

# Oyster Habitat & Population Enhancement in Maryland

2022 Oyster Habitat Managers and Practitioners Workshop

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### **Maryland Oyster Management**

- balance among three priorities







#### **Aquaculture: Oyster Harvest**





### **Shellfish Division - Md DNR**

#### • Public Fishery

- Sanctuaries
- Monitoring

Regs, Policies

Seed and Shell Plantings Stone Plantings

Oyster Hatchery Harvest Limits "Fall Oyster Survey" Stock Assessment

Oyster Committees Oyster Advisory Commission

Outreach Partners, etc, etc.

Aquaculture is under a different Division

(also clams)









#### **Harvest Management**

Harvest managed by:

- Season length and # days/week
- Bushel limits per gear type
- Set annually based on stock assessment and monitoring data



Must pay an additional license surcharge fee to actually harvest oysters

- 2,828 commercial fishing licenses exist for fish, crabs etc....but only...
- 812 to 1,228 *oyster surcharges* are bought per year (data: last 10 years)
- But even less than this number actually harvest oysters (note: a person might pay the surcharge but never oyster)

Harvest is allowed in all open areas. Majority of harvest areas are open.

• Some planted sites are closed at the request of County Oyster Committees to allow undisturbed growth of planted seed to market size.

### Public Fishery Bottom & Enhancement





Habitat and population enhancement on public fishery bottom

Over 1,000 oyster bars

• 248,476 acres not in sanctuaries

Total planting since 2010 (orange areas on map)

- >1.5M bushels of fresh shell
- >160k bushels of natural seed
- >2.3B hatchery spat

Acres = historic oyster bottom charted in the Yates Survey from 1906 to 1912 plus its amendments.

# Public Fishery Bottom & Enhancement



Methods often include Watermen

-Planting "fresh shells" from shucking houses by hiring watermen with large workboats called runboats or buyboats.

-Planting natural seed (when available) using runboats and buyboats as above.

-Purchasing spat from "vendors" who bid on seeding projects. Vendors are often watermen who set up remote setting tanks on their property. They buy larvae and shells, set the spat, and then plant the "spat-on-shell" on specified bars. Some vendors are seafood dealers, not watermen.

### Public Fishery: Plantings by Year





Dredged Shell: buried and extracted by dredging

Fresh Shell: from shucking houses









#### **Habitat and Seed Funding**

Public Fishery Shell and Seed Planting Program

- ~\$1M to \$2.3M state funds annually
  - Taxes: \$1/bu harvest tax. 30 cent/bu export tax
  - Oyster license surcharge fee: \$300 each
  - Grant: from MD Dept of Transportation
- Private Waterman Association funds and other funding

Large-Scale Sanctuary Restoration: Seed and Substrate Construction
\$65M to date

• About 47% State, 30% USACE, 16% NOAA, 6% Other

#### Small-Scale Sanctuary Restoration

- State funded \$250k/yr
- Marylanders Grow Oysters Program ~ <sup>1</sup>/<sub>3</sub> state funded, rest private funded
- Build-A-Reef program private funds



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#### **MD Sanctuaries**

#### 51 sanctuaries as of 2010

78,961 acres of oyster bottom

- Ongoing habitat and population enhancement
  - Large-scale restoration in 5 sanctuaries
  - Small-scale restoration in some of the other 46 sanctuaries (most sanctuaries are left to nature)



Acres = historic oyster bottom charted in the Yates Survey from 1906 to 1912 plus its amendments.



### **Large-Scale Oyster Restoration**

## Chesapeake Bay Watershed Agreement (2014)

Reaffirmed the 2009/10 commitment to restore native oyster habitat and populations in 10 Bay tributaries by 2025

- Five in Maryland
- Five in Virginia

The 2014 Agreement added: "and to ensure their protection".

Maryland.....since 2012

- Over 900 acres have been initially restored with work still ongoing
- Over 5.5 billion hatchery spat planted
- Estimated cost for planting stone and spat on a site is \$142K/acre





### **Sanctuary Terminology**

**Initial Restoration** - Substrate reef base constructed (if needed) and the first seeding conducted

**Premet** - Sites that already meet the density and biomass targets (no restoration treatment required)

**Seed Only** - Sites that already have a suitable reef base but require higher oyster density and biomass (hatchery spat-on-shell planting required)

**Substrate and Seed** - Sites that require substrate as a reef base and hatchery spat-on-shell

**Second seeding** - If sites are faring as expected based on monitoring occurring 3 years post-initial restoration, then a second seeding occurs. If faring better than expected, no second seeding is needed.

**Completed Restoration** - All restoration treatments have been applied



### Restoration Metric Success Criteria



#### A successfully restored <u>reef</u> should have:

- •*Minimum threshold*: 15 oysters and 15 grams dry weight per m<sup>2</sup> covering at least 30% of the target restoration area at six years post restoration;
- •*Target*: 50 oysters and 50 grams dry weight per m<sup>2</sup> covering at least 30% of the target restoration area at six years post restoration;
- •Two or more oyster year classes present; and
- •Stable or increasing spatial extent, reef height, and shell budget.

#### A successfully restored <u>tributary</u> is one where:

- •50 to 100% of the currently restorable oyster habitat has oyster reefs that meet the reef-level metrics above; and
- •8 to 16% of historic oyster habitat (or more) has oyster reefs that meet the reef-level metrics above



#### **Restoration Treatment Types**



Each reef has an initial seeding at year 0 followed by a second seeding at year 4 17



### **Restoration Treatment Types**

#### **Substrate Materials - options**

- Large-Scale Restoration
  - Locally sourced granite used the most as it is readily available
  - Florida fossil shell used once
  - Mixed clam shell not enough available
  - Reef balls rare, but used
- Other Past Projects
  - Slag
  - Concrete
  - Limestone
  - Dredged Shell
  - Fresh Shell

#### **Planting Details**

Sanctuary Bottom Plantings

- Restoration Substrate
  - Planted 1 foot thick
  - Multiple bathymetry surveys pre, during, and post construction to ensure built to specification
- Restoration hatchery spat-on-shell
  - Initial seeding of 4-6M per acre
  - 2nd seeding (if needed) of ~2M per acre

#### **Public Fishery Bottom Plantings**

- 1-3 inch thick shell plantings
- 1M to 3M hatchery spat-on-shell per acre



#### Progress

### **Oyster Reef Restoration Progress Dashboard**

Tributary Restoration Plan	Initial Reef Construction and Seeding	Monitoring and Evaluation	Completed/Target Acreage (2022)
25% 50% 75% 100%	25% 50% 75% 100%	25% 50% 75% 100%	25% 50% 75% 100%
Harris Creek	Harris Creek	Harris Creek	Harris Creek 348/348
Little Choptank	Little Choptank	Little Choptank	Little Choptank 358/358
Tred Avon	Tred Avon	Tred Avon	Tred Avon 130/130
	: : :		
Upper St. Mary's	Upper St. Mary's		Upper St. Mary's 60/60
Manokin			82/ 441

LOREM

### Large-Scale Restoration Results



Six-year-old reefs (Harris Creek and Little Choptank River reefs combined):

- 99% of restored reefs met the minimum oyster density success criterion
- 83% met the higher target density
- 100% of restored reefs met the multiple year class and shell budget success criteria





### **Harris Creek Sanctuary**

Restoration began in 2011.

Initial restoration was completed in 2015.

348 acres initially restored Substrate & Seed: 196.9 acres Premet: 3.4 acres Seed Only: 148 acres

Seed planted: 2.49 billion

First of the five tributaries completed toward the 2014 Chesapeake Bay Watershed Agreement.

Monitoring is completed.

6-year monitoring results:

98% of reefs met threshold oyster density98% of reefs met threshold biomass100% had multiple year classes present100% had stable or increasing shell budget





### **Little Choptank River Sanctuary**

Restoration began in 2014.

Initial restoration completed in 2020. Second seeding ongoing.

358 acres initially restored Substrate & Seed: 125.8 acres Premet: 6.7 acres Seed Only: 225.7 acres

Seed planted: 1.85 billion (as of 2021)

Second of the five tributaries completed toward the 2014 Chesapeake Bay Watershed Agreement.

Monitoring is ongoing: so far 100% of 6-yr old reefs are meeting threshold success metrics





#### **Tred Avon River Sanctuary**

Restoration began in 2015.

Initial restoration completed in 2021. Second seeding ongoing

130 acres initially restored Substrate & Seed: 64.7 acres Premet: 0.4 acres Seed Only: 65.5 acres

Seed planted: 926 million (as of 2021)

Third of the five tributaries completed toward the 2014 Chesapeake Watershed Bay Agreement.

Monitoring is ongoing: so far 86% of 3-yr old reefs are meeting threshold success metrics. No reefs have had the 6-yrs monitoring yet.



#### Upper St Marys River Sanctuary

Restoration began in 2021.

Initial restoration completed in 2022.

60 acres initially restored Substrate & Seed: 8.7 acres Premet: 34.9 acres Seed Only: 16.5 acres

Seed planted: 151.2 million (as of 2021)

Fourth of the five tributaries completed toward the 2014 Chesapeake Bay Watershed Agreement.

Monitoring and second seedings to start, now that construction is completed.







#### **Manokin River Sanctuary**

Restoration began in 2021.

Initial restoration is ongoing.

441 acres planned to be initially restored Substrate & Seed: 141 acres expected Premet: 0 acres Seed Only: 300 acres expected

Seed planted: 73.4 million (as of 2021) Substrate placed: 15 acres (as of 11/2022)

Fifth of the five tributaries toward the 2014 Chesapeake Watershed Bay Agreement.



#### **Oyster Monitoring**





Fall Oyster Dredge Survey

- Since 1939
- 200-400 samples annually

Patent Tong Population Surveys
~4 to 8 sanctuaries annually

 Large-Scale Restoration Monitoring
3 and 6 years after restoration
Determines if meets success metrics



#### **Oyster Monitoring: Fall Survey**

Fall Oyster Survey

- Spat Set (spat per bushel)
- Disease (MSX and Dermo)
- Mortality (observed)
- Biomass (index since 1994)

https://dnr.maryland.gov/fisheries/pages/shellfishmonitoring/reports.aspx



#### **Oyster Monitoring: Fall Survey**



2020 -Higher spatsets were more concentrated Primarily in the lower Eastern Shore and Choptank R and its tributaries



-Higher spatsets were more widely distributed Lower E. and W. Shores, plus the Eastern Bay region had its best spatset in decades

Similar graphs for disease and mortality across years

#### Oyster Population Estimated from the Stock Assessment





https://dnr.maryland.gov/fisheries/pages/oysters/oyster\_stock\_assess.aspx <sup>29</sup>

### Lessons Learned and Future Projects



#### Adaptive learning from large-scale restoration

- Potential cost savings on planned second seeding
- Higher resolution of pre-restoration groundtruth survey
- Deeper water clearance needed on substrate restoration sites
- Planting density amount of spat and amount of shell with spat



#### Still to be learned from large-scale restoration

- Impacts to ecosystem tributary wide?
- Far-field effects are sanctuaries increasing spat sets elsewhere (baywide)?
- Long-term (+20 years) results

#### **Future projects**

- Eastern Bay multi-use area to replenish fishery bottom, restore sanctuary bottom, and increase aquaculture
- New Bay Bottom Survey to identify current oyster habitat



### **Other Information**

Five Year Oyster Management Review Reports <u>https://dnr.maryland.gov/fisheries/pages/oysters/5-year-oyster-review-report.aspx</u>

Oyster Advisory Commission https://dnr.maryland.gov/fisheries/pages/mgmt-committees/oac-index.aspx

Aquaculture Coordinating Council <u>https://dnr.maryland.gov/fisheries/pages/mgmt-committees/acc-index.aspx</u>

Oyster Management Plan https://dnr.maryland.gov/fisheries/pages/fmp.aspx

MD DNR Shellfish Program Website https://dnr.maryland.gov/fisheries/pages/oysters/index.aspx

MD DNR Aquaculture Program Website <a href="https://dnr.maryland.gov/fisheries/pages/aquaculture/index.aspx">https://dnr.maryland.gov/fisheries/pages/aquaculture/index.aspx</a>