NOAA FISHERIES

Large-Scale, Non-Harvest Oyster Restoration in Chesapeake Bay

Photo: Oyster Recovery Partnership

Developed for:
2025 Coastal Ecological Restoration Technical Workshop
September 11, 2025

Stephanie Reynolds Westby
NOAA Restoration Center
stephanie.westby@noaa.gov

What did we set out to do?

Collective goal:

- *Restore oysters in 10 Chesapeake tributaries by 2025, and ensure their protection.* (2014 Chesapeake Bay Watershed Agreement)
- All sanctuary (non harvest)
- Multi-partner effort

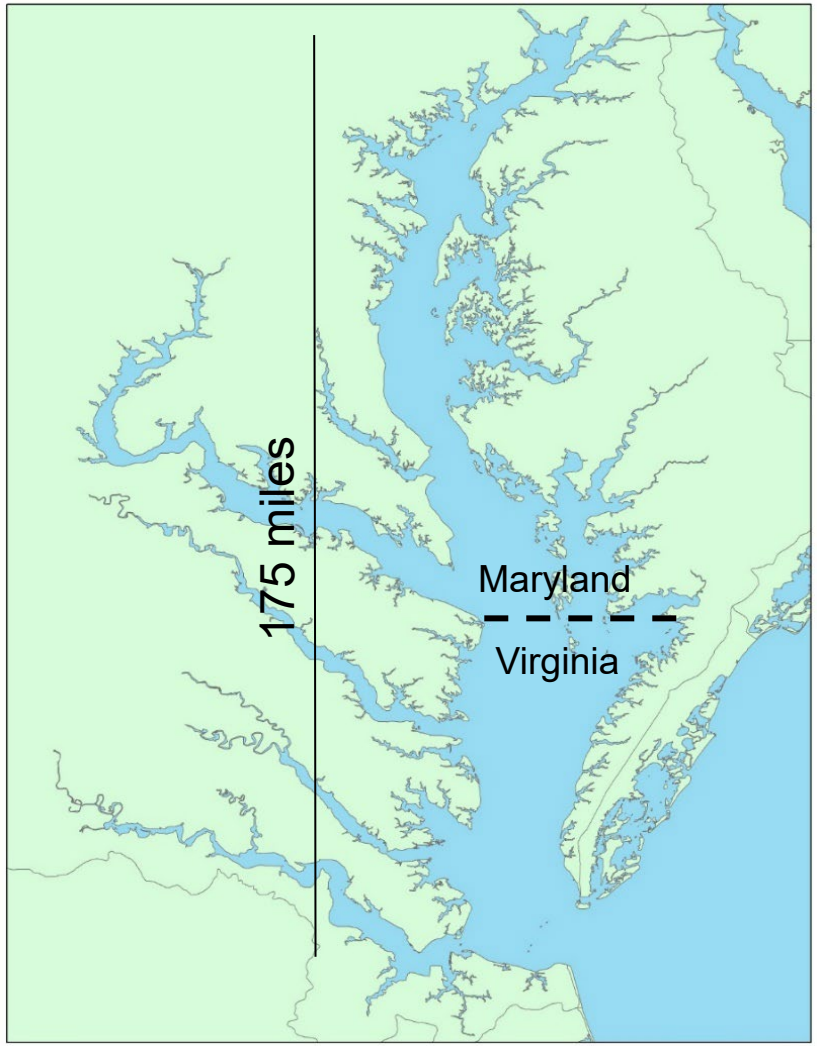
Collective success criteria[1] established prior to tributary selection, planning, or implementation:

- Reef level: a restored reef, 6 years post-restoration, will have a certain oyster density & biomass; stable or increasing reef height, footprint, and shell budget
- Tributary level: at least 50% of currently restorable river bottom will be covered with reefs that meet the reef-level success definition.

Collective tributary selection & restoration blueprints developed for each tributary[2]

Collective implementation, tracking, monitoring

Parallel research efforts to quantify some ecosystem services, engage the public

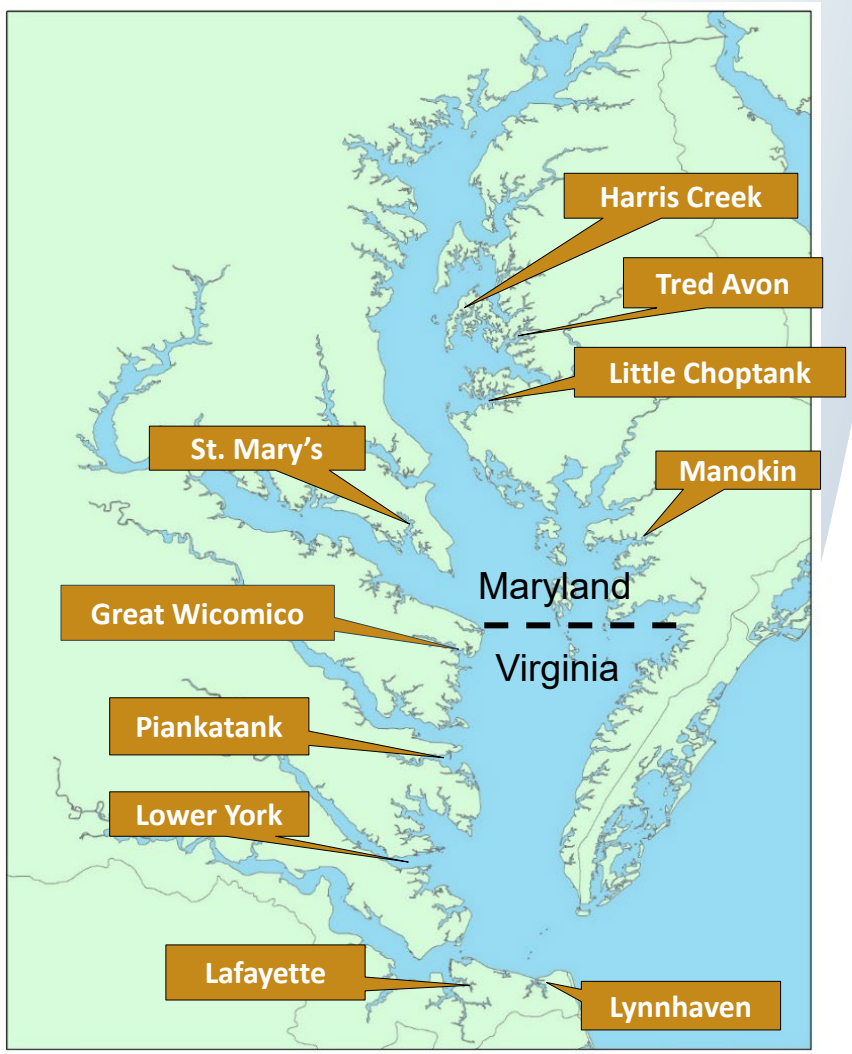


1. *Restoration Goals, Quantitative Metrics and Assessment Protocols for Evaluating Success on Restored Oyster Reef Sanctuaries*, https://www.chesapeakebay.net/what/publications/oyster-restoration-success-metrics
2. Available at: https://www.chesapeakebay.net/who/publications-archive/maryland-and-virginia-oyster-restoration-interagency-teams

NOAA FISHERIES

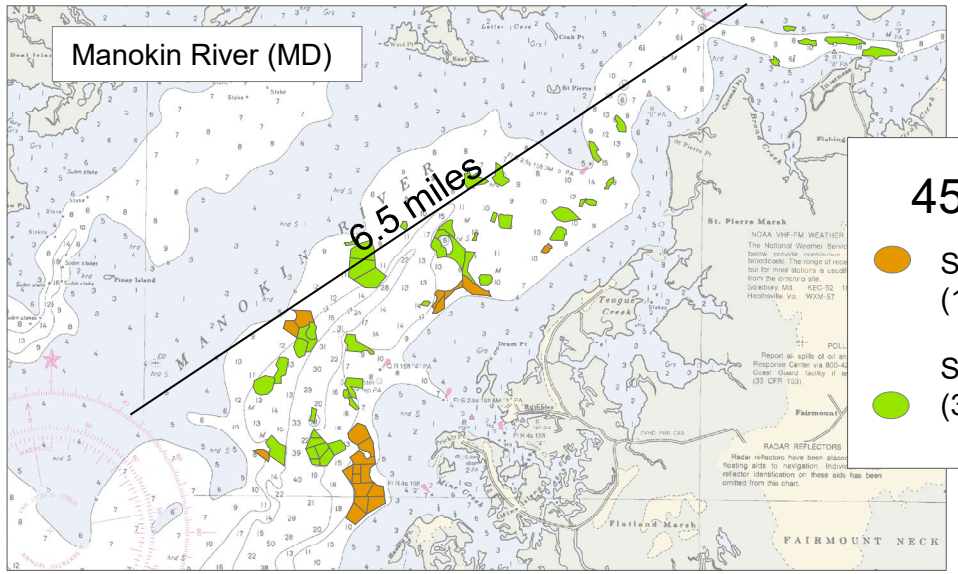
How is it going?

- Completed restoration work on all 10 tributaries (as of September 2025)
- 1,900 acres of reefs built- nearly 3 square miles
- In-water cost approx. $120 million
- Monitoring results:
  - 99% of reefs are meeting the minimum thresholds for oyster density & biomass;
  - 85% are meeting the higher, target levels.



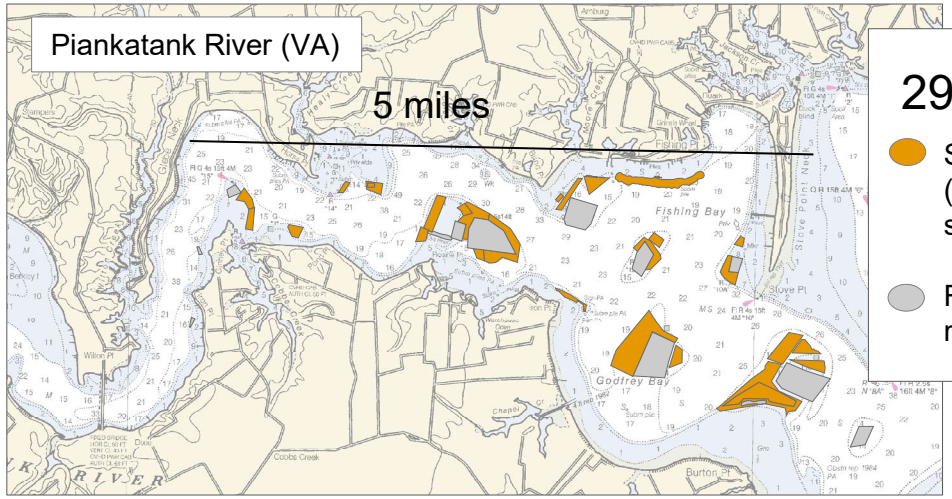
How is it going?

Two Example Rivers:



455 acres

- Stone substrate reefs
  (136 acres planned; 1”-4” substrate size)
- Spat-on-shell only reefs
  (305 acres planned)



294 acres planned (all complete)

- Stone substrate reefs
  (2-4” stone and VDOT A1 rip rap—approx. football-size stones)
- Reefs already meeting success standards prior to restoration initiative

NOAA FISHERIES

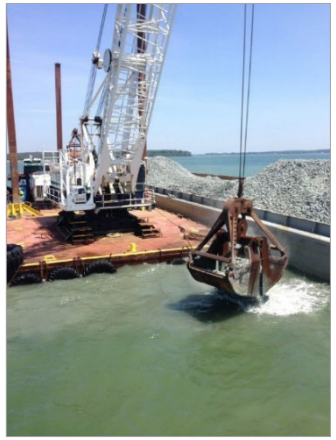
Reef Construction Methods

Seed-only treatment (hatchery-produced spat-on-shell)


Photo: Horn Point Oyster Hatchery


Photo: Oyster Recovery Partnership

Substrate-only treatment
(primarily stone, 1-6”, some larger; some shell; reefs typically 6-12” high)



Substrate & Seed

NOAA FISHERIES

How is it going?

Outreach & Engagement

- Open Houses for input on planning
- Oyster gardening
  - Chesapeake Bay Foundation program (NGO)
  - State of Maryland developed its own program (5,000+ cages)
- Rod and Reef Slam Fishing Tournaments
- Sprint for Spat; Bay paddleboarder, etc. etc.

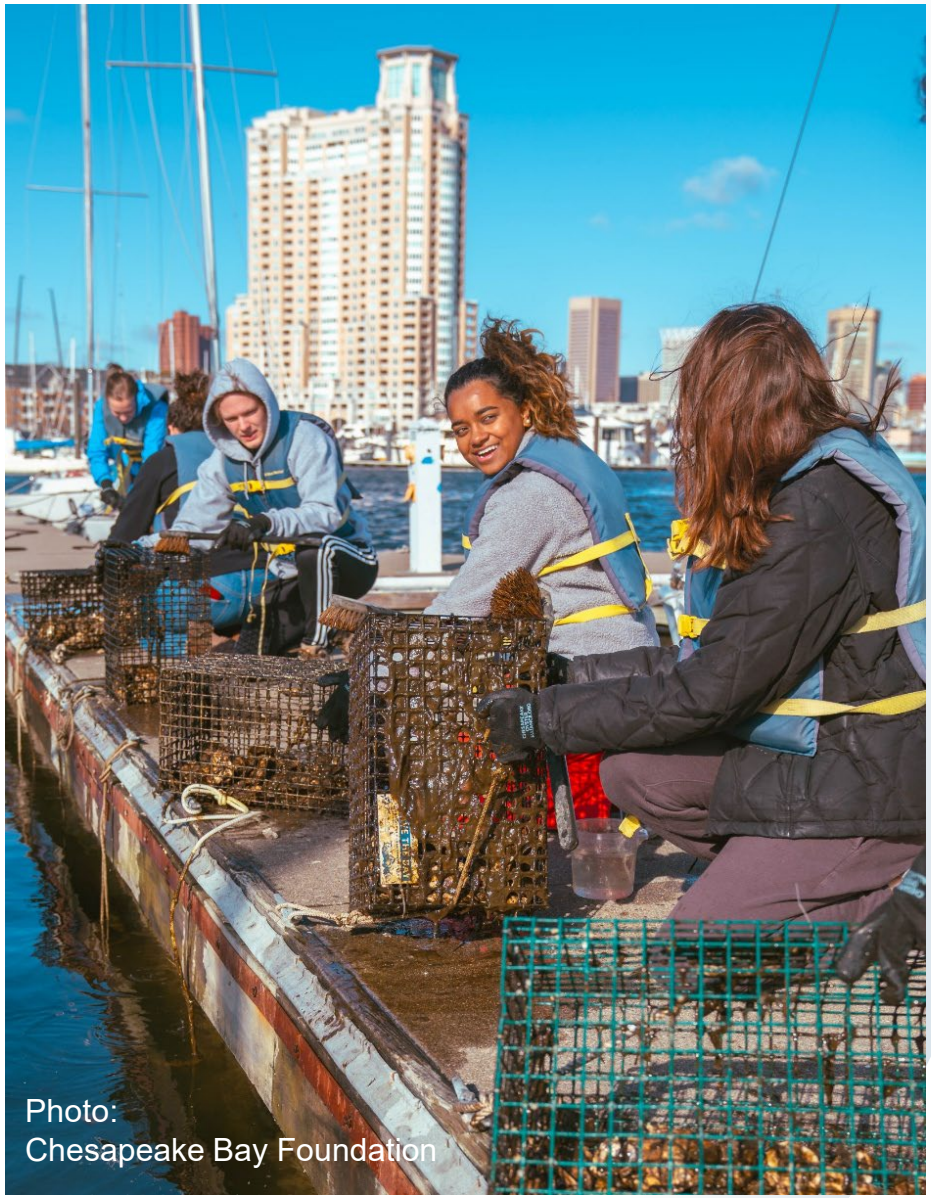


Photo:
Chesapeake Bay Foundation

NOAA FISHERIES

What is the value proposition in all this?

Risks

- Expense
- Everything will get poached
- The oysters will all die
- People will hate it
- It can’t be done at this scale

Potential Rewards

- Nitrogen and phosphorous reductions
- Increased fish habitat
- People will like it
- It can be an example for other regions

NOAA FISHERIES

What is the value proposition in all this?

Risks

- ✔ Expense $120 million
- ✘ Everything will get poached: 99% of reefs are meeting their density & biomass thresholds
- ✘ The oysters will all die: ditto above
- ✔ / ✘ People will hate it: some did; most didn't
- ✘ It can't be done at this scale: 1900 acres of reefs that didn't exist before.

Rewards

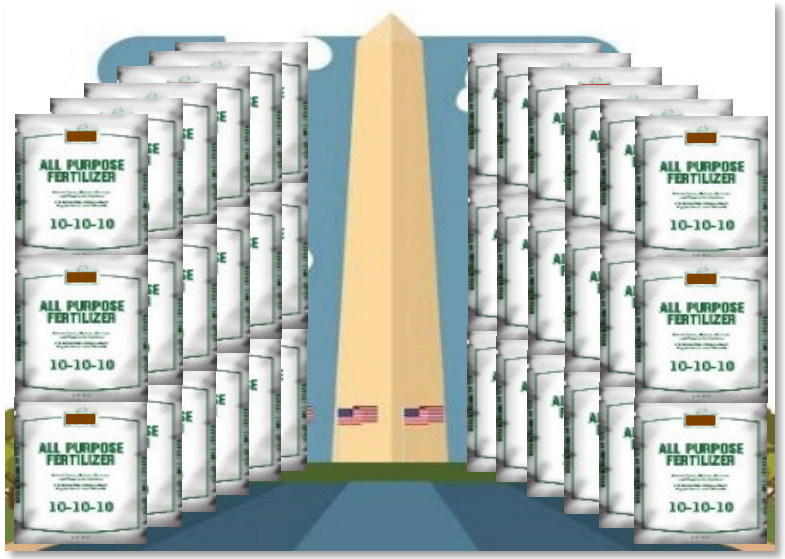
- ✔ Nitrogen and phosphorous reductions: In Harris Creek, 350 acres of restored reefs remove 1 million lbs N, and 42,000 lbs P, over a decade[1]

1. *M.L. Kellogg, M.J. Brush, J.C. Cornwell. 2018. An Updated Model for Estimating the TMDL Related Benefits of Oyster Reef Restoration. Virginia Institute Marine Science and University of Maryland (funded by NOAA, Nature conservancy, Oyster Recovery Partnership)*

NOAA FISHERIES

Harris Creek (350 acres of restored reefs)

- Restored reefs annually remove nitrogen and phosphorous equivalent to:
  - ≈ 20,000 bags of 10-10-10 fertilizer, [1]
  - ≈ 12 stacks of fertilizer bags equal in height to the Washington Monument[1]
- Estimated $3 million annually in nitrogen and phosphorous reductions[1]



Graphic: M. Lisa Kellogg, VIMS

1. M.L. Kellogg, M.J. Brush, J.C. Cornwell. 2018. An Updated Model for Estimating the TMDL Related Benefits of Oyster Reef Restoration. Virginia Institute Marine Science and University of Maryland (funded by NOAA, Nature conservancy, Oyster Recovery Partnership)

What is the value proposition in all this?

Risks

- ✔ Expense $120 million
- ✘ Everything will get poached: 99% of reefs are meeting their density & biomass thresholds
- ✘ The oysters will all die: ditto above
- ✔ / ✘ People will hate it: some did; most didn't
- ✘ It can't be done at this scale: 1900 acres of reefs that didn't exist before.

Rewards

- ✔ Nitrogen and phosphorous reductions: In Harris Creek, 350 acres of restored reefs annually remove 1 million lbs N over a decade[1]
- ✔ Increased fish habitat: Modeling predicts restored reefs result in 150% increase in blue crab harvest over unrestored areas[2]
- ✔ / ✘ People will like it most did; some didn't
- ✔ It can be an example for other regions Throughout the US; several European countries; New Zealand; Australia; South Korea, China.
- ✔ Return on investment: Harris Creek: $29 million cost to restore; N and P reductions = $3m/ annually[1] = 10 year return on investment
  Three MD tributaries combined: $65 million cost to restore; projected to increase annual total regional economic impact by $23 million ('direct + indirect + induced effects') = less than 3 year return on investment

1. *M.L. Kellogg, M.J. Brush, J.C. Cornwell. 2018. An Updated Model for Estimating the TMDL Related Benefits of Oyster Reef Restoration. Virginia Institute Marine Science and University of Maryland (funded by NOAA, Nature conservancy, Oyster Recovery Partnership)*

2. Estimating Ecological Benefits and Socio-Economic Impacts from Oyster Reef Restoration in the Choptank River Complex, Chesapeake Bay. 2020. Knoche, Scott; Ihde, Thomas F.; Samonte, Giselle

NOAA FISHERIES

What did we learn?

- We can do oyster restoration at this scale
- The reefs are thriving
- It is expensive
- Ecosystem services may make it worth the investment
- Public is generally very supportive… but build your reefs correctly!
- Not everyone loves it
- Partnerships are key, including collective goal setting, success criteria, planning, and tracking.
- Approach restoration at this scale as a marine construction project: permit large areas at once; consider economy of scale; ensure QA/QC processes; get public input early.
- This feels hopeful

What are we doing next?

draft Beyond 2025 Chesapeake Bay Agreement Oyster Goal:

- Restore or conserve at least 1,800 additional acres of oyster reef habitat concentrated primarily in restoration focus areas to provide ecosystem service benefits.
- Maintain reefs established under the 2014 Chesapeake Bay Watershed Agreement to achieve restoration success metrics.
- Maintain sustainable oyster abundance through oyster fisheries and aquaculture practices.

NOAA FISHERIES