

Artificial reefs for habitat loss mitigation: Delaware Bay case study

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Habitat loss in coastal and estuarine waters to support human needs, other than those related to indigenous fish and wildlife, is increasing in the world. Attempts are being made to conserve and restore essential coastal habitats whenever possible, but net habitat loss can not always be prevented or, in some circumstances, be considered justifiable to serve greater human needs. An example of this occurred when a small tidal marsh and some adjacent subtidal mud flat in the upper Delaware Estuary were filled or altered to create an area to deposit dredged material. The dredged material resulted from maintaining navigation for sustaining maritime commerce in the area. To mitigate this habitat loss, a prefabricated artificial reef was deployed elsewhere in the estuary because of the absence of in-kind mitigation options.

To assess the mitigation value of this out-of-kind, off-site mitigation, a five year study of the biological productivity of the artificial reef was begun. After four years of study, the artificial reef was found to attract or support hard surface communities considered typical for the estuary. The artificial reef also established biological biomass levels that were about 150 to 900 times that of an equivalent area of sandy natural bay bottom. Most of this biomass consisted of a population of blue mussel *Mytilus edulis* and there was evidence of fishery resources preying upon this mussel and other reef fauna.

The apparent enhancement of the benthic macrofauna and epifauna in Delaware Bay suggests that some biological energy flux in the Bay has been sequestered or focused in an ecological compartment of the estuary, a "reef", that can directly support some fishery resources. The change in benthic community types, by the establishment of a reef community, from one based mostly on deposit feeding to one based on filter feeding also can be beneficial in addressing eutrophication problems in many estuaries.

Despite these apparent or potential benefits, it has not yet been determined how the artificial reef functionally compensated for the lost habitat in the dredge material disposal area. It is clear that an artificial reef can focus or concentrate energy in certain biological communities and fishery resources, and have other functions that can be valuable to coastal habitat management. More studies are needed, however.