

Journal for Oyster Reef Restoration Literature Review

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- 1 Summary of Ecosystem Services Model**
- 2 Summary of Foundation Species Model**
- 3 Application of Models to Oyster Restoration
and Aquaculture**

Oysters and oyster reefs are conceptualized using both the ecosystem services model and the foundation species model. Sometimes both of these models are referenced in the same paper (Mercaldo-Allen et al., 2023). There is evidence in the literature to support the use of both of these models for understanding oyster ecology. The foundation species model proposes that an ecosystem contains one or a few species that have a disproportional effect on community structure by altering the physical, chemical, and biological processes of an ecosystem to facilitate and stabilize a specific community (Fields & Silbiger, 2022). The presence of the foundation species creates and stabilizes the physical environment by minimizing fluctuations in temperature, moisture, pH, or other physical parameters (Ellison et al., 2005). Foundation species can also alter ecosystem production through changes in nutrient cycling, in some cases increasing (Fields & Silbiger, 2022) or decreasing (Ellison et al., 2005) nutrient availability. In some cases, the main effect of the foundation species is to literally build the three-dimensional habitat that other species require (Mercaldo-Allen et al., 2023). Because they are capable of building large biogenic structures that can persist for decades to centuries (Lockwood & Mann, 2019) and processing large volumes of materials via filtration (Newell, 1988) oyster reefs can be conceptualized as foundation species where they occur. For example, Newell (1988) reports that prior to their depletion during the 19th and 20th centuries, oyster reefs could remove 22 — 44% of phytoplankton C production in the Chesapeake Bay, indicating a significant alteration of material cycling in the system consistent with the role of a foundation species (Fields & Silbiger, 2022). Other studies support the idea that the function of oyster reefs is dependent on their structural development

indicating that it is the creation of a particular habitat and its associated conditions that drives the effect. Searles, Gipson, Walters, and Cook (2022) found that macroinvertebrate communities recovered on the interior of restored reefs but not their margins, suggesting that a certain oyster density or reef structure was required to facilitate the colonization of the macroinvertebrates.

4 Impact of Models on Understanding Oyster Management

References

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