Amendment 1 to the

2019 Maryland Chesapeake Bay

Oyster Management Plan

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DRAFT

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Introduction

Fishery Management Plans (FMPs) serve as a framework for conserving and wisely using fishery resources. An FMP provides a format for undertaking management measures throughout Maryland state waters. In addition, FMPs allow the Department of Natural Resources (Department or DNR) to specifically address issues that are unique to Maryland resources. The goal of an FMP is to protect the resource while allowing sustainable harvest. Therefore ecological, economic and sociological factors affecting the resource are considered in the process. Elements of a plan include: quantifying biologically appropriate levels of harvest; identifying habitat requirements and recommending protection and restoration measures; expanding single-species management to include ecosystem-based approaches; monitoring the status of the resource, including fishery dependent and independent surveys; and defining and enforcing management recommendations. The Department uses FMPs to guide actions taken to conserve and manage the species.

The Eastern oyster (*Crassostrea virginica*) is native to coastal waters from the Gulf of St. Lawrence in Canada to the Atlantic coast of Argentina. It is common in estuaries and coastal areas of reduced salinity and can occur as extensive reefs or bars on hard to firm bottoms in both the intertidal and subtidal zones. In Maryland's portion of the Chesapeake Bay, variable salinity and temperature regimes are the primary environmental determinants of oyster population dynamics given their influence on reproduction, growth and mortality. The most recent FMP for oysters is the Maryland Chesapeake Bay Oyster Management Plan (May 2019)[1] (OMP). Shortly after adoption, the Department was directed by the Maryland General Assembly to convene the Oyster Advisory Commission (OAC) to develop a package of consensus recommendations for enhancing and implementing the FMP for oysters. This Amendment addresses the recommendations.

Background

Sections 4-204 and 4-215 of the Natural Resources Article, Annotated Code of Maryland were amended in 2020 (2020 Md. Laws, Chap. 5 and 9). The legislation required the Department of Natural Resources, in coordination with the University of Maryland Center for Environmental Science, to convene the OAC to develop a package of consensus recommendations for enhancing and implementing the FMP for oysters.

The OAC was restructured and began meeting in February 2020 to comply with the new statutory mandates. The group developed a package of consensus recommendations through a facilitated consensus solutions process based on a 75% majority agreement level for each recommendation. The process was informed by a collaboratively developed, science-based modeling tool used to quantify the long-term impacts of management actions and possible combinations of management actions on oyster abundance, habitat, harvest, harvest revenue, and nitrogen removal. The OAC provided the Department with an approved package of 19 recommendations (Appendix 1) in November of 2021[2] which were based on options that were rated with an agreement level of 75% or higher.

Purpose

The purpose of Amendment 1 to the 2019 Oyster Management Plan (Amendment) is to formally update the oyster management framework in Maryland. The Amendment incorporates recommendations from the OAC to further define strategies for protecting, rebuilding, and managing the native oyster population. The OAC recommendations correspond to several current actions, strategies, and goals in the OMP, but some recommendations require new actions to be added. One existing action is replaced and ten new actions are defined in this amendment.

Adaptive Management (Section 2.3 of the OMP)

In 2007, the Maryland General Assembly passed legislation that required the Department to establish the OAC (2007 Md. Laws, Chap. 114). This legislation directed the OAC to:

- Review the best possible science and recommend changes to the framework and strategies for rebuilding and managing the oyster population in the Chesapeake Bay under the Chesapeake Bay Oyster Management Plan;
- Review the latest findings of the multi-state and federal government's Environmental Impact Statement evaluating native and nonnative oyster restoration alternatives for the Chesapeake Bay; and
- Review any other scientific, economic, or cultural information relevant to oysters in the Chesapeake Bay.

Throughout 2017 and 2018, the first oyster stock assessment was presented to the OAC to solicit feedback on data sources, assessment methodologies, and results. Since adaptive management requires feedback, flexibility, and the ability to adapt and make necessary changes, the Department continues to utilize the OAC to solicit feedback on the assessment.

Action 2.3.4
Utilize the Oyster Advisory Commission to review and comment on applicable studies and stock assessments when requested by the Commission.

Substrate (Section 3.0 of the OMP)

The OMP substrate strategy is to promote the conservation and protection of natural oyster substrate (oyster shell) and evaluate and utilize alternative substrates as a method to ensure that the rate of habitat accretion exceeds loss. Action 3.0.8 in the OMP was determined to be no longer relevant. Amendment 1 replaces the previous action with new Action 3.0.8.

Action 3.0.8
Review the current state laws and regulations to evaluate and develop potential strategies including private sector engagement, public-private partnerships (P3s), and economic incentives to retain and reuse processed shell in Maryland.

Action 3.0.10
Develop and support a subcommittee within the Oyster Advisory Commission which will evaluate strategies, costs, and benefits for substrate enhancement.

Action 3.0.11
Evaluate the effectiveness of bar cleaning in low or underperforming harvest areas to promote improved spat sets, in collaboration with the Oyster Advisory Commission when requested by the Commission.

Sanctuary (Section 5.0 of the OMP)

The Eastern Bay region is a mixed-use region with sanctuaries, public fishery bottom, and shellfish aquaculture, which garnered concern from the OAC. During the 2019-2021 OAC's consensus process, many different management strategies were examined using a dynamic population model to predict future impacts of each management strategy on abundance, harvest, and habitat. One management option consisting of a combination of oyster restoration and replenishment in the Eastern Bay region was predicted by the model to increase abundance, harvest, and habitat, and thus was supported by the OAC.

There are seven sanctuaries in the Eastern Bay region (Eastern Bay, Cox Creek, Cabin Creek, Prospect Bay, Mill Hill, Wye River and Miles River sanctuaries) consisting of 4,937 acres of historic oyster bottom as identified by the 1906-1912 Yates Survey plus its amendments.

The Eastern Bay region was once a highly productive region; however, due to low spatfall and declining substrate and broodstock among other factors, the region's oyster population has been declining. The latest Oyster Management Review[3] ranked these areas as:

- Level C (below average productivity): Mill Hill Sanctuary
- Level D (low productivity): Wye River Sanctuary and Miles River Sanctuary
- Level E (insufficient data to classify): Cox Creek Sanctuary, Eastern Bay Sanctuary, Prospect Bay Sanctuary and Cabin Creek Sanctuary

Given the decline in the oyster population and habitat in the Eastern Bay region, the Department should work towards restoring these oyster sanctuaries. A plan should be developed to assess the current habitat and oyster population in the region and outline a method forward to increase oyster populations, broodstock, and habitat. Data from a new Chesapeake Bay bottom survey within the region will accurately identify acres suitable for restoration, and ground truthing surveys would confirm which restoration treatment to apply to each restoration site. Goals and objectives should be clearly defined in the plan and metrics developed to determine if those goals and objectives are being met.

Action 5.0.8
Develop and implement a plan to restore sanctuary oyster bottom in the Eastern Bay region. Evaluate the effectiveness of this plan every five years.

Fishery Management (Section 6.0 of the OMP)

Fishery stock assessments can be used to assess existing population status as well as predict future population status. The current oyster stock assessment is utilized only to assess the existing oyster population, however it could be altered to also project future abundance and harvest after additional work with the University of Maryland. The future projections could be

used to assist with annually setting harvest limits depending if the forecast indicated notable shifts in the marketable stocks, either up or down. Caution should be exercised when examining future projections because models, like stock assessments, can never truly mimic or predict nature and sudden environmental changes can cause projections to be incorrect.

Action 6.0.7
Consider altering the oyster stock assessment model to allow for future projections of abundance and harvest.

In addition to recommending action related to the sanctuaries in the Eastern Bay region, as described in the previous section, the OAC also recommended action related to fishery management within the region. There are three NOAA Code harvest areas within the Eastern Bay region (039 Eastern Bay, 099 Wye River, and 060 Miles River) which include 15,358 acres of historic oyster bottom, as identified by the 1906-1912 Yates Survey and its amendments, that are not in sanctuaries. The Wye River NOAA Code harvest area is fully encompassed by the Wye River Sanctuary. The Eastern Bay region currently has twelve active shellfish aquaculture leases (as of September 2022).

The Eastern Bay region was once a highly productive region, however, due to low spatfall and declining substrate and broodstock among other factors, the region's oyster population has been declining (Figure 1). The latest Oyster Management Review[3] report ranked these areas as:

- Level C (below average productivity): Eastern Bay NOAA Code Harvest Area 039
- Level D (low productivity): Miles River NOAA Code Harvest Area 060

Given the decline in the oyster population, harvest, and habitat in the Eastern Bay region, the Department should work towards replenishing the public fishery bottom. A plan should be developed to assess the current habitat and oyster population in the region and outline a method forward to increase oyster populations, oyster broodstock, habitat, and productivity. Data from a new Chesapeake Bay bottom survey within the region accurately identify acres suitable for replenishment. Goals and objectives should be clearly defined in the plan and metrics developed to determine if those goals and objectives are being met.

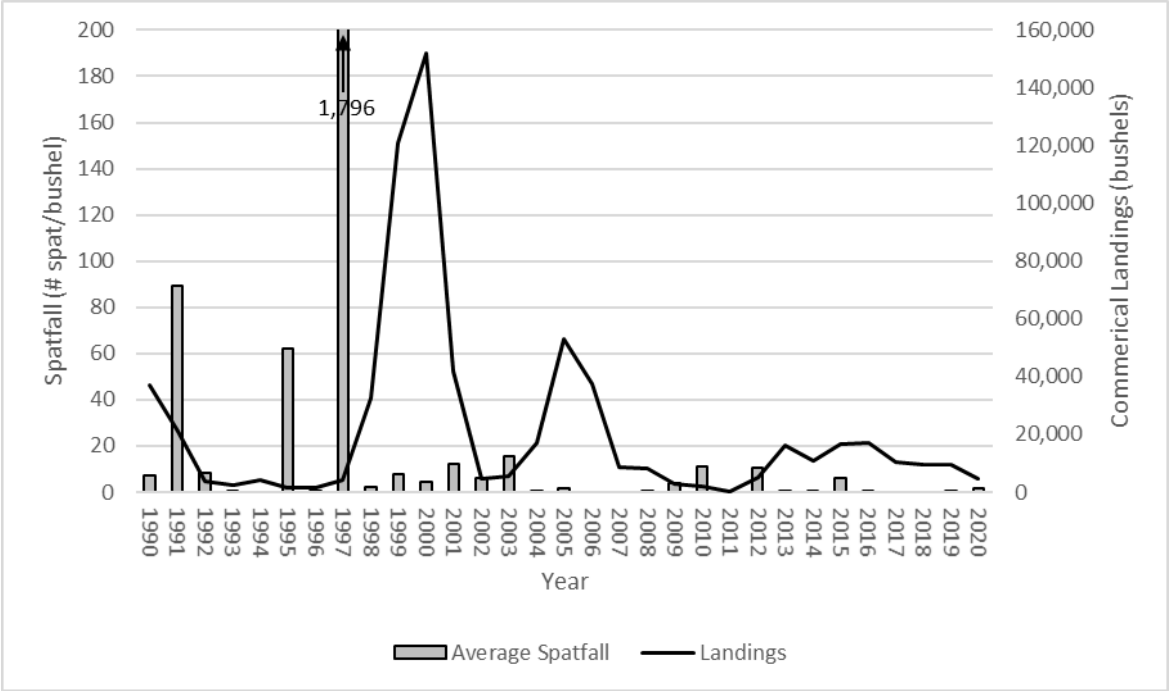

Figure 1. Commercial oyster landings (bushels) as reported by seafood dealer buy tickets and average spat per bushel in the Eastern Bay region of Maryland's portion of the Chesapeake Bay.

Action 6.6.5
Develop and implement a plan to replenish public fishery oyster bottom in the Eastern Bay region. Evaluate the effectiveness of this plan every five years.

Aquaculture (Section 7.0 of the OMP)

The actions and strategies in this section enhance and support aquaculture throughout the Chesapeake Bay. The OAC recommended action related to shellfish aquaculture in Eastern Bay. Actions 7.0.1 and 7.0.2 address the recommendations baywide including this specific region by providing existing and potential new aquaculture industry participants with the tools, resources, and support necessary to conduct shellfish aquaculture in Eastern Bay.

Monitoring (Section 8.0 of the OMP)

In 2021, the Maryland General Assembly passed legislation that required the Department to create a mobile mapping application (2021 Md. Laws, Chap. 169). Shellfish Waters of the State of Maryland[4], a mobile mapping application, was developed using interactive maps to aid an individual on Maryland's portion of the Chesapeake Bay in determining their location, in real time, relative to: aquaculture leases; demonstration leases; fixed fishing devices - registered pound net sites; natural clam or oyster bars; oyster sanctuaries; Public Shellfish Fishery Areas;

Submerged Aquatic Vegetation Protection Zones; Yates Bars; and any other data areas that the Department deems relevant.

Action 8.0.9
Continue supporting a mobile mapping application related to shellfish management.

Socioeconomic Considerations (Section 9.0 of the OMP)

In 2022, the Maryland General Assembly passed legislation that created a loan program to finance eligible seafood processing projects (2022 Md. Laws, Chap. 30). This supports the goal of increasing the amount of shell retained in Maryland and returned to Maryland's portion of the Chesapeake Bay and its tidal tributaries. Loan forgiveness could occur for returning shucked shell or producing spat-on-shell with the shucked shell and planting the shell or spat-on-shell to Maryland's portion of the Chesapeake Bay and its tidal tributaries.

Action 9.0.4
Support the enhancement of oyster processor capabilities and techniques.

The Department provides education and outreach on all managed fisheries through its education programs and its partnerships with other organizations and state and federal agencies. Commercial fishing licensees also pay a seafood and aquaculture products marketing surcharge which contributes to a fund that provides outreach materials related to fishery products harvested in Maryland.

Action 9.0.5
Support outreach and education to enhance awareness of the oyster resource, including the fishery and its ecosystem benefits.

Ecosystem Considerations (Section 11.0 of the OMP)

Under natural conditions, oyster reefs and bars are composed of shell and live oysters. However, shell degrades due to a combination of taphonomic factors, where shell is lost through chemical (e.g., dissolution), physical (e.g., sedimentation, subsidence, breakage, dislodgement from the bar), and biological (e.g., shells riddled by boring sponges, polychaete worms, etc.) processes. For reefs and bars to build, the rate of shell accretion must exceed the rate of shell loss, which under natural conditions occurs by some small amount.

Alternative substrates may also be used to build reefs and bars, acting as a base for oysters to naturally recruit on or to plant hatchery spat-on-shell on. Loss of alternative substrate such as stone could occur through sedimentation over time, just as it does with shell, however the rate of loss is unknown and may vary by location.

Action 11.0.7
Evaluate the rate of shell and artificial substrate loss in the Maryland portion of the Chesapeake Bay.

References

[1] Maryland Department of Natural Resources. 2019. Maryland Chesapeake Bay Oyster Management Plan (May 2019). https://dnr.maryland.gov/fisheries/Documents/MD_Oyster_FMP-2019.pdf

[2] Maryland Department of Natural Resources Fishing and Boating Services and the Oyster Advisory Commission in consultation with The University of Maryland Center for Environmental Science. 2021. Final Report: Oyster Advisory Commission Consensus Recommendations on Oyster Management. Pg 475. https://dnr.maryland.gov/fisheries/Documents/Final_Report_OAC_SB0808_HB0911.pdf

[3] Maryland Department of Natural Resources. 2021. Oyster Management Review: 2016-2020. https://dnr.maryland.gov/fisheries/pages/oysters/5-year-oyster-review-report.aspx

[4] Shellfish Waters of the State of Maryland. https://dnr.maryland.gov/fisheries/pages/ishellfish/main.aspx

Appendix - 2021 Oyster Advisory Commission Recommendations

OYSTER ADVISORY COMMISSION RECOMMENDATION	DNR RESPONSE
DNR should evaluate and develop cost effective strategies for identifying and obtaining sources of shells and substrate.	This recommendation is addressed by Action 3.0.5. No change to the management plan.
DNR should review the current state laws and regulations to evaluate and develop potential strategies, including providing economic incentives, to retain shell in the state of Maryland and reuse it.	This recommendation is partially addressed by Action 3.0.8. Action 3.0.8 is replaced so that the recommendation can be fully incorporated.
DNR should support a Maryland-wide substrate action subcommittee of the OAC to evaluate strategies, costs, and benefits for substrate enhancement.	This recommendation is addressed by new Action 3.0.10.
DNR should work collaboratively with the OAC to commission an academic peer-reviewed study to evaluate the ability of bar cleaning in low/underperforming harvest areas to promote improved spat sets.	This recommendation is addressed by new Action 3.0.11.
DNR should work to improve the Fall Dredge Survey (e.g., new locations, fall dredge survey before the start of fishery, cooperative survey with industry, etc.).	This recommendation is addressed by Action 8.0.7. No change to the management plan.
DNR should develop tools to mark navigation hazards and oyster management boundaries.	This recommendation is addressed by new Action 8.0.9.
Over the next 25 years, a combination of replenishment, restoration and aquaculture activities should be collectively planned and undertaken in Eastern Bay, with an equal amount of funding for spat planting in sanctuaries ($1M annually adjusted for inflation) and for spat and shell planting on fishery bars ($1M annually adjusted for inflation) in addition to current replenishment and restoration activities. The effectiveness of this option should be evaluated every 5 years.	This recommendation is addressed by two new actions 5.0.8 and 6.6.5 and existing Strategy 7.0 and Actions 7.0.1, 7.0.2, and 7.0.3.
The OAC supports keeping the oyster fishery open.	This recommendation is addressed by the goal of the OMP. No change to the management plan.

OYSTER ADVISORY COMMISSION RECOMMENDATION	DNR RESPONSE
The OAC supports replenishment plantings on oyster fishery bottom.	This recommendation is addressed by Strategy 6.6. No change to the management plan.
Improve organization and cooperation among groups and integrate projects across the 3 sectors (fishery, aquaculture, restoration).	This recommendation is addressed by Overarching Oyster Resource Objectives 6 and Action 2.5.1. No change to the management plan.
Improve processor capabilities and techniques (e.g., more shucking houses, develop frozen product).	This recommendation is addressed by new Action 9.0.4.
Use bars north of the Bay Bridge as “investments” against disease outbreaks in lower Bay.	This recommendation is addressed by Strategy 2.4. Oyster bars north of the Gov. William Preston Lane Jr. Memorial Bridge (Bay Bridge) are located in low salinity areas whereas there is low natural recruitment and low disease pressure as compared to bars in Maryland’s lower Chesapeake Bay and tributaries located in higher salinity. Continually planting seed (wild seed and hatchery spat-on-shell) on bars north of the Bay Bridge could increase the oyster population in lieu of natural recruitment and is more efficient than planting only substrate. The planted seed could also serve to increase or maintain harvest especially during a disease outbreak in the lower Chesapeake Bay. Bars north of the Bay Bridge are subjected to intermittent, long-term freshetts that can result in substantial mortality thus proposed planting sites should be assessed for past freshet impacts. No change to the management plan.
Use nutrient credit opportunities to help finance restoration on sanctuaries and replenishment on public fishery bottom in Maryland’s Chesapeake Bay.	This recommendation is currently addressed by Action 11.0.5 and Action 11.0.6. No change to the management plan.
Special effort should be placed on outreach and education in minority communities to enhance awareness of the oyster resource and associated career opportunities and environmental benefits.	This recommendation is addressed by new Action 9.0.5.

OYSTER ADVISORY COMMISSION RECOMMENDATION	DNR RESPONSE
Conduct a comprehensive survey of the Maryland Bay bottom with a focus on describing the current amount, quality, and location of oyster habitat.	This recommendation is addressed by Action 3.0.6. No change to the management plan.
Develop the ability to make stock assessment projections of abundance and harvest.	This recommendation is addressed by new Action 6.0.7.
Determine ways to reduce sedimentation.	This recommendation is addressed by the goal of the current OMP whereas achievement of the goal could accelerate recovery of the Chesapeake Bay and improve water clarity by filtering sediment and phytoplankton from the water, in turn reducing nitrogen and phosphorus levels. It is also addressed by Action 3.0.3 and by the twelfth Research Need in the current OMP. No change to the management plan.
Conduct studies to estimate the loss rates of shell (both newly planted and existing bottom) and artificial substrate.	This recommendation is addressed by new Action 11.0.7.
OAC should be a mechanism for reviewing studies and stock assessments, as requested by commissioners.	This recommendation is addressed by new Action 2.3.4.