

Oysterscapes

Determining the Suitability of Oyster Reef Restoration in Massachusetts Bay

Oysters have recently become a prominent figure in climate adaptation planning. Their newfound role as infrastructure owes to their biological capacities. The Eastern Oyster moves 50 gallons/day of seawater through their tiny bodies in order to feed. While they feed on plankton, they remove anthropogenic contaminants from the water. Oysters are also reef builders. The solid structures they build with their shells break up wave action. The reefs act as living breakwaters and limit the flooding extent, especially during a storm. Finally, they are referred to as “coastal architects,” not only for their reef building capacity, but for its ripple effects. Waters slow as they move over the reef, and the particles suspended in it fall through the water column, increasing sedimentation. The sediment accumulates, vegetation takes hold, and marshes develop.

Area Mapped

The extent shown is of Massachusetts Bay from Rockport at the north and to Marshfield at the south. Inner Boston Harbor is to the west and the Atlantic Ocean to the east.

Methodology

This study began with a set of criteria for determining the suitability of sites in Massachusetts Bay for *Crassostrea virginica*, the Eastern Oyster.

The scientific literature recommends considering many different variables in siting a restoration project. The priority of any given criterion depends on the restoration goals. The goal of this study was to identify potential sites for reef restoration, including where a deployed reef could complement flood control infrastructure. Such a reef would be composed partially of manufactured materials on which oysters would grow. The selected criteria are common to all oyster restoration efforts, but some priority has been given to locations where a reef could be deployed. The criteria included the composition of the seafloor sediments, the depth of the water, and the slope of the seafloor.

Suitability analysis began with classifying effective depths for a subtidal reef: 10 meters or less. Depths were classified into five categories ranked lowest suitability to the highest. Slope was calculated using bathymetric data and sorted into five categories matching the depth analysis. Sediments were grouped into five categories according to the oysters’ biological needs and also ranked. All layers were entered into ArcMap’s Raster Calculator, weighted at 0.2 for sediments, 0.3 for slope, and 0.5 for depth. Sediments were

ranked lowest to prioritize areas where a manufactured substrate could be deployed.

To ensure the least anthropogenic interference with the reef, human uses of Massachusetts Bay were mapped, surrounded with a 100 meter buffer. These uses included recreational and commercial activity (including boating and fishing), dredging projects, and existing pipelines and cables. These uses were not calculated in the suitability analysis but presented here to illustrate potential conflicts.

Findings

The coastal areas of Massachusetts Bay are highly suitable for oyster reef restoration in terms of sediment, depth, and slope. Areas that would otherwise be considered less desirable for oyster restoration, such as Boston Harbor, are considered candidates in this analysis owing to consideration of deployed reef options.

Limitations

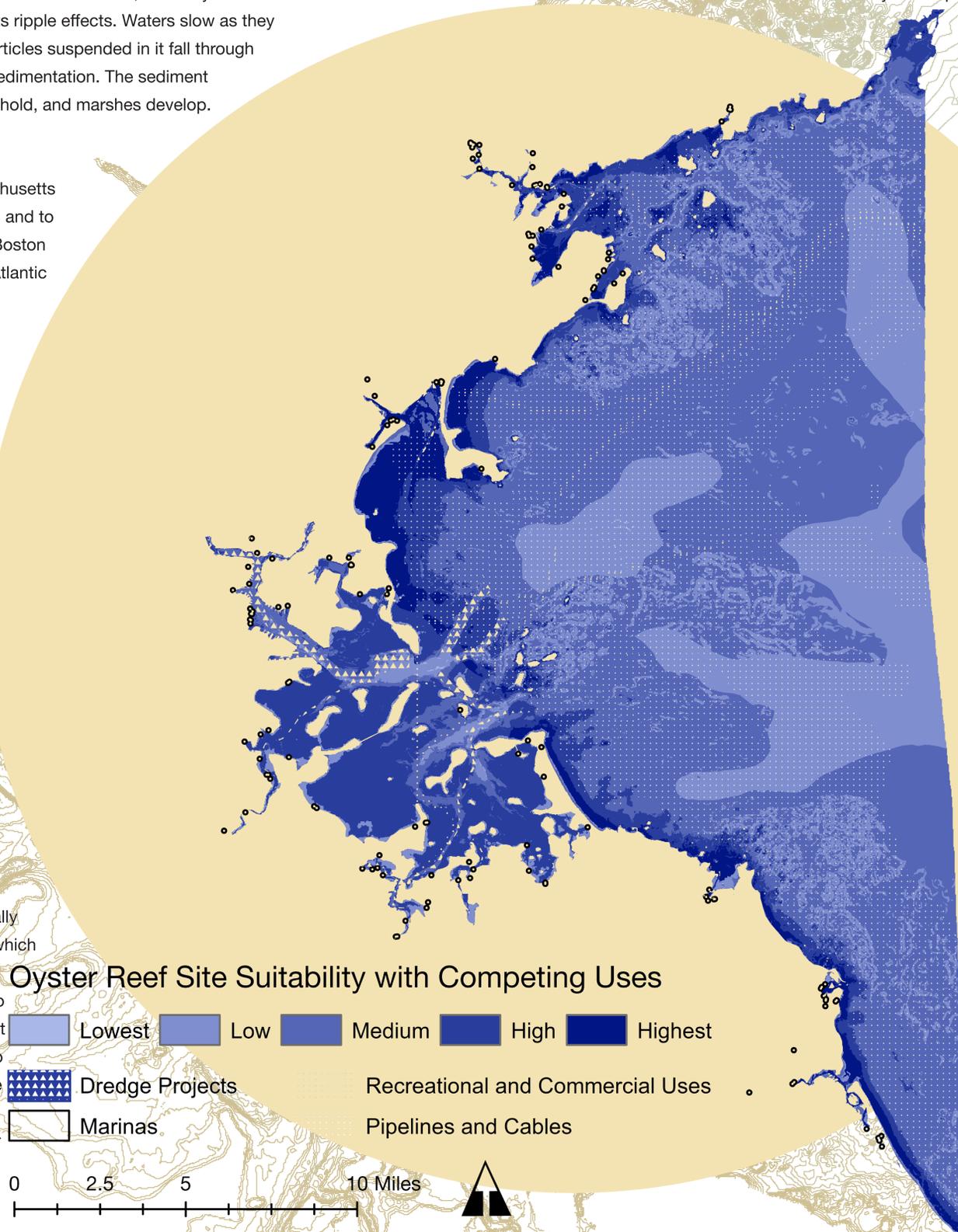
The three criteria considered are selected from among dozens of such indicators used in more detailed analyses of site suitability. Further research is needed into important factors like salinity, water quality, flow rate, and others. Additionally, while this study concerns the potential infrastructural role oysters can play, their effects in mitigating flooding are not examined here.

Data Sources: Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Special Projects (SP)

Projection: NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_2001

Cartographer: David Morgan

Developed for: Intro to GIS, December 2018



Oyster Reef Site Suitability with Competing Uses

