Pilot Boarding Areas	CZM	Representatives from state pilot associations (Boston Harbor Pilot Association and Northeast Pilots Association) provided the center coordinate of five pilot boarding areas in the Massachusetts ocean management planning area. The Boston Harbor pilot boarding area was buffered by a nautical mile radius, and the remaining four pilot boarding areas were buffered by a 0.5 nautical mile radius.

Datalayer Name	Originator	Description
Potential Tidal Resources	CZM	ADCIRC Coastal Circulation and Storm Surge Model is a system of computer programs for solving time dependent, free surface circulation and transport problems in two and three dimensions. The model was used by Applied Science Associates to provide an estimate of the maximum tidal currents experienced in the Massachusetts ocean management planning area during a tidal cycle. All areas with a current speed exceeding 2.75 knots were selected and isolated.
Precautionary Areas	NOAA	These data were extracted from NOAA's ENC Direct to GIS web portal.
Proposed New England Marine Renewable Energy Center (MREC) Test Area	CZM	CZM digitized the MREC proposed area for renewable energy research and projects from coordinates provided by MREC.
Proposed Tidal Energy Project Areas	CZM	This dataset shows the general locations of proposed tidal energy sites in the Massachusetts ocean management planning area from relevant Federal Energy Regulatory Commission (FERC) preliminary permit applications.
Public Open Spaces	MassGIS	This dataset was extracted from the MassGIS "Protected and Recreational OpenSpace" (last updated October 2009) data layer. Generally, sites within one quarter of a mile from the coast were selected, although in some instances parcels farther away from the coast were included due to local topography. This layer was then reviewed to select those polygons with the greatest feasibility of viewing the Massachusetts ocean management planning area. Parcels with no public access were removed.
Recreational Fishing Areas	DMF	This data layer represents the recreational fisheries identified in the Massachusetts ocean management planning area from the DMF Massachusetts Ocean Planning Recreational Fishing Effort Survey. The field study was designed to collect information about recreational fisheries in four regions in Massachusetts state waters. To create this later, polygons drawn on recreational fishing maps developed by DMF were digitized.
Regional Planning Agencies	MassGIS	This dataset was extracted from MassGIS's Regional Planning Agencies (RPAs) (last updated December 2007) data layer. CZM extracted the RPAs adjacent to the Massachusetts ocean management planning area.
Roseate Terns	DFW/ NHESP	This dataset represents documented Roseate Tern breeding, staging (presence of 100 or more individuals), and foraging areas. The breeding and staging sites were identified and mapped by DFW/NHESP biologists and buffered 0.3 nautical miles. Within the foraging areas, DFW/NHESP biologists identified core foraging areas based upon scientific literature to represent the most important foraging areas in the mapped breeding and staging areas. NHESP biologists and CZM extracted the breeding, staging, and critical foraging areas as Roseate Tern core habitat.

Datalayer Name	Originator	Description
Rugosity	CZM	Rugosity is a measure of terrain roughness and is indicative of the amount of habitat available for colonization by epibenthic organisms and shelter and foraging area for mobile organisms. For this dataset, CZM calculated rugosity with an algorithm developed by Sappington et al. 2005 that measures vector dispersion in three dimensions. CZM then reclassified those areas greater than one standard deviation from the mean as “high” rugosity.
Separation Zone	NOAA	Traffic separation zones were extracted from NOAA’s ENC Direct to GIS web portal.
Shipping Lanes	CZM	CZM digitized traffic lanes, shipping channels, and recommended routes from current NOAA charts.
Special Concern Terns	DFW/ NHESP	The core habitats delineated for three tern species (Common, Least, and Arctic, all of which are state-listed as species of special concern) include documented breeding, staging (presence of 100 or more pairs), and foraging areas. The breeding and staging sites have been identified and mapped by DFW/NHESP biologists. These sites were buffered 0.3 nautical miles. Within the foraging areas, DFW/NHESP biologists identified core foraging areas based upon scientific literature to represent the most important foraging areas in the mapped breeding and staging areas. NHESP biologists and CZM extracted the breeding, staging, and critical foraging areas as core habitat.
Surficial Sediments	CZM and DMF	Sediment data from the USGS publication, <i>usSEABED: Atlantic Coast Offshore Surficial Sediment Data Release</i> (USGS Data Series 118) were augmented by seafloor sediment data from DMF lobster surveys, DMF trawl surveys, EPA/EMAP grab samples, MWRA grab samples and SPI data, National Coastal Assessment grab samples, and USGS Open File Reports. The data points were converted to Thiessen polygons to create a surficial sediment map, resulting in the following four categories: muddy, sandy, gravelly, and hard bottom. Note that the distribution of points in the aggregate dataset is not uniform- this causes polygons to differ in size and shape throughout Massachusetts waters.
Vessel Monitoring System (VMS)	NMFS Northeast Regional Office	VMS data are collected by NMFS to track fishing vessel activity for law enforcement (closed areas), safety, and scientific study. This dataset documents the density of fishing vessels from September 1, 2007, to September 1, 2008, using the VMS records available for that period. CZM digitized polygons from this dataset to represent areas where greater than 25 vessels were recorded in a 250 x 250-meter grid cell over the duration of the year.