Eelgrass Loss
Predicting eelgrass decline in southern MA from anthropogenic impacts

What is Eelgrass?
Zostera, the genus of seagrass also known as eelgrass, is a keystone species that grows in soft-bottom intertidal zones. Eelgrass retains coastal sediment and supports waterfowl, fish, and shellfish. These habitats have been shrinking, and in 2009 the global rate of eelgrass loss was 3.7 percent per year. In the Great Bay Estuary, NH, eelgrass cover decreased an average of 2.2 percent per year from 1996 to 2016 (Figure 1).

Why is it declining?
The steadily increasing impact of human activities is linked to eelgrass habitat loss. Degraded water quality and physical disturbance, such as from fishing and dredging, disrupt the beds and reduce their ability to recover from the stress of natural events like storms. Restoration projects have seen success, however, and identifying the most vulnerable areas could help towards preventing severe habitat loss.

MA Eelgrass Loss
This project attempted to use anthropogenic impact to identify vulnerable eelgrass habitats. The accuracy of the results was judged through comparison with habitat loss observed by the Massachusetts Department of Environmental Protection’s (DEP’s) eelgrass mapping project. The area of analysis, as displayed in figure 2, surrounds the Cape Cod region of Massachusetts.

Methodology
To identify observed eelgrass change, a union overlay was performed from the 2011 to the 1995 DEP eelgrass polygons. Areas gained and lost were identified through selection by attributes. The data sets used to quantify anthropogenic impact include dead zones, seaports, commercial fishing activity, and mean annual shellfish catch (figures 3–5, respectively). The dead zones represent water quality, and the other three represent physical disturbance. Relative impact was estimated by adding together classified raster layers produced from this data.

Results
The relative anthropogenic impact is mapped below in figure 7. When compared with eelgrass loss mapped by the DEP (figure 6), areas of high and medium impact correlate with many of the eelgrass habitats that were lost between 1995 and 2017. The analysis did not measure above low impact for many small habitats close to land that were lost, however.

This could be due to other factors, such as sewage outfalls or construction activities, which could mobilize sediment and impair water clarity. Overall, this analysis identified the largest lost eelgrass habitats as facing medium or high impact. Further analysis could consider which areas would ecologically benefit the most from eelgrass restoration.

Projected Coordinate System:
NAD 1983 Massachusetts State Plane Mainland (FIPS 2001, Meter)

Geographic Coordinate System:
GCS North American 1983

Data Sources
MA Department of Environmental Protection
MA Department of Transportation
MA Division of Marine Fisheries
MA Office of Coastal Zone Management
MA GIS
World Resources Institute; R. Diaz, M. Selman, and C. Chipe

Citations:

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