

FINAL REPORT

TO: Dr. Amy Frietag

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RE: Virginia Sea Grant Final Report

Over the last century, the Chesapeake Bay has experienced a remarkable decline in the oyster population due to a combination of overharvesting, disease, and environmental conditions. This decrease has dramatic ramifications for the Chesapeake Bay economy, water quality, and ecology. In light of this, the federal government and the states of Virginia and Maryland have implemented multiple strategies to revive the Bay's oyster population for a variety of commercial and conservation purposes. It is now understood that due to the size of the problem and the multifaceted impacts, a comprehensive approach to rehabilitating the oyster population is necessary.

To that end, we have investigated this complex problem in the run up to the regional Oyster Summit that will bring together state and government agencies, commercial and recreational watermen, aquaculturists, and environmental groups in early 2016. We focused on three primary issues: 1) The regulatory hierarchy and overlap; 2) The state of cost-benefit analyses regarding restoration of the oyster fishery; and 3) The legal and adjudicatory landscape. Each of these three issues are explained below.

Regulatory Landscape

To understand the implementation of regulations and laws regulating oysters, we delved into federal and state agency involvement in order to map out what agencies were involved in oyster-related activities in the Bay.

The first goal of this portion of the project was to determine which agencies were involved in regulating oysters. We identified five federal agencies, nine state agencies, and a bistate commission—the Potomac River Fisheries Commission – that are involved in some

capacity in regulating oyster activities in the Chesapeake Bay. We then created an organizational chart of the agencies in order to visualize how oysters are regulated across the whole Chesapeake Bay and to potentially identify any areas of jurisdictional overlap.

The second goal of this portion of the project was to outline which activities the agencies are involved in. We did this for several reasons. The first reason was to determine if there was significant overlap regulating and participating in certain types of activities between state agencies and between state and federal agencies. The second reason was to see if certain agencies were promoting aquaculture or restoration in the Bay by only funding or working on those types of projects. Regulatory overlap and conflicting agency goals could be contributing to conflict between the agencies and creating barriers to certain types of activities. These conflicts would obstruct the goal of increasing oysters in the Bay.

The federal agencies are generally acting as granting agencies to fund reef restoration; research on oysters, oyster reef restoration, and aquaculture; monitoring; and financial assistance programs for aquaculture businesses. Army Corps of Engineers, National Oceanographic and Atmospheric Association (NOAA), and the U.S. Fisheries and Wildlife Service (FWS) also have actively restored oyster reefs. NOAA has a separate Office of Aquaculture that performs research and provides technical support and best management practices for aquaculture businesses. The Army Corps of Engineers is the only agency that has a published opinion about preferences for certain types of projects. The Norfolk and Baltimore Army Corps offices will only restore oyster reefs that will be closed indefinitely to harvest.

At the state level, The Virginia Marine Resources Commission (VMRC) and the Maryland Department of Natural Resources (MDDNR) are the two main agencies involved with regulating oyster-related activities in the Bay. Both agencies perform restoration work and support oyster aquaculture in their states. The other state agencies are focused on individual missions that do not typically overlap. For example, the VA Department of Health is focused on monitoring oyster beds for safe consumption, while the VA Department of Environmental Quality is the agency in charge of awarding grants for Virginia's Coastal Zone Management Program.

Consequently, we discovered that while there are several state and federal agencies involved regulating oysters in the Chesapeake, they all officially maintain relatively separate spheres of influence. In addition, there are several structures in place that promote, and even mandate, interagency communication and collaboration on oyster issues. Both the federal and state agencies are also working with local communities and nonprofit organizations on various projects throughout the Bay. Therefore, inter-agency conflicts and communication issues do not seem to be a result of structural flaws, such as a lack of formalized communication channels between agencies. Instead, they may be a result of cultural issues within or between the agencies. Dr. Freitag's network analysis of stakeholder informal communication channels supports this finding, as it reveals that managers and scientists within the different agencies are communicating with each other on a fairly regular basis and have a well-developed network of communication.

It is worth noting that there were several rumors of tension between VMRC and Army Corps of Engineers about jurisdictional issues over different projects. However, Army Corps has precedence as a federal agency in all navigable waters of the United States, and it is written in the Virginia state code that all agencies must give Army Corps deference in all decisions where it has jurisdiction. Therefore, VMRC must yield to Army Corps in any disputes over areas in navigable waters of the U.S., which essentially covers all waters that could be utilized for oyster growth within state waters (in natural water bodies, not aquaculture tanks).

The third goal of this portion of the project was to map the flow of funding through the federal and state agencies in order to examine the question of whether certain agencies were promoting restoration or aquaculture. It proved to be a complex undertaking that was too large for the scope of this project. In the future, it will take several rounds of Freedom of Information Act (FOIA) requests to find the line-items in the budgets and determine how the money is being spent. The group recommends that VA Sea Grant work on refining its questions to make them as specific as possible in order to carry out this project in the future.

The final deliverables for this portion of the project include a handout of the organizational chart with details about each agency's activities and an explanation of the appropriations and FOIA processes.

Economic Landscape

With the approval of the Chesapeake Bay Total Maximum Daily Loads (TMDLs), much effort has been devoted to quantifying the impact of reducing nutrient inputs to the Bay. The role of oysters as filter feeders and potential nitrogen sinks as well as their importance to the Chesapeake Bay economy as a marketable good has required economists to include the oyster in the quantification of the costs and benefits associated with the implementation of the TMDLs. Unfortunately, these analyses mostly focus on the potential costs savings that oysters can bring relative to the implementation of other best management practices rather than on the total value of increasing the number of oysters in the Bay. In fact, the only full cost-benefit analysis that was found for a complete oyster restoration project was from the Gulf of Mexico and is for a smaller scale restoration than a Bay-wide effort. However, even considering these caveats, it is possible to garner an idea of the primary costs and benefits associated with increasing the number of oysters in the Chesapeake Bay.

While the methods of increasing the number of oysters in the Chesapeake Bay can take many forms, the costs and benefits addressed in the studies most specifically pertain to restoration efforts that would allow for future harvest. However, some of the benefits, such as pollution removal could also be derived from aquaculture activities, and closed harvest sanctuary reefs would contribute to coastal protection and could further provide spillover effects as well. Because of this caveat complexity, costs and benefits must take into account the conglomeration of sanctuaries, harvest reserves, open harvest, and private aquaculture. Further, while there was an initial goal for this project of ranking the costs and benefits, the interplay between the different harvest choices along with the range of uncertainty associated with the estimations made in the case studies, caused that endeavor to be sidelined due to information asymmetry between the different costs and benefits and potential double counting.

The associated spreadsheet catalogues the dollar values related with the six benefits and four costs noted on the handout. The ten categories are not exclusive, nor are they necessarily distinct and many of them may overlap each other. However, they encapsulate the major costs and benefits indicated in the literature, whether or not the literature offered dollar estimates. The spreadsheet associated with this section contains the oyster-related costs and benefits from the associated studies. This spreadsheet should only be used to gain an understanding of the complexity involved in partitioning out the different costs and benefits. The spreadsheet should not be used to gather an estimate of one of the costs or benefits since the studies are generally site-specific and most are not peer reviewed. While much of the literature focuses on benefits, very few analyses discuss the costs associated with efforts to increase the oyster population. Further, the majority of the analyses neglect any impact of a discount rate on the potential costs or benefits. This is particularly true for the large-scale economic reports on the value of cleaning up the Bay, a fact that is a bit concerning. A discount rate allows for the inclusion of the fact that a dollar today means more to us than a dollar tomorrow. This is especially important when considering ecological benefits like pollution removal and increased catches, which inherently will not accumulate until the future. Most environmental cost-benefit analyses utilize a lower than normal discount rate to account for the future accumulation of benefits relative to the high upfront costs (e.g., 3% rather than 7-10%). However, this point may be moot since it is our opinion that a full cost-benefit analysis is not adequate in the context of increasing oysters in the Chesapeake Bay because of the complications noted above involving the necessity to incorporate multiple harvest and restoration practices along with vague ecosystem services compounded by overlapping costs and benefits.

Dr. Eric Powell, a shellfish population and management modeler formerly of Rutgers University and now the head of the University of Southern Mississippi's Gulf Coast Research Laboratory, recently stated that if the Bay oyster were switched from a state to a federally regulated fishery then the fishery would be closed for the next several decades or more in order for biomass to adequately increase. In light of this and the issues noted above, a modeling effort that couples an ecological model with a Bayesian-type model that can incorporate choice

preferences would be better at analyzing the best combination of sanctuary, harvest reserve, open harvest, and aquaculture than a comprehensive cost-benefit analysis. While no peer-reviewed published study was found to have completed such a modeling study, a conference proceedings paper comes relatively close.

Mykoniatis and Ready (2012) conducted an economic optimization modeling study that looked at the net benefit of allocating oyster grounds among the four harvest and restoration options. They found that the first-best option is to allocate all grounds for open harvest. However, given imperfect information (scientific, economic, etc.) along with imperfect enforcement, the first-best option is unfeasible. While the modeling study took ecosystem services as public goods into account, it did not account for changes in habitat use and environmental conditions that could be derived from an ecological model. A comprehensive study that could inform the best allocation of oyster grounds among the four options would need to combine the scientific information from an ecosystem model along with the economic choice information from an optimization model. While further background information for different model parameters will surely be necessary for such a study, Mykoniatis and Ready mention that one significantly limiting factor is the impact of aquaculture on ecosystem service values and economic implications.

While it may be beyond the scope of Virginia Sea Grant, our recommendation is that a full coupled modeling study be conducted to form a baseline for decisions made regarding what oyster grounds should be allocated to the different restoration and harvest methods. Dr. Powell's statement is a warning that a precautionary approach must be utilized to try and stave off a complete collapse and shuttering of the fishery especially as environmental and climate changes impact the viability of current and future restoration projects.

Further questions regarding the merits and a CBA or the allocation of costs and benefits into the ten categories will likely come up. Since the matter is fairly fluid depending on one's idea of what should be allocated into which bin and the fact that no comprehensive peer reviewed study has been conducted, any questions can be addressed to Ike Irby.

Legal Landscape

The legal landscape involved two distinct areas of the law: court adjudication and understanding the federal and state legislation involving oysters.

With the court adjudication prong, we analyzed over 90 cases that dealt with oyster regulations and disputes in the Supreme Court, Fourth Circuit, and Maryland and Virginia state courts. The most common dispute involved property rights between citizens and sometimes citizens challenging leases with the state. Although many of the complaints received from stakeholders did not appear in the cases themselves, we suspect that this may be attributed – at least partially – to standing. Standing establishment is further explained in the legal glossary and can help stakeholders challenge laws in the courts in the future. A database is also attached to detail all of the cases, their holdings, and other variables to use in the future. Precedential value is also included in the database to ascertain which cases are still most relevant to today. The only cases that should no longer be used as support have the Warning indicator because the case holdings have all been superseded by statute.

In order to understand the interplay between the various levels of regulation and law—federal, state, and local—we have conducted an analysis of the current laws governing oyster growing and harvesting. Attached to this report is an outline of all the applicable state and county laws from Virginia and Maryland. The laws may change quickly, so we advise using the outline with caution, but it should ultimately help answer various questions brought by the stakeholders.

Additionally, we examined jurisdictional disagreements, particularly between the states. Maryland and Virginia have some differences in how they regulate leases, criminal statutes, and property rights in the water column. For example, Maryland allows bottom use leases and water column leases whereas Virginia only leases the bottom. Since stakeholders have expressed concerns with getting leases in Maryland, we also prepared a handout that details the leasing process for Maryland and Virginia, which is attached to this report.

Furthermore, we focused on a few key areas of the law that, if changed, will promote easier cooperation between Virginia and Maryland and encourage greater aquaculture

investment. Many counties have various specifications on tools that can be used in certain areas, making it difficult for law enforcement to enforce the regulations and leaseholders to fish legally in their waters. These county differences (often dictated by latitude and longitudinal lines) appear in other areas of the law as well that could be cleaned up for efficiency in the future. Preferences for citizens also remain in Virginia and Maryland, requiring that a leaseholder be a resident of the specific state in order to get a lease. If this were lessened, the states could perhaps attract more business. These are just a few examples of the key areas of the law that we found. More details are included in the outline itself.