Non–human labor and oyster reefs

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1 Oysters in the Chesapeake Bay

2 The ecosystem services model is incompatible with the foundation species model of ecosystems

Ecologists use models to manage the contingency and complexity of ecological systems[1] and to be able to predict how ecological systems will behave in relation to human interactions with them[2]. The two main ecological models applied to oyster reefs are the *ecosystem services model* and the *foundation species model*. Although these models are frequently references in the same paper[3], these two models conceptualize ecosystems in fundamentally different and mutually incompatible ways. Therefore, it is impossible to meaningfully apply both models simultaneously to a system, and as I illustrate below, when this is attempted, the fundamental characteristics of the foundation species model is disregarded in favor of the characterizations of the ecosystem services model.

Humans have recognized the benefits to human well–being provided by ecosystems for much of our history[4]. However until the twentieth century the benefits provided by nature were identified primarily as "free gifts"[5] that were not recognized by the economy. With the recognition of the damage that human activities were doing to the ability of nature to continue to sustain human life, there was a movement to incorporate the "services" that nature provides into the economic system, recognizing that "the human species, while buffered against environmental changes by culture and technology, is fundamentally dependent on the flow of ecosystem services"[6]. This recognition is partially accomplished by the calculating what it would cost if the economy would have to "pay" nature for the services it provides. Highlighting the magnitude of the contribution of

[1] (?, ?)

[2] cite something about resource management here

[3] For example see: cite BUNCH OF EXAMPLES, (Angelini, Altieri, Silliman, & Bertness, 2011)

[4] CITE something here

[5] See (Battistoni, 2017)

[6] (Reid et al., 2005, p. V)

ecosystem services to the *economy*, Costanza et al. concluded that the total value of the ecosystem services provided by the biosphere is at a minimum, US$33 trillion, which the authors point out is 1.8 times greater than the global GNP in 1998. The implication of Costanza et al. is that the magnitude of the "free gifts" of nature, defies compensation even if there was the will. More practically, the calculation of ecosystem services is used to provide a market incentive for the preservation of ecosystems[7]. For example, Grabowski et al. shows that the value of the services provided by oyster reefs exceeds the value of the harvested oysters[8] thereby suggesting that the market should de–incentivize the harvesting of the reefs. That this has not happened[9] raises questions about whether the ecosystems services model is accurately represented in the economic analysis.

The ecosystem services model is fundamentally anthropocentric in that it represents "the idea that we should care for the non–human world because of all of the services it provides to humans to maintain the world we need and want"[10]. Through this anthropocentric lens, the ecosystem services model reinforces the subject–object relationship between humans and natural systems, whereby humans are the recipients of a unidirectional flow of services from the ecosystem[11]. By remaining outside of the system, humans are able to reap the benefits of the system without influencing it or being influenced by it.

2.0.1 The foundation species model is holistic

In contrast to the reductive nature of the ecosystem services model, the foundation species model is inherently holistic. That is to say that the foundation species model centers the relationships between species, that, if broken alter the system. Ellison describes foundation species as "at or near the base of the directional interaction networks that characterize ecosystems... [and] are likely to be connected—directly and indirectly—to many more species than any other species in ecological networks"[12]. In Ellison's description we can see the role of the foundation species as a hub through which interactions in the system flow.

[7](Barron & Hess, 2020)

[8]The highest value ecosystem services provided by the oyster reefs, according to (Grabowski et al., 2012) was shoreline protection. When this service was included in the analysis, the reefs recovered their cost of construction within 2 years of construction. However, even when shoreline protection was omitted from the analysis, the reefs recovered their cost of construction within a decade.

[9]While the production of "sanctuary", that is un–harvested reefs has increased since Grabowski et al. analysis, the harvest of oysters from the Chesapeake Bay has not only not stopped but has increased since the beginning of the twentieth century. In 2000 the total landings of eastern oysters in Maryland and Virginia was 1,148 metric tons. The landings were lowest in 2004 with only 39 metric tons, but since then have climbed to the highest recorded landings in 2022 of 2,811 metric tons (https://www.fisheries.noaa.gov/foss/f?p=215:200:10909893918708:::::). Furthermore this increase in wild harvested oysters is accompanied by an even greater growth in oyster aquaculture, which occupies Bay bottom to the exclusion of natural reefs (CITE).

[10](Barron & Hess, 2020, p. 166)

[11]This relationship is captured in the idea of the "nature–3" definition by Battistoni (2021), where nature is defined as a source of "free gifts" for human use.

[12](Ellison, 2019, p. 255)

The relational structure of the system is ontological.

3 The ecosystem services model alienates the non–human labor of the oyster reef

4 The foundation species model *recognizes* the labor and agency of non–humans in political and economic systems

5 Conclusion

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