

Using an Ecosystem Service Model to Inform Restoration Planning: A Spatially Explicit Oyster Filtration Model for Pensacola Bay, Florida - Philine zu Ermgassen

Pensacola Bay, Florida, has a need for large-scale oyster habitat restoration, following significant declines in extent and habitat quality over the past two hundred years. A diverse consortium of stakeholders, including the State of Florida, the Pensacola and Perdido Bays Estuary Program (PPBEP), local municipalities, commercial oyster harvesters, non-governmental organizations, and others have taken a stakeholder-led approach to defining their long-term restoration goals, which are reflected in the Oyster Fisheries and Habitat Management Plan for the Pensacola Bay System (PBS Oyster Plan) and the PPBEP's Comprehensive Conservation and Management Plan (CCMP). These included creating a "Vision Map" of priority restoration locations for the PBS based on restoration and management targets; and to establish ecosystem targets to manage the bay system. Improved water quality, supported by oyster filtration, was identified as a key ecosystem service of interest to recover in the PBS Oyster Plan and CCMP.

To support large-scale restoration planning of oyster reef habitats in the PBS we derived a spatially explicit estimate of water filtration services provided by the eastern oyster, by linking an oyster habitat suitability model to a hydrodynamic-oyster filtration model. This allowed us to map the areas where restored oyster reefs have the potential to provide the greatest increase in filtration service as well as provide spatially explicit estimates of the potential filtration provided of oyster habitat restored. Such information is now being applied in restoration planning and management of the Vision Map by the PPBEP that includes stakeholder engagement and outreach and education programs.

In this presentation we will describe the model, the results, and how these have informed large-scale restoration planning in the PBS, as well as its application for restoration of oyster resources in other bays and estuaries.

Expanding Advocacy & Restoration through Oyster Gardening in Baltimore - Kellie Fiala

The Chesapeake Bay Foundation's (CBF) Oyster Gardening program gives people an opportunity to play a vital role in the recovery of oyster populations by growing oysters in suspended cages. CBF Maryland Oyster Gardeners care for spat on shell at their private, community or public docks for nine months before returning them to CBF. In the spring of each year, the returned oysters are planted on nearby sanctuary reefs.

While this has been a very successful restoration and community engagement program, public access to water to grow oysters is a challenge. This is true across the state, but nowhere so much as Baltimore. As the city transitions from an industrial port town to a modern city and tourist destination, there are ongoing efforts to clean up the harbor and its surrounding waterways. These efforts involve not only implementing stormwater BMPs and enforcing the Clean Water Act, but also combatting the negative stigma that has been long linked to Baltimore's water.

CBF and the Waterfront Partnership of Baltimore formed the Great Baltimore Oyster Partnership to restore oyster populations in Baltimore and reconnect communities to their local waterways. The public oyster gardens in Baltimore bring people to the water not only to contribute to oyster restoration efforts, but also to see first-hand the life that the miniature reefs support. Over six million oysters have been planted since the development of the partnership and CBF has doubled its program in Baltimore in the last two years.

This talk will seek to share what growing a public engagement program looks like in the context of the stigma that often surrounds urban waterways and the role of community-based restoration in combatting it, as well as joys and lessons learned along the way.

Lessons Learned While Measuring the Social Impact of Oyster Restoration in NYC - Tanasia Swift

Billion Oyster Project aims to restore oyster reefs to New York Harbor through public education initiatives. Our goal is to engage one million people in restoring one billion oysters by 2035. One way Billion Oyster Project engages communities is through our Field Stations Program. Field Stations are waterfront sites targeted with the objective of developing place-based learning centers that provide waterfront access and oyster restoration-related engagement activities. Currently Billion Oyster Project has 9 Field Stations: Bushwick Inlet, Coney Island, Canarsie, Brooklyn Bridge Park, Sunset Park, Far Rockaway, Williamsburg, Governors Island, and Newtown Creek.

To understand the impact of the Field Stations Program, Billion Oyster Project has collected qualitative and quantitative data across all Field Station sites. At the end of each year, the Field Stations team produces a program evaluation that presents the results of our findings. Some key questions asked while evaluating the program are: how we can better serve inner-city communities with limited access to the waterfront, what is the impact of our work on NYC youth, what are best practices when collaborating with communities, and how can we scale up the program to reach the overall goal of one million people by 2035. Our goal will be to share some of the key takeaways from the Field Stations Program, the methods used to measure our impact, and how we can refine our methods to measure the social impact of oyster restoration in NYC.

GIS-based approach to Oyster Resource Management and Disaster Response - Ellen Coffin

The proposed presentation aims to showcase the effectiveness of MDMR's GIS-based approach to oyster resource management and restoration. By leveraging the capabilities of ArcGIS Pro, MDMR has been able to analyze complex spatial data, identify key trends and patterns, and develop targeted strategies to address the multiple threats facing Mississippi Sound's oyster populations.

Oysters are considered a keystone species, playing a pivotal role not only in Mississippi but also throughout the entire Gulf region. These ecosystems have faced significant challenges, through

manmade and natural disasters, which have had a severe and compounding impacts on the resource. The 2019 opening of the Bonnet Carre Spillway caused extended periods of low salinity that had an adverse effect on the natural oyster populations. This sharp decline in oyster population numbers has created an environment with minimal spawning activity, which is a critical factor in maintaining and rebuilding reefs. This event highlighted the vulnerability of oyster populations to major environmental disruptions, underscoring the urgent need for comprehensive management and restoration actions.

MDMR utilizes ArcGIS Pro, a robust GIS software, to enhance oyster resource management. By consolidating spatial data on reef assessments, cultivation sites, side scans, spat sampling events, and more, MDMR has developed a state-specific oyster resource management map. This map facilitates decision-making by identifying priority areas for conservation, restoration, and sustainable harvesting, based on extensive scientific evidence. ArcGIS Pro enables MDMR to analyze complex spatial data, detect crucial trends, and devise targeted strategies to address the various threats facing Mississippi Sound's oyster populations.

The Business of Restoration: Opportunities to Scale the Oyster Restoration Industry - Bryan DeAngelis Meeting coastal ecosystem restoration goals is daunting. For example, restoring oyster habitat to documented historic baselines would take over 1,000 years and tens of billions of dollars at the current pace and efficiency. To explore opportunities to increase the pace and scale of oyster restoration, we conducted an analysis with two over-arching goals: (1) determine the size of the oyster restoration market in the U.S., and (2) identify opportunities to reduce costs to increase the scale of oyster restoration. We estimate that the U.S. oyster restoration industry has an annual expenditure of ~\$80M, directly supporting ~1,500 jobs, and contributing \$210M of economic output each year. To improve restoration efficiencies, we identify six performance improvement opportunities that collectively would reduce the cost of restoration by greater than 50%. While these cost reduction opportunities can be applied to any organization or project, we further highlight nine actionable recommendations for the oyster restoration industry itself to overcome cost and scaling barriers, such as reducing the stochastic nature of restoration funding, or implementation of state-wide oyster restoration planning and permitting. Implementing these recommendations will require a regionally or even nationally coordinated effort, but once accomplished, will support the success of oyster restoration efforts across the U.S. The future requires restoration of oyster habitat at unprecedented rates, and status quo approaches will not yield success. These recommendations can help oyster restoration significantly reduce costs to scale and succeed.