Suminoe Oysters Redux:
A Continuing Case of Environmental Rehabilitation

by

Matthew L. Simon
Department of Science
Northeast Iowa Community College, Calmar, IA

Preparation

Before beginning this case study, watch the following two videos:

- Maryland Looks to Restore Oyster Population. Produced by *CBS Mornings*, 2022. Running time: 6:57 min. <https://youtu.be/7hJDntUZU8Y>
- From the Field: A Glimpse into a Restored Chesapeake Oyster Reef. Produced by Chesapeake Bay Program, 2018. Running time: 5:19 min. <https://youtu.be/EcazND81K0Y>

Introduction

"This project has taken so much work! Has all of this work been worth it?"

A fair, necessary, and hard question asked of environmental managers everywhere. Management of landscape-scale ecosystems is a challenging proposition of balancing the desires of human stakeholder groups whose interests may be in opposition, along with the needs of the ecosystem. It can seem like an impossible task with enormous outlays of time, money, emotion and effort! The Chesapeake Bay estuary and its watershed present a current and ongoing example of a large-scale restoration project, much of it centered around the charismatic keystone species, the Eastern oyster *(Crassostrea virginica)*. Learning how these types of projects function in the environment as well as in the minds of stakeholders is important.

Human impacts on ecosystems like the Chesapeake Bay have been classified into five major categories: overfishing, chemical pollution and eutrophication, habitat destruction, invasive species, and anthropogenic climate change (Carlton, 2000). As a keystone species in estuarine habitats, Eastern oysters in the Chesapeake Bay have been negatively impacted by all of these classes of stressors, so much so that only about three percent of these oysters remain in their native range. The reefs that oysters form are the foundation upon which many of the ecosystem services that estuaries provide are built upon. Nutrient removal and increased biodiversity of ocean life are pillars of these services that oyster beds provide (NOAA, n.d.)

Ecosystem restoration in the Chesapeake Bay watershed has focused on mitigating upstream impacts into the bay, as well as consideration of introducing a non-native oyster species that could fulfill some of the ecosystem roles that the Eastern oyster provides. The process of ecosystem restoration is a human endeavor to fix what we have broken, which means that human systems must be employed to get the results that best work for people, the economy, and the environment. Political realities, availability of funding, and adequate motivation of people and organizations are all aspects that need to be considered when developing plans to restore an ecosystem as large and complex as the Chesapeake bay. The first part of this case study utilizes a previously published case study examing the political and ecological realities of these issues in the 21st century (Nieman& Liu, 2006). The second part of this case study is designed to develop and extend your understanding of these issues as they exist today.

Part I – Can Suminoe Oysters Save Chesapeake Bay?

Read the original case study by Nieman& Liu (2006), "Can Suminoe Oysters Save Chesapeake Bay?" at
<https://www.nsta.org/ncss-case-study/can-suminoe-oysters-save-chesapeake-bay>
The case tells the story of a fictionalized politician's decision-making process and examines how stakeholders impact decision making on environmental problems. After you have read the story, answer the following questions from the original case study.

Questions

1. Who is being affected by this decision and how?

2. If the decision is made to introduce the Suminoe oysters, what might be the long-term effects on the environment, the communities, the people?

3. Any choice implies other lost opportunities. In what alternative ways might this money be spent to deal with the Chesapeake Bay's problems and serve constituents?

4. What might this region look like in years if nothing is done?

5. What should Senator Ben Fisher do?

Part II – Updates

The Nieman & Liu (2006) case study is effective at building an understanding of the complexity of resource management activities and is a relevant example, but, as written, the case is now (2024) outdated and there have been many changes in this watershed in the intervening years. After having completed the Nieman and Liu (2006) case study, you will now explore how the Chesapeake Bay has been managed over the intervening years and what impacts those management activities have had on the Eastern oyster, the Chesapeake Bay and its watershed. An excellent synopsis of the issues surrounding the possible release of non-native Suminoe oysters *(Magallana ariakensis)* can be found in a brief report from The National Academies (2003).

Questions

Section A – Political/Policy Decisions Directly Related to Oysters

1. What decision was made regarding whether or not to introduce the Suminoe oysters, and why was it made? Pimentel (2009) and Haviland (2009) provide good summaries of this decision.

2. Using the "Chesapeake Bay Oyster Recovery: Native Oyster Restoration Master Plan" (USACE, 2012) as a guide, review the "Executive Summary" and Section 3.0, "Restoration Vision." Briefly describe the main points in Section 3.0 and the overarching goals of the proposed project.

3. After describing the main points in Section 3.0, explain why policy (political) decisions are so influential to the outcomes of management of resources and the science that informs those decisions. Why is this important?

4. Reflect on your local environment and provide an example of how policy directly or indirectly influences an environmental issue (positively or negatively) in your area. Provide citations for your example in your answer.

Section B – Watershed Changes and Ecological Consequences

5. By now you should have an understanding of what sorts of decisions were made in the wake of the controversy around the potential release of non-native Suminoe oysters. Since they were ultimately not released and the decision was made to focus on restoring the native oyster populations instead, describe how native oyster populations are currently faring. Consider recent and historical trend data from various sources such as state and federal agencies and non-profit organizations. Examples from Virginia (Southworth & Mann, 2022) and Maryland (Tarnowski, 2017) are provided as example citations; more are available online.

6. What types of changes are necessary to be made throughout the watershed? The Chesapeake Bay Foundation website (CBF, n.d.) has links to individual states' implementation plans.
    a. Why are these changes important for the whole watershed and not just the Chesapeake Bay? For a concise summary of the topic, see Felver (2018).

    b. Provide some specific examples of watershed changes, such as; projects implemented, practices adopted, etc, from the implementation plans and what they are intended to accomplish.

    c. Provide some examples of general watershed changes, such as; changes in how broad areas approach the idea of watershed conservation practices, from the implementation plans and what they are intended to accomplish.

7. What are some demonstrated changes to the Chesapeake Bay ecosystem as a result of the management activities in its watershed in the intervening time since "Ben Fisher" had to cast his vote? Recent water quality summaries are available, e.g., Felver (2022); you can find similar reports from other resources as well. Cite your sources.

8. Is there scientific consensus on the success of watershed management efforts? STAC (2023a, 2023b) provide a recent review on the topic and you should find similar reports from other resources as well to develop a robust picture of the state of the Bay. Cite your sources.

9. Is there broader community consensus on the success of how the Chesapeake Bay and its watershed has been managed? *Note:* Community consensus may be different than scientific consensus and searching for editorial or op-ed pieces, public hearing summaries, etc., on the topic will yield a diversity of opinions. Cite your sources.

10. Do you think the Chesapeake Bay restoration project has been successful? Why or why not?

Section C – Future Challenges and Opportunities

11. By now you should have a firm understanding of the past and current state of the bay. Climate change, disease, and continued point and nonpoint pollution will likely continue to impact the bay. Review page 12 of Karl et al (2009) for a summary of anthropogenic climate change challenges. Two major pathogens that are having negative impacts on oysters, include "dermo" and "MSX." Research these diseases and speculate how they may impact oyster populations. Watershed based (point and nonpoint) pollution continues to impact oyster habitat and water quality in the Chesapeake Bay. How do you think these issues can be addressed to help oyster populations?

12. Development of aquaculture production for oysters is an important and growing component of oyster conservation (USDA, 2023). What role do you think aquaculture-raised native oysters will play in wild oyster conservation?

13. What changes to the watershed and bay would you suggest?

References

Carlton, J. (2000). Global change and biological invasions in the oceans. In: Mooney, H. & R. Hobbs. *Invasive Species in a Changing World*. Island Press, Washington D.C. Pp. 31–53.

(CBF) Chesapeake Bay Foundation. (n.d.). State watershed implementation plans. [Webpage]. <https://www.cbf.org/how-we-save-the-bay/chesapeake-clean-water-blueprint/state-watershed-implementation-plans/>

Felver, R. (2018). Why should you care about a watershed implementation plan? [Webpage]. Chesapeake Bay Program. <https://www.chesapeakebay.net/news/blog/why-should-you-care-about-a-watershed-implementation-plan>

Felver, R. (2022). Bay water quality continued to decline in 2018–2020. [Webpage]. Chesapeake Bay Program. <https://www.chesapeakebay.net/news/blog/bay-water-quality-continued-to-decline-in-2018-2020>

Haviland, M. (2009). USACE decision sets focus for Chesapeake Bay oyster restoration. [Webpage]. US Army. <https://www.army.mil/article/26041/usace_decision_sets_focus_for_chesapeake_bay_oyster_restoration>

Karl, T.R., J.M. Melillo, & T.C. Peterson, (eds.) (2009). *Global Climate Change Impacts in the United States*. Cambridge University Press. <https://www.nrc.gov/docs/ML1006/ML100601201.pdf>

Nieman, V., & Z.-J. (2006). Can Suminoe oysters save Chesapeake Bay? [Case study]. National Center for Case Study Teaching in Science. <https://www.nsta.org/ncss-case-study/can-suminoe-oysters-save-chesapeake-bay>

(NOAA) National Oceanic and Atmospheric Administration. (n.d.) Chesapeake Bay: oyster restoration. [Webpage]. <https://www.fisheries.noaa.gov/topic/chesapeake-bay/oyster-restoration>

Pimental, A. (2009). Officials rule against introducing Asian oysters into bay. [Webpage]. Chesapeake Bay Program. <https://www.chesapeakebay.net/news/blog/officials-rule-against-introducing-asian-oysters-into-bay>

Southworth, M., & R. Mann. (2022). The status of Virginia's public oyster resource 2021. [Report]. Molluscan Ecology Program, Virginia Institute of Marine Science, Gloucester Point, VA. 52 pp. <https://doi.org/10.25773/6GB1-V305>

(STAC) Scientific and Technical Advisory Committee. (2023a). Achieving water quality goals in the Chesapeake Bay: a comprehensive evaluation of system response. Executive summary from *An Independent Report from the Scientific and Technical Advisory Committee (STAC)*. 9pp. <https://www.chesapeake.org/stac/wp-content/uploads/2023/05/CESR-Executive-Summary.pdf>

Scientific and Technical Advisory Committee (STAC). (2023b). Achieving water quality goals in the Chesapeake Bay: a comprehensive evaluation of system response (K. Stephenson & D. Wardrop, eds.). STAC Publication Number 23-006, Chesapeake Bay Program Scientific and Technical Advisory Committee (STAC), Edgewater, MD. 129 pp. <https://www.chesapeake.org/stac/wp-content/uploads/2023/05/CESR-Final-update.pdf>

Tarnowski, M. (2017). Maryland oyster population status report 2016 fall survey. Maryland Department of Natural Resources. 61 pp. <https://dnr.maryland.gov/fisheries/documents/Oyster-Population-2016.pdf>

The National Academies. (2003). Non-native oysters in the Chesapeake Bay. National Academies Press, Washington D.C. 4 pp. <https://nap.nationalacademies.org/resource/10796/oyster_brief_final.pdf>

(USACE) United States Army Corps of Engineers. (2012). Chesapeake Bay oyster recovery: native oyster restoration master plan. 290 pp. <https://www.nab.usace.army.mil/Portals/63/docs/Environmental/Oysters/CB_OysterMasterPlan_Oct2012_FINAL.pdf>

(USDA) United State Department of Agriculture. (2023). USDA report shows increases in number of Virginia oyster operations and production. [Press release]. <https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/virginia/news/usda-report-shows-increases-in-number-of>

Internet references accessible as of April 19, 2024.