Summer 2019

Shellfish Production in Virginia: Public Grounds

Geoffrey Grau

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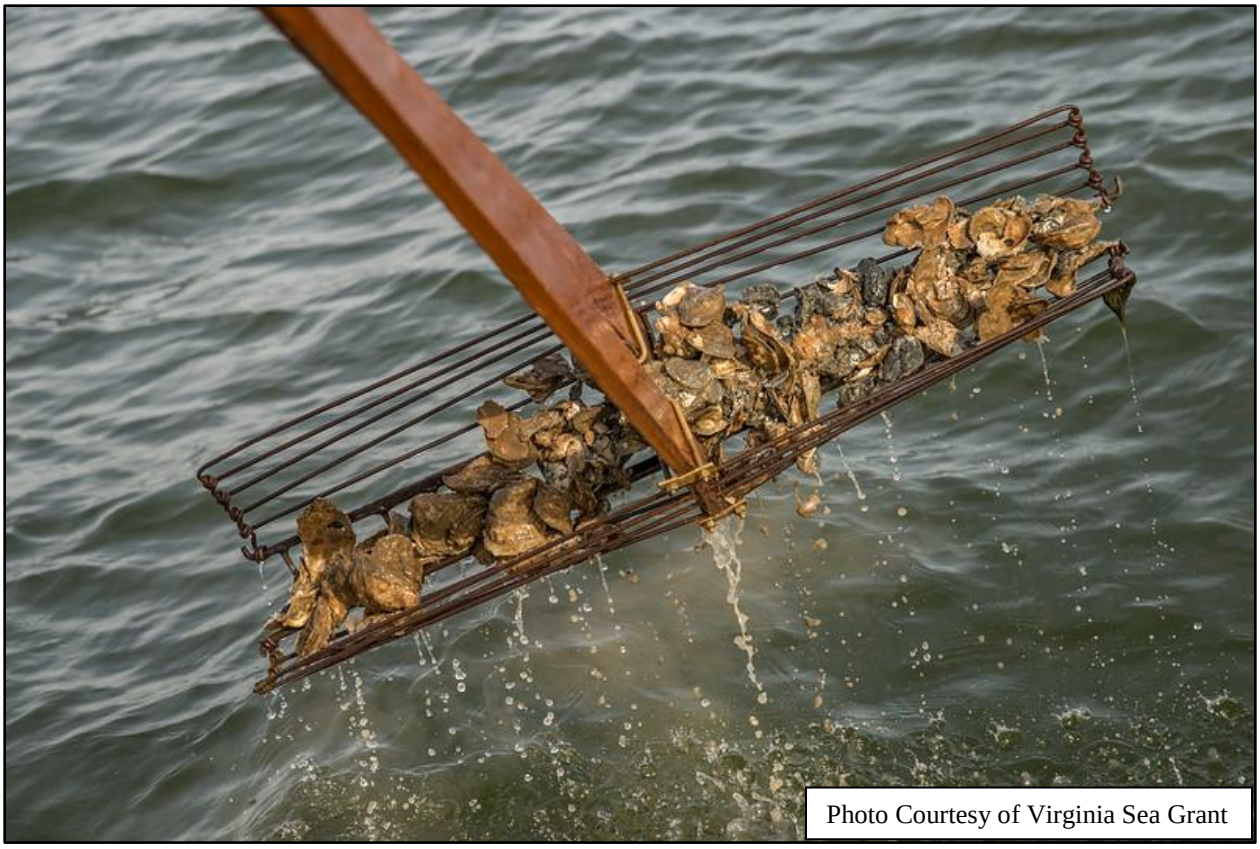

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About the Author

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About the Virginia Coastal Policy Center

The Virginia Coastal Policy Center (VCPC) at the College of William & Mary Law School provides science-based legal and policy analysis of ecological issues affecting the state's coastal resources, by offering education and advice to a host of Virginia's decision-makers, from government officials and legal scholars to non-profit and business leaders.

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VCPC grounds its pedagogical goals in the law school's philosophy of the citizen lawyer. VCPC students' highly diverse interactions beyond the borders of the legal community provide the framework for their efforts in solving the complex coastal resource management issues that currently face Virginia and the nation.

I. INTRODUCTION

Aquaculture, the farming of oysters and clams,[1] continues to grow in Virginia.[2] Virginia is first in the nation for hard clam production and ranks first on the East Coast for oyster production, all while directly providing employment for hundreds of Virginians each year.[3] The state has a multimillion-dollar aquaculture industry, estimated in 2017 to have a gate value of $53.4 million dollars.[4] Various organizations such as Virginia Sea Grant and the Virginia Institute of Marine Science (VIMS) endeavor to provide necessary assistance to allow the industry's continued growth, providing various "support tools, manuals, websites, and workshops" to the benefit of many.[5] Ultimately, the upwards expansion of the aquaculture industry is a result of adapting to the times: an increase in intensive aquaculture practices.[6]

One potential impediment to the continued growth of the aquaculture industry in Virginia is the current management framework associated with the use of the public Baylor Grounds.[7] Virginia's constitution provides, in part, that the "natural oyster beds, rocks, and shoals in the waters of the Commonwealth shall not be leased, rented, or sold but shall be held in trust for the benefit of the people of the Commonwealth."[8] Originally, oyster beds in the Chesapeake Bay (the "Bay") were so plentiful that "oyster reefs rose so high that they grazed the bottoms of boats sailing the Bay."[9] By the late 19th century, however, vast areas in the Bay were depleted due to overharvesting and habitat destruction.[10] In response, these overharvested areas were designated for commercial use to encourage shell and habitat restoration.[11] The result yielded the separate designation of Virginia's public lands in 1894 with the Baylor Grounds survey.[12]

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[1] *Shellfish Aquaculture, Farming and Gardening*, VIRGINIA MARINE RESOURCES COMMISSION, http://www.mrc.state.va.us/shellfish_aquaculture.shtm (last visited July 29, 2019).
[2] Karen Hudson, VIRGINIA SHELLFISH AQUACULTURE SITUATION AND OUTLOOK REPORT: RESULTS OF THE 2017 VIRGINIA SHELLFISH AQUACULTURE CROP REPORTING SURVEY 3 (2018).
[3] *Id.*
[4] *Id.* at 3-4 (one figure reveals a "reported 111.1 million single oysters planted in 2017, a 5% increase from 2016 and 6% less than projected for 2017. Growers reported that triploids made up 87% of their plantings in 2017 which was similar to reports in 2016. The outlook for 2018 suggests a 2% increase in oysters planted by Virginia growers; to 113 million single oysters planted.").
[5] *Tools and Training to Support Virginia's Shellfish Aquaculture Industry*, VIRGINIA SEA GRANT, https://vaseagrant.org/tools-training-to-support-virginias-shellfish-aquaculture-industry/ (last visited July 29, 2019).
[6] Press Release, Va. Inst. of Marine Sci., Oyster aquaculture on upswing in Virginia (July 28, 2011) (on file with author). *See also* Hudson, VIRGINIA SHELLFISH AQUACULTURE SITUATION AND OUTLOOK REPORT, *supra* note 2.
[7] VA. CONST. art. XI, § 3; VA. CODE ANN. § 28.2-603 (2011); VA. CODE ANN. § 28.2-1208 (2009); 4 VA. ADMIN. CODE § 20-336-40 (1998).
[8] VA. CONST. art. XI, § 3.
[9] *Oysters*, SEA GRANT MARYLAND, https://www.mdsg.umd.edu/topics/oysters/oysters.
[10] Bradford Botwick & Debra McClane, *Landscapes of Resistance: A View of the Nineteenth-Century Chesapeake Bay Oyster Fishery*, 39 HIST. ARCHAEOLOGY 94, 94-95 (2005).
[11] *Id.*
[12] *Historical Highlights of the Virginia Marine Resources Commission*, VIRGINIA MARINE RESOURCES COMMISSION, http://www.mrc.virginia.gov/vmrchist.shtm (last visited July 29, 2019).

This hand-mapped survey specifically determined the naturally productive oyster beds, rocks, and shoals of Virginia.[13] The naturally productive bottomlands were excluded so "individuals would have an incentive to restock the barren sites for private use without closing productive sites that watermen could continue to harvest."[14] The ultimate result yielded 232,016 acres of designated natural reproductive beds, open only to public use as designated by Article XI in Virginia's Constitution.[15] While the original intent was to incentivize the resupplying of the specific areas open to private use in 1894,[16] a great deal of change has occurred in the productivity of the bottom beds of Virginia in the 125 years since the original survey.[17] Furthermore, these historic lines have rarely been modified, despite the fact that Virginia has considered future expansion into portions of the public Baylor Grounds.[18]

Essentially, a general lack of productivity is prevalent throughout the natural oyster beds of the public Baylor Grounds.[19] There are areas, for example, that lack the appropriate substrate to make them suitable for natural oyster production or restoration,[20] where intensive commercial aquaculture could make these areas more productive.[21] Therefore, this paper will identify potential advantages of expanding aquaculture production by either allowing alternative intensive uses of the Baylor Grounds and/or redrawing the boundaries of the public grounds.

II. PROJECT BENEFITS

Multiple environmental and economic benefits may result from either legally reallocating use to allow intensive aquaculture in certain areas of the Baylor Grounds in some form, or massively overhauling the Baylor Grounds boundaries. This section will outline the various benefits that could arise from either possibility.

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[13] *Id.*
[14] *Virginia and Submerged Lands*, VIRGINIA PLACES, http://www.virginiaplaces.org/boundaries/submerged.html (last visited July 29, 2019); *see also* Botwick & McClane, *supra* note 10.
[15] *Virginia and Submerged Lands*, VIRGINIA PLACES, *supra* note 14.
[16] *Id.*
[17] *Id.*
[18] Steven G. Bowman and John T. Wells, *SJ330 Report of the Virginia Marine Resources Commission and the Virginia Institute of Marine Science* (Jan. 2012), https://www.deq.virginia.gov/Portals/0/DEQ/CoastalZoneManagement/FundsInitiativesProjects/task96-03-10b.pdf; Ctr. for Coastal Res. Mgmt., Va. Inst. of Marine Sci., *Shellfish Aquaculture Suitability Within Baylor Grounds of the Lower Rappahannock River* (Nov. 2008), https://www.deq.virginia.gov/Portals/0/DEQ/CoastalZoneManagement/task92-01-07.pdf.
[19] *See, e.g.*, Ctr. For Coastal Res. Mgmt., *supra* note 18.
[20] James Wesson et al., *Expanding Virginia's oyster industry while minimizing user conflict*, VA. INST. OF MARINE SCI. 4-9 (2018).
[21] *See* Donald Webster & Donald Meritt, *Stabilizing Oyster Ground*, U. MD. SEA GRANT EXTENSION PROGRAM 5-6 (1988).

A. Adapting to New Challenges and Opportunities

Over two hundred thousand acres of naturally productive grounds were set aside for public use 125 years ago.[22] However, a great deal of technological, social, and environmental adaptation has taken place since then, yielding the need for a reassessment of either the boundaries of the Baylor Grounds or the uses permitted within them.

First, the actual lines of the Baylor Grounds simply remain out of date, drawn by hand in straight lines, and produced "solely on the input of the county oyster inspectors, who served as [James Baylor's] guides, without any ground truth examinations of the bottom."[23] Therefore, inaccuracies exist within these maps such as mislabeling locations of actual reefs even to the extent where "some reef areas [were] kept out and barren areas [were] included."[24] Large areas of the Lynnhaven River were not mapped at all, as the oyster inspectors that Baylor relied upon sought to keep areas of the Eastern and Western Branches out of the public fishery.[25] Moreover, the inspectors delineated the public grounds on a series of polygons, complicating matters even greater with an overlapping of large swaths of barren areas within these rough estimates.[26]

Primarily, these inaccuracies do not have to endure any longer, as numerous environmental agencies have demonstrated their ability to accurately map productive grounds. For example, the Virginia Marine Resources Commission (VMRC) maintains an assortment of public maps with geographic information system (GIS) data correctly identifying the various oyster stocks throughout the Bay that are updated annually.[27] And, the Virginia Coastal Zone Management manages the Virginia Coastal Geospatial and Educational Mapping System (GEMS) tool that includes numerous data layers, including oyster aquaculture vulnerability and suitability models.[28] Therefore, utilizing these updated mapping systems to redraw or reallocate uses for the Baylor Grounds may yet yield greater efficiency and use of Virginia's waters for aquaculture purposes.

Second, further unanticipated changes since the survey need to be addressed by either redrawing or reallocating use of the Baylor Grounds. For example, two catastrophic epidemics have further hastened the decline of native oysters in the region.[29] Dermo, a disease easily transmitted by the parasite, *Perkinsus marinus,* was introduced to the Bay in the 1940s.[30] More

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[22] DEXTER S. HAVEN, JAMES P. WHITCOMB & PAUL C. KENDALL, THE PRESENT AND POTENTIAL PRODUCTIVITY OF THE BAYLOR GROUNDS IN VIRGINIA ii (Va. Inst. Marine Sci. ed., 1st ed. 1981).
[23] David M. Schulte, *History of the Virginia Oyster Fishery, Chesapeake Bay, USA*, 4 FRONTIERS IN MARINE SCI. 1, 13 (2017).
[24] *Id.*
[25] *Id.*
[26] *Id.*
[27] *Maps & Geographic Information System (GIS) Data*, VA. MARINE RES. COMM'N., http://www.mrc.virginia.gov/links.shtm (last visited July 29, 2019).
[28] *Virginia Coastal Geospatial and Educational Mapping System (GEMS)*, VA. COASTAL ZONE MGT. PRG., https://www.deq.virginia.gov/Programs/CoastalZoneManagement/CoastalGEMS-GeospatialData.aspx (last visited July 29, 2019).
[29] *Oysters*, CHESAPEAKE BAY PROGRAM, https://www.chesapeakebay.net/issues/oysters.
[30] *Oyster Diseases of the Chesapeake Bay*, VA. INST. OF MARINE SCI., https://www.vims.edu/_docs/oysters/oyster-diseases-CB.pdf (last visited July 29, 2019).

than a decade later, the MSX disease, transmitted by the parasite *Haplosporidium nelson*, was first introduced to the Bay in the late 1950s.[31] The "combined Dermo-MSX epidemic caused massive oyster (primarily adults of sub-market and market size) mortalities (90–95%) in high salinity waters."[32] While MSX remains limited to areas with high levels of salinity in the water, Dermo is prevalent everywhere in the Bay.[33] The bottom line remains: diseases like Dermo decimate native oyster populations in the Bay within the first three years of their lifespan, many of which are killed before they are marketable in size.[34] The rampant nature of these parasitic diseases incentivized the breeding of new triploid oysters that grow "bigger and faster than natural oysters" to be harvested earlier to avoid these diseases.[35] Therefore, a potential option for stimulating the productivity of the public grounds may be to explore the use of caged aquaculture within certain parameters.

Additionally, private fisheries outnumbered public fisheries in the Bay for the first time beginning in the 1920s.[36] In the years since the Baylor Grounds were established, private use has remained arguably more efficient than public use. As intensive farming expands, oyster populations in the Bay will increase. In essence, "[p]rivate industry is just great for innovation. . . . We need to transition from the waterman, the hunter-gatherer, gold rush mentality."[37] For example, in 2002, VIMS prepared an atlas of possible oyster restoration sites, illustrating potential locations of future oyster reefs in the Bay.[38] Included within the appendix were thirty separate analyses and conclusions that measured the population and mortality rates of oysters in the public and private grounds.[39] The results showed "[l]ow population levels on Baylor Grounds subject to consistent disease (MSX and Dermo) mortality" within twenty-seven out of thirty areas analyzed.[40] Conversely, within those very same maps, only fourteen out of thirty private ground areas located next to the Baylor Grounds saw similar low population numbers.[41] This data indicates, at some level, that intensive farming increases the amount of oysters in the Bay.[42]

Notably, harvest statistics from the public grounds keep decreasing, as indicated by a 0.5% yield for the public fishery since the early 1990s, compared to a 0.8% yield for the private leasehold

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[31] *Id.*
[32] Schulte, *supra* note 23.
[33] *Oyster History*, U. MD. CTR. FOR ENVTL. SCI., http://hatchery.hpl.umces.edu/oysters/history/ (last visited July 29, 2019).
[34] Ryan B. Carnegie & Eugene M. Burreson, STATUS OF THE MAJOR OYSTER DISEASES IN VIRGINIA 2006-2008: A SUMMARY OF THE ANNUAL OYSTER DISEASE MONITORING PROGRAM 4 (2009); *see also Oyster Restoration in Virginia*, VIRGINIA PLACES, http://www.virginiaplaces.org/natural/oysterrestoration.html.
[35] Dennis Hollier, *Tasty Mutants: The Invention of the Modern Oyster Genetic innovation, on the half shell*, THE ATLANTIC (Sep. 29, 2014), https://www.theatlantic.com/technology/archive/2014/09/todays-oysters-are-mutants/380858/.
[36] Schulte, *supra* note 23, at 1.
[37] Rona Kobell, *Aquaculture most likely future for Chesapeake Bay's oysters*, 19 BAY J. 1, 4 (2009) (quoting Tommy Leggett, lifetime waterman).
[38] *See* Marcia Berman et al., *Virginia Oyster Reef Restoration Map Atlas* (Aug. 2002), http://ccrm.vims.edu/cascade_files/VIMSOyRestAtlas.pdf.
[39] *Id.*
[40] *Id.*
[41] *Id.*
[42] *Id.*

fishery.[43] Even before that point, from the period of 1981-1990, the Baylor Grounds harvests averaged 322,000 bushels of oysters per year, a steady decline from 475,000 bushels in 1981 to 178,000 bushels in 1990.[44] This decline represented a 73% drop.[45] Therefore, it remains important to increase the volume of these yields, which could involve opening up the underutilized public Baylor Grounds for more efficient purposes. Greater efficiency could create greater economic ancillary benefits as well.[46] Valued in 2017 as a $15.9 million industry, "[o]ysters are the most rapidly developing sector of Virginia's shellfish aquaculture[.]"[47]

Because the vast majority of private lands have already been leased, at an extremely low price per acre, those who wish to enter the aquaculture industry are left in a lurch.[48] Opening up the naturally unproductive areas of the Baylor Grounds remains an appealing prospect, especially as a solution to keep Virginia's oyster harvests steady (or increasing) and provide employment opportunities for watermen.

B. Environmental Benefits from Increased Oyster Yields

There are many environmental benefits that oysters generally provide to the Bay. In addition to various ancillary benefits, such as oysters serving as habitats "for other marine life such as juvenile crabs and fish,"[49] oyster filtration of nutrients remains a significant advantage provided by increased aquaculture.[50] If left unchecked, excess nutrients from human activities create "dead zones" in the Bay.[51] In these areas of limited oxygen, aquatic animals are unable to survive.[52] Additionally, the excess nutrients encourage algae bloom growth that, in turn, limits the amount of sunlight reaching underwater grasses.[53] Oysters help lessen these impacts to animal and plant life because a single three-inch adult oyster can filter thirty to fifty gallons of water a day, consuming the byproducts of over-nitrification.[54] For instance, because twenty oysters remove at least one gram of nitrogen at the time of harvest, a "weekly harvest of only about 200 oysters can compensate for the nutrient inputs of a typical waterfront homeowner on a properly functioning

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[43] Schulte, *supra* note 23.
[44] *Id.*at 9.
[45] *Id.*
[46] *Id.* at 15. ("[E]conomic perspective and returns in recent decades for…subsidies have not been positive. This could change if the public ground harvest continues to increase, prices per bushel hold steady or decrease, and the price of shell remains modest compared to a similar volume of harvested live oysters.").
[47] Hudson, *supra* note 2.
[48] Schulte, *supra* note 23.
[49] Alison Prost, *Now Is Not the Time to Limit Oyster Aquaculture*, CHESAPEAKE BAY FOUNDATION, https://www.cbf.org/blogs/save-the-bay/2018/08/now-is-not-the-time-to-limit-oyster-aquaculture.html (last visited July 29, 2019).
[50] *Oyster Fact Sheet*, CHESAPEAKE BAY FOUNDATION, https://www.cbf.org/about-the-bay/more-than-just-the-bay/chesapeake-wildlife/eastern-oysters/oyster-fact-sheet.html (last visited July 29, 2019).
[51] *Dead Zones*, CHESAPEAKE BAY FOUNDATION, https://www.cbf.org/issues/dead-zones/ (last visited Aug. 5. 2019).
[52] *Id.*
[53] *Id.*
[54] Richard F. Golen, *Incorporating Shellfish Bed Restoration into a Nitrogen TMDL Implementation Plan*, https://web.archive.org/web/2018*/https://www.coonamessettfarm.com/sitebuildercontent/sitebuilderfiles/Incorporating_Shellfish_Bed_Restoration_into_Nitrogen_TMDL_Implementation_Plan.pdf (last visited Aug. 5, 2019).

septic system."[55] Moreover, "[a] commercial weekly harvest of ~10,000 oysters contains about 13.6 kg of nitrogen and 1.4 kg of phosphate, and can result in the removal of 100kg of N per year," so "an oyster farm of about 1 ha can compensate for the [nitrogenous] wastes of 40-50 coastal inhabitants."[56] Therefore, the simple act of adding more oysters through more intensive aquaculture use could help Virginia reach its goals to restore the Bay's water quality to sustainable levels.[57]

Additionally, as aquaculture practices in Virginia increase, more opportunities exist to help with shell replenishment, which enables the sustainability of commercial harvests by effectively repairing previously destroyed reefs and habitats.[58] Originally, shell gained from natural oyster mortality kept the reefs sustainable.[59] The natural replenishment rate of the public Baylor Grounds, however, is currently not self-sustaining.[60] Even if VMRC had unlimited monetary funding and shell to lay substrate, it would at best only be able to support a limited amount of the grounds.[61] Ultimately, the "vast majority of Baylor ground (~78%) cannot be maintained with available shell resources and should be considered for alternate strategies."[62]

III. CURRENT FRAMEWORK

A. Virginia General Assembly

Virginia's Constitution grants the General Assembly the power to set and revise the parameters of the natural oyster beds, rocks, and shoals, as well as allow certain public uses of the Baylor Grounds.[63] Article XI states:

> The natural oyster beds, rocks, and shoals in the waters of the Commonwealth *shall not be leased, rented, or sold* but shall be held in trust for the benefit of the people of the

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[55] Sandra E. Shumway et al., *Shellfish aquaculture-In praise of sustainable economies and environments*, WORLD AQUACULTURE 15, 16 (2003).
[56] *Id.*
[57] *See, e.g.*, *Ecology of Oysters, Oyster Growth and Water Quality*, COLUM. U., IRVING MED. CTR., http://score.dnr.sc.gov/ktmlpro10/files/uploads/riverlab.pdf (last visited July 29, 2019) ("When oysters take in water through their gills, the foods are sent to digestive organs while non-food sediments are mixed with sticky secretions (similar to the matrix that make up shells, pearls and the affixing substrate). The wastes (psuedofeces) are egested in a form much denser than their original composition and they sink to the bottom where they are more quickly decomposed or covered by other sediments and thus removed from the water column. When not filtered by oysters, concentrated sediments in water can cause excess heat adsorption and reduce oxygen levels."); Alexander L. Miller, *An Economic Evaluation of the Nutrient Assimilation Potential for Commercial Oyster Aquaculture in the Chesapeake Bay*, at ii (Jan. 8, 2009) (unpublished Ph.D. dissertation, Virginia Polytechnic Institute and State University) (on file with Virginia Polytechnic Institute and State University).
[58] Schulte, *supra* note 23 at 14.
[59] *Oyster Reefs*, NOAA CHESAPEAKE BAY OFFICE, https://chesapeakebay.noaa.gov/oysters/oyster-reefs (last visited July 29, 2019).
[60] James Wesson et al., *supra* note 20, at 2.
[61] *Id.* at 9.
[62] *Id.*
[63] VA. CONST. art. XI, § 3.

> Commonwealth, subject to such regulations and restriction as the General Assembly may prescribe, but the General Assembly may, from time to time, define and determine such natural beds, rocks, or shoals by surveys or otherwise.[64]

Within these parameters, it remains clear that the public lands in the Baylor Grounds remain wholly off-limits to any private leasing.[65] To reiterate, though, these public waters are wholly dependent on Baylor's 1894 survey, "made pursuant to Chapter 511 of the 1892 Acts of Assembly," which primarily "shall continue to be the surveys defining and determining the natural oyster beds, rocks, and shoals of the Commonwealth."[66] As mentioned earlier, this baseline analysis was plagued by inaccurate reporting and rough sketching,[67] which has resulted in an inadequate reflection of oyster beds over a century later.[68] Unfortunately, these maps still remain the "conclusive evidence of the boundaries and limits of all the natural oyster beds, rocks, and shoals" despite such inaccuracies.[69]

While it is not unusual to add new territory to the Baylor Grounds,[70] the General Assembly rarely removes land from the Baylor Grounds. The legislature's exercise of its ability to change the contours of the Baylor Grounds is not unprecedented, however. In 1973, the Attorney General of Virginia wrote an opinion emphasizing the language in the Virginia Constitution, that the "General Assembly may by '*surveys or otherwise*' define or redefine the limits of such protected natural oyster grounds."[71] In this case, the General Assembly had decreased the size of the Baylor Grounds pursuant to "Chapter 390, Acts of Assembly of 1958, [which] provide[d] for the release of the United States of America from all claims for damages to public and private oyster beds resulting from the construction, operation, and maintenance of certain anchorages in the Elizabeth River."[72] The opinion noted that language on the map that was incorporated into the Act, along with "the broad nature of the release provisions", extinguished all oyster rights and, therefore, "the

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[64] *Id.* (emphasis added).
[65] *Id.*
[66] VA. CODE ANN.§ 28.2-551 (1992).
[67] Schulte, *supra* note 23.
[68] *Management of State-owned Bottomlands on the Seaside of the Eastern Shore*, VA. INST. OF MARINE SCI. & VA. MARINE RES. COMM'N. 2 (2012) (VIMS' and VMRC's "analysis revealed that only 43% of the natural oyster beds on the seaside are located within the Baylor Grounds. This distribution can largely be explained by the dynamic nature of the environment on the seaside. In the intervening 117 years, since Baylor's survey was completed, the barrier islands along the seaside have moved—in some cases as much as a quarter mile—often burying oyster beds in the process. Over that same time period, sea level has risen nearly 1.5 feet in the region, dramatically changing the location of the intertidal zone, where oysters in the region are located. The survey reveals extensive, apparently natural, oyster resources that lie outside of the Baylor Grounds.").
[69] VA. CODE ANN. § 28.2-551.
[70] *See* VA. CODE ANN. § 28.2-648 (1992) ("The following grounds in Mobjack Bay, Gloucester-Mathews Counties, contained within the following boundaries are declared to be public oyster rocks, beds, and shoals and unassignable to any person for private use, in the same manner and to the same extent as if the rocks, beds, and shoals had been within the original Baylor survey."); VA. CODE ANN. § 28.2-639 (1992) ("Russ' Rock and Little Carter's Rock are declared to be public oyster rocks, beds, and shoals and unassignable to any person for private use, in the same manner and to the same extent as if the rocks, beds, and shoals had been within the original Baylor survey.").
[71] 1973-1974 Op. Va. Att'y Gen. 86 (emphasis added).
[72] *Id.*

General Assembly intended to permanently remove the portion of the . . . grounds . . . from the . . . Baylor Survey[.]"[73]

Additionally, the legislature has the authority to allow other public uses within the public grounds. For example, in *Commonwealth v. City of Newport News*, the Supreme Court of Appeals of Virginia reiterated that the legislature may not "authorize, permit or suffer a *private use* of the actual natural oyster beds, rocks and shoals,"[74] but may "authorize, permit or suffer tidal waters, including those over natural oyster rocks, to be used for *any public purpose* to which they are at common law subject or the legislature may deem it to be for the benefit of the people to authorize or suffer."[75]

Furthermore, the legislature may place certain parameters on the public's ability to harvest oysters from the public grounds, such as specifying the type of gear that can be used for harvest or establishing a season in which the harvest can take place.[76]

B. The Virginia Marine Resources Commission (VMRC)

VMRC also has the power, granted by the Virginia General Assembly, to reestablish or alter the parameters of the Baylor Grounds in certain circumstances.[77] Although VMRC was originally created as an agency with limited powers, tasked with merely "stocking the waters of Virginia with fish[,]"[78] it is currently a crucial regulatory agency that, among other things, oversees the Commonwealth's oyster ground leasing program.[79]

Most of VMRC's authority concerning the boundaries of the Baylor Grounds relates to reestablishing, relocating, and remarking survey lines. For example, the Commission is authorized to "appoint a surveyor" for purposes of "reestablish[ing] and permanently mark[ing] any line or lines of the Baylor survey of natural oyster rocks which the Commission finds necessary to define."[80] Further, VMRC may "reestablish, relocate, and remark all lines of the Baylor survey"

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[73] *Id.*
[74] Commonwealth v. City of Newport News, 158 Va. 521, 553 (1932).
[75] *Id.* at 554 (allowing the City of Newport News to discharge sewage into the tidal waters) (emphasis added).
[76] *See, e.g.*, VA. CODE ANN. § 28.2-506 (1992) (providing the season for taking oysters from public rocks with certain devices).
[77] 2012 Op. Va. Att'y Gen. 50 (The Virginia "General Assembly may delegate Baylor grounds boundary determinations and boundary adjustments to the Virginia Marine Resources Commission, provided the law delegating the authority establishes specific policies and fixes definite standards to guide the VMRC in making its determinations.").
[78] Keith W. Davis, *The Role of Virginia Marine Resources Commission in Regulating and Zoning the Water Bodies of the Commonwealth*, 16 WM. & MARY ENVTL. L. & POL'Y REV. 81, 97 (1992).
[79] *Id.*
[80] VA. CODE ANN. § 28.2-552 (1992); 1968-1969 Op. Va. Att'y Gen. 112-113 ("[T]he legislature is empowered to determine what specific portions of the bottom area included in the Baylor Survey are in fact not natural oyster rock and designate them accordingly. The legislature would have complete discretion to select the method of making the determination of what areas are to be released, including a resurvey of such areas as it may wish. This authority may be delegated to the Marine Resources Commission.").

when previous marks have been lost or destroyed.[81] Under certain circumstances, VMRC also has authority to alter the boundaries of the public grounds to permit the construction of an erosion control structure.[82]

VMRC's authority centers on the agency's ability to reestablish or remark existing Baylor survey lines. But VMRC only has limited authority to alter the boundaries of the Baylor survey when private oyster ground leases have been mistakenly granted on public grounds, which is limited in time and location.[83] Additionally, if VMRC modifies the boundaries to remove the private oyster ground lease from the public grounds, VMRC "shall neither reduce nor enlarge the area of public grounds, nor materially reduce or increase the value of the private grounds whose boundaries are being adjusted."[84] Therefore, the overall size of the public grounds may not change in that situation.

Regarding the seafood and marine resources of the Commonwealth more generally, the General Assembly also granted VMRC broad authority to make regulations regarding the acquisition of seafood, which include establishing licenses and fees for seafood capture devices.[85]

C. Uses Within the Baylor Grounds

Restrictions on the use of the Baylor Grounds reinforce the exclusion of private use. First, areas of bottomland may only be leased on "grounds other than public oyster beds, rocks, or shoals, as defined by law and included in the Baylor survey."[86] Second, VMRC can only "grant easements over or under or lease the beds of the waters of the Commonwealth outside of the Baylor Survey."[87] Thus, one simply cannot lease the bottom beds or obtain easements within the Baylor Survey.[88]

While the Baylor Grounds cannot be leased, rented, or sold, they are held in public trust, so oystermen may harvest oysters on state-owned bottom land.[89] VMRC regulates these public grounds as a public fishery, and has established harvest seasons and areas, day/time limits, gear restrictions, and quota and harvest limits.[90] Under this regulatory framework, many types of gear,

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[81] VA. CODE ANN. § 28.2-553 (1992).
[82] VA. CODE ANN. § 28.2-556 (2001).
[83] The private leaseholder must have petitioned VMRC for a boundary line modification of the public grounds prior to January 1, 2015 and he must have been granted the lease more than five years before that petition. VA. CODE ANN. § 28.2-551.1 (2014).
[84] *Id.*
[85] VA. CODE ANN. § 28.2-201 (2009).
[86] VA. CODE ANN. § 28.2-603.
[87] VA. CODE ANN. § 28.2-1208.
[88] *See, e.g.*, 4 VA. ADMIN. CODE § 20-336-40 ("All proposals for noncommercial shellfish aquaculture structures to encroach in, on or over state-owned subaqueous land which meet the criteria in subdivisions 1 through 3 of 4 VAC 20-336-30 are hereby approved subject to the following conditions: . . . 7. There is expressly excluded from this permit any portion of the waters within the Baylor Survey."); 4 VA. ADMIN. CODE § 20-1130-40 (2007) ("There is expressly excluded from the [general] permit any portion of the waters within the boundaries of the Baylor Survey.").
[89] Schulte, *supra* note 23, at 1.
[90] 4 VA. ADMIN. CODE § 20-720-10 (2012).

including hand tongs, hand scrapes, oyster patent tongs, and oyster dredges, are allowed to be used within the public grounds as long as the owner of the gear obtains an appropriate license.[91] VMRC has included additional restrictions with respect to the use of specific types of gear in certain areas.[92]

Additional types of gear used to catch finfish, such as pound nets, are also allowed in various areas of the Baylor Grounds.[93] Pound nets are defined multiple ways within the Virginia Code and VMRC regulations.[94] Virginia Code requires that a person seeking to take or catch fish with a pound net must obtain a license from the Commissioner[95] and includes other restrictions regarding the length and siting of such nets.[96] VMRC regulations set forth further details, which include licensing procedures, pound net regulation areas, location and measurement requirements, no-fishing zones, and priority rights concerning net locations.[97] VMRC regulations also provide for public notice and review of pound net applications[98] in addition to establishing a limit on the number of pound nets one may operate.[99]

While private caged aquaculture is prohibited in the public grounds, intrusive fishing methods, which involve tongs and dredges, are permitted.[100] Tongs operated by hand or hydraulically, clip direct areas of a reef.[101] Dredges, "metal-toothed frames with an attached bag that are pulled over the bottom by the boat," are dragged over an area of reef, even more damaging than tongs, and "over time, spread the remaining reef material over a wider area, expanding it while reducing reef quality."[102] Conversely, caged aquaculture is less damaging to the actual oyster reefs, resulting in minimal ancillary disadvantages.[103]

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[91] 4 VA. ADMIN. CODE § 20-720-75 (2018); VA. CODE ANN. § 28.2-501 (1992) (dredge and scrape); VA. CODE ANN. § 28.2-503 (1993) (both tongs).
[92] *See, e.g.*, 4 VA. ADMIN. CODE § 20-130-10 (1995) and 4 VA. ADMIN. CODE § 20-780-10(1986) (regarding the use of patent tongs).
[93] *See Pound Net Map*, VA. MARINE RES. COMM'N., https://webapps.mrc.virginia.gov/public/maps/virginia_poundnets.php (last visited July 29, 2019).
[94] VA. CODE ANN. § 28.2-200 (2003) (a pound net is "any net having a funnel mouth, round mouth or square mouth with the head exposed above the water"; 4 VA. ADMIN. CODE § 20-600-20 (1995) (a pound net is "a stationary or fixed fishing device consisting of several stakes or poles which have been pushed or pumped into the bottom and attached netting which forms a straight wall or leader which serves to guide fish through a funnel and heart-shaped enclosure into a terminal head or pocket with a netting floor"); 4 VA. ADMIN. CODE § 20-20-20 (2015) (a pound net is "a fixed entrapment gear attached to posts or stakes with three continuous sections from offshore to inshore consisting of (i) a pound made of mesh netting that entraps the fish; (ii) at least one heart made of a mesh netting that is generally in the shape of a heart and aids in funneling fish into the pound; and (iii) a leader, which is a long, straight element consisting of mesh or vertical lines that directs the fish offshore towards the pound.").
[95] VA. CODE ANN. § 28.2-300 (1992).
[96] *See, e.g.*, VA. CODE ANN. § 28.2-305 (2012); VA. CODE ANN. § 28.2-307 (2009).
[97] 4 VA. ADMIN. CODE § 20-20-10 (2010).
[98] 4 VA. ADMIN. CODE § 20-25-10 (2004)
[99] 4 VA. ADMIN. CODE § 20-600-10 (1995).
[100] VA. CODE ANN. § 28.2-501 and -503; VA. CODE ANN. § 28.2-503; 4 VA. ADMIN. CODE § 20-720-75; *see also* Schulte, *supra* note 23.
[101] Schulte, *supra* note 23, at 10.
[102] *Id.*
[103] *See generally* Elvira A. Baluyut, *Aquaculture Methods and Practices: A Selected Review* ch. 4 (1989), http://www.fao.org/3/t8598e/t8598e05.htm#4.

IV. RECOMMENDATIONS

As the landscape for growing and harvesting wild oysters continues to evolve, consideration should be given to the purpose of the Baylor Grounds to act as a sustainable breeding ground for harvestable oysters. The following section evaluates whether the boundaries of the public oyster beds should be redefined to remove unproductive areas or if caged aquaculture should be permitted within some of these unproductive areas. In addition to maintaining or increasing Virginia's overall oyster harvests, utilizing caged aquaculture within the areas of the public grounds that are no longer naturally productive or not likely to become naturally productive in the future, could be a potential way to create opportunities for watermen currently harvesting a dwindling number of wild oysters to transition to another form of fishing. Potential methods to implement such changes are discussed in more detail below.

A. Change Boundaries of Existing Baylor Grounds

One option would be to change the boundaries of the existing Baylor Grounds. This could be accomplished on a broad scale, as a complete overhaul of the existing boundaries, or on a piecemeal, case-by-case basis.

Using its authority under the state constitution, the General Assembly could order a comprehensive re-evaluation of existing boundary lines or adopt legislation to provide VMRC with clear authority to do so. The benefits of completely redrawing the entire layout of public grounds would allow for increased efficiency and productivity. As mentioned earlier, modern technology has resulted in a more accurate process to discover naturally productive oyster beds, specific points for wildlife sanctuaries, and unproductive grounds. Despite any logistical disadvantages encountered while initially implementing this proposal,[104] utilizing such precision technology to develop a more accurate public grounds map would remain in the best interest of Virginia when viewed on a long-term scale.

Another option is to take an incremental, case-by-case approach. For example, in Maryland, individuals can petition the State's Department of Natural Resources (MDNR) to declassify sections of public shellfish fishery areas (PSFA) through a leasing application if certain criteria are satisfied.[105] The Code of Maryland Regulations states that MDNR may declassify certain PSFAs after quantitative data and commercial harvest activity is reviewed by the MDNR, if the lease application meets certain regulatory requirements and a biological survey conducted by a designated agent or MDNR shows "that the average density of oysters per square meter is equal to or below the maximum threshold of one oyster that is 1 inch or greater per square meter[.]"[106] Similarly, before the New Jersey Shellfisheries Council (NJSC) decides whether to approve a leasing application for caged aquaculture in public waters along the state's Atlantic

[104] It remains to be seen whether a complete overhaul of the boundaries of the public grounds could present logistical hurdles. For example, reallocating already leased private lands to public use would require having to conciliate aggravated lessors who wish to maintain the status quo.
[105] Md. Code Regs. 08.02.04.17(B) (2019).
[106] Md. Code Regs. 08.02.04.17(B)(2)(a) (2019).

Coast, the Bureau of Fisheries must issue a biological survey to the NJSC.[107] This survey assesses whether the public ground on the coastline is so naturally unproductive that aquaculture would enhance shellfish harvesting in that area.[108] The NJSC has stressed that to maintain the sustainability of the shellfish industry in New Jersey, "'[l]ess productive areas' (waters that…do not have a consistent history of natural recruitment) [should be] utilized and enhanced through a carefully managed leasing program."[109] The General Assembly could establish a similar system here in Virginia. For example, if a biological survey, or similar assessment, of the Baylor Grounds determined that certain areas no longer naturally produced shellfish in a sustainable manner, this data could serve as a basis to modify the classification of those areas as Baylor Grounds. In addition to the review of biological factors, the Commonwealth also could include a review of societal factors – such as population density near the grounds and/or the grounds' distance to the shore – as a means of minimizing potential use conflicts resulting from the reclassification.

B. Modifying the Types of Uses Allowed Within Unproductive Areas of the Baylor Grounds

In order to fully utilize the public grounds in a more time-efficient manner, modifications could be made to the Virginia Code and VMRC regulations to specifically allow for the licensing of caged aquaculture within unproductive areas of the public grounds. Similar to the option of redefining the boundaries of the Baylor Grounds, modifying allowable uses within unproductive areas of the Baylor Grounds should be considered. For example, would the Commonwealth want to take an experimental approach[110] or a broader, more comprehensive approach to establish a licensing program for expanding allowable uses within unproductive areas of the public grounds?

As noted previously, different types of equipment are currently allowed for use within the Baylor Grounds. For example, equipment such as tongs, dredges, and scrapes can be used to harvest wild oysters from the Baylor Grounds. Additionally, equipment such as pound nets can be used to harvest finfish in the waters above the Baylor Grounds. Arguably, allowing caged aquaculture in the unproductive areas of the public grounds, through a newly created licensing system, is no different in ecological impact than allowing these existing types of intrusive equipment. Additionally, VMRC has broad authority to make regulations regarding the acquisition of seafood, which include establishing licenses and fees for seafood capture devices.[111] VMRC utilizes this authority to establish the licensing arrangements for different types of gear, and they could potentially utilize this same authority to establish a licensing framework for caged aquaculture within the public grounds.

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[107] N.J. Admin. Code § 7:25-24.6(d)(2) (2019).
[108] *Shellfish Aquaculture Leasing Policy of the Atlantic Coast Section of the New Jersey Shellfisheries Council*, N.J. DIV. OF FISH & WILDLIFE 7 (2019).
[109] *Id*.
[110] Experimental fisheries are already a large part of federal fishery management practices. See 50 C.F.R § 648.12 (experimental fishing); 50 C.F.R § 600.745 (exempted educational, research, or educational activity). Similar to these existing examples of experimental approaches, the specific framework for allowing experimental caged aquaculture within the unproductive areas of the public grounds could be limited by multiple factors such as time, location, size, and number of licensees.
[111] VA. CODE ANN. § 28.2-201.

Although the use of cages differs from the use of tongs, dredges, and scrapes in that the cages would be present within the public grounds for the entire grow-out of the cultured oysters, rather than only at the time of actual harvest, the use of cages is no more damaging to the public grounds themselves than those types of gear. Additionally, gear used to catch finfish, such as pound nets, are allowed to be installed as stationary devices on the bottomland within the public grounds for extended periods of time. For this reason, it is beneficial to evaluate the licensing framework regarding pound nets in order to determine whether such an approach could be developed for caged aquaculture. VMRC regulations regarding pound nets include multiple chapters that cover procedures for licensing, location, measurements, marking of the gear, priority rights with respect to license renewals, and limitations on the overall number of licenses.[112] Many of these elements could be modified to apply to caged aquaculture usage; however, it might be beneficial to capture the entire regulatory framework within one chapter of the Virginia Code rather than spreading it out over multiple chapters. The following outline provides an example of how such a chapter within Title 4, *Conservation and Natural Resources*, Agency 20, *Marine Resources Commission*, might be structured while briefly describing specific considerations and content for each section:

- Chapter 1340, *Pertaining to the Licensing of Shellfish Aquaculture Structures*: Specific consideration would need to be given to phrasing to convey the type of regulated gear. The current suggested language is based on Chapter 335, *Pertaining to on-Bottom Shellfish Aquaculture Activities*:
    - Section 10, *Purpose*: This section would include a general purpose statement for the chapter. The specifics of this statement would depend upon how the remaining sections of the chapter are structured.
    - Section 20, *Definitions*: This section would define key terms and phrases that are used throughout the chapter. Like the previous section, the specific terms and phrases included would depend on the content of the remaining sections.
    - Section 30, *Aquaculture Structures Siting Public Interest Review*: This section could set forth the procedures for public notice and review of applications to place the structures within the public grounds. Chapter 25 of VMRC's regulations,[113] *Pertaining to Pound Net Siting Public Interest Review*, could serve as guidance for further development of this section.
    - Section 40, *Location, Measurements, and Marking of Shellfish Aquaculture Structures*: This section would detail any required distance from the shoreline, depth of water, limit on the density of structures, and any other special parameters regarding the location, size, and marking of the licensed structures.
    - Additional elements could be incorporated, either within the sections detailed above or within separate sections, to include limitations on the overall number of licenses that will be available, general length of licenses, potential input or output requirements regarding the license renewals, and priority rights concerning license renewals.

[112] 4 VA. ADMIN. CODE §§ 20-20-10 *et seq.*; 20-25-10 *et seq.*; 20-600-10 *et seq.* (Chapter 600, *Pertaining to Pound Net License Sales*, cites to VA. CODE ANN. § 28.2-204.1, as well as VA. CODE ANN. § 28.2-201 for authority).
[113] 4 VA. ADMIN. CODE § 20-25 *et seq.*

Another framework to consider in formulating the structure of a licensing program for aquaculture within unproductive areas of the public grounds, is the Commonwealth's previous attempt to establish a program for water column leases for aquaculture purposes via legislation in 2004.[114] Ultimately, state funding was not included in the general appropriation act for the period of July 1, 2005, through June 30, 2006, so these provisions did not take effect.[115] However, similar to the pound net licensing example discussed above, the structure of the water column leasing approach is informative. Proposed sections of the leasing program defined key terms, identified eligible applicants, established parameters for the VMRC to use in reviewing applications, and included requirements related to public notice, survey and marking, annual rent, and reporting and production.[116] There are also provisions regarding lease duration, transfer, and termination.[117] Additionally, the legislation clarified the rights of riparian owners, the lessee, and the public and included provisions regarding submerged aquatic vegetation, navigation, water quality standards, health and sanitation, imported species, harvest restrictions, and the maintenance or removal of structures within the leased area.[118]

V. CONCLUSION

In order to increase the productivity of its oyster fishery, the Commonwealth could either modify the boundaries of the Baylor Grounds or modify the uses allowed within the existing grounds. These options may require changes to state code or agency regulations, or a combination of the two. In determining which of these options to pursue, consideration should be given to the long-term sustainability of oyster production in Virginia and, ultimately, which path forward best matches with the Commonwealth's desired policy goals with respect to shellfish production.

[114] Va. Acts 2004 ch. 892, *available at* http://lis.virginia.gov/cgi-bin/legp604.exe?041+ful+CHAP0892 (to establish VA. CODE ANN. §§ 28.2-1600 to -1632).
[115] VA. CODE ANN. §§ 28.2-1600 *et seq.* (stating that the provisions of Chapter 16 are "not in effect").
[116] VA. CODE ANN. §§ 28.2-1600 to -1609.
[117] VA. CODE ANN. §§ 28.2-1610 to -1612.
[118] VA. CODE ANN. §§ 28.2-1613 to -1622.