

# Oyster Reef Restoration in 10 Chesapeake Bay Tributaries

*A Completion Summary for the 2014 Chesapeake Bay  
Watershed Agreement Oyster Outcome*



Prepared by the Maryland and Virginia  
Oyster Restoration Interagency Workgroups  
May 2026



# Summary

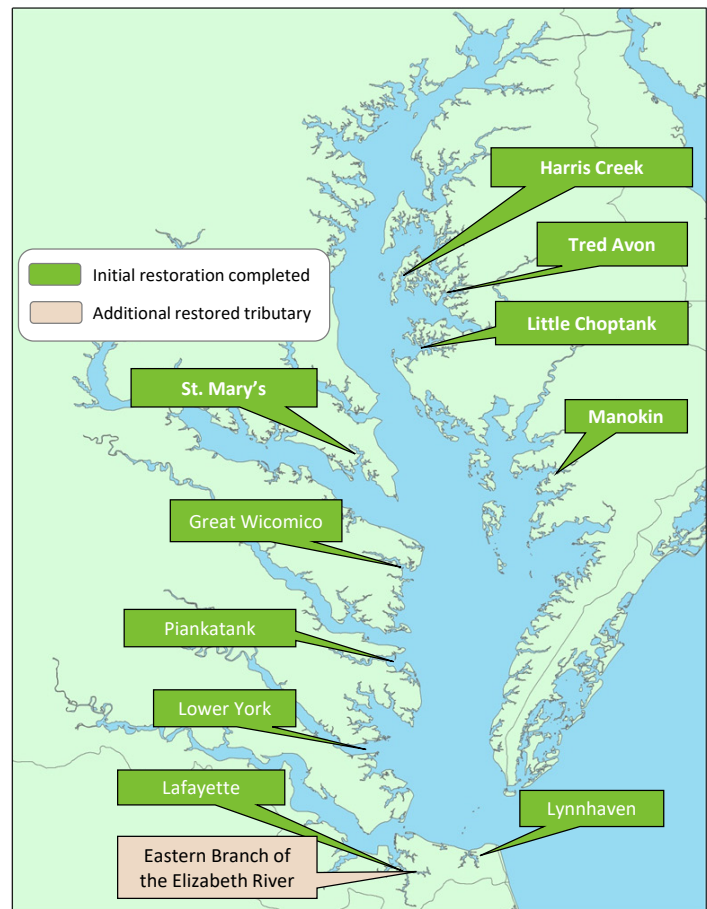
## Bay-wide Restoration Achieved under the Chesapeake Bay Watershed Agreement’s “10 Tributaries by 2025” Oyster Outcome

The [2014 Chesapeake Bay Watershed Agreement](#), which guided the work of the Chesapeake Bay Program through 2025, called for state and federal partners to “restore native oyster habitat and populations in 10 Bay tributaries by 2025, and ensure their protection” (hereafter, “10 Tributaries initiative”). Working together for more than a decade, partners reached this goal in late 2025. Five tributaries were restored in Maryland, and five (plus a sixth “bonus tributary”) in Virginia.

To achieve this work, the Chesapeake Bay Program’s [Sustainable Fisheries Goal Implementation Team](#) convened [working groups in each state](#). With guidance from consulting scientists and the public, these groups set tributary-specific restoration goals and developed [Restoration Blueprints](#) describing how the tributaries would be restored, consistent with success criteria described in the [Chesapeake Bay Oyster Metrics Report](#).

More than 1,900 acres of reefs were restored Bay wide. This was a monumental effort, and has been recognized nationally and internationally as an outstanding example of large-scale, multipartner ecological restoration. These reefs are designated as non-harvest areas, with the intent of keeping these healthy reefs thriving for generations to come.

- ✓ **10 tributaries restored Bay-wide**
  - ✓ 5 in Maryland
  - ✓ 5 plus a 6th ‘bonus tributary’ in Virginia
- ✓ **1,905 acres of reef habitat restored**
  - ✓ 1,310 acres in Maryland;  
595 acres in Virginia
  - ✓ Together with 488 existing acres, the result is 2,393 acres—3.75 square miles—of healthy reefs. That’s more than 1,800 football fields!
- ✓ **7.3 billion oysters planted**
- ✓ **Bay-wide cost: \$121.16 million\***



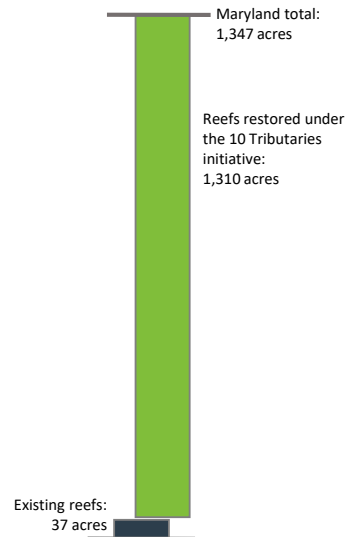
\*This approximate cost is Bay-wide, through the end of 2025, for reefs restored under the 10 Tributaries initiative. Throughout this report, cost numbers include reef construction and seeding only. Costs such as benthic surveys, planning, permitting, and monitoring are not reflected. Restoration cost per acre varies due to factors including material type, reef height and configuration, hydrologic factors, agency and community preferences, whether a reef requires seeding with juvenile oysters (as is typical in Maryland, due to lower natural oyster reproduction than Virginia rivers), and other factors.

# Maryland Overview

Restoration work in all five Maryland tributaries toward the 10 Tributaries initiative has been completed. Work in each tributary followed a [Restoration Blueprint](#). Partners have restored 1,310 acres of oyster reefs across all five tributaries at a cost of approximately \$96 million. These reefs were constructed using one of two methods: by building a substrate base followed by planting with hatchery-produced oyster seed, or by placing only seed onto existing reefs. [Monitoring results](#) show strong success relative to preestablished success criteria.



**Acres of reefs restored: 1,310**



**Seed planted: 7.34 billion**  
in Maryland under the 10 Tributaries Initiative

The vast majority of the seed planted was spat-on-shell, produced at the University of Maryland's Horn Point Oyster Hatchery. Chesapeake Bay Foundation, Marylanders Grow Oysters, St. Mary's Watershed Association, and The Nature Conservancy's Supporting Oyster Aquaculture & Restoration program produced oysters as well.

**Cost: \$96.04 million**

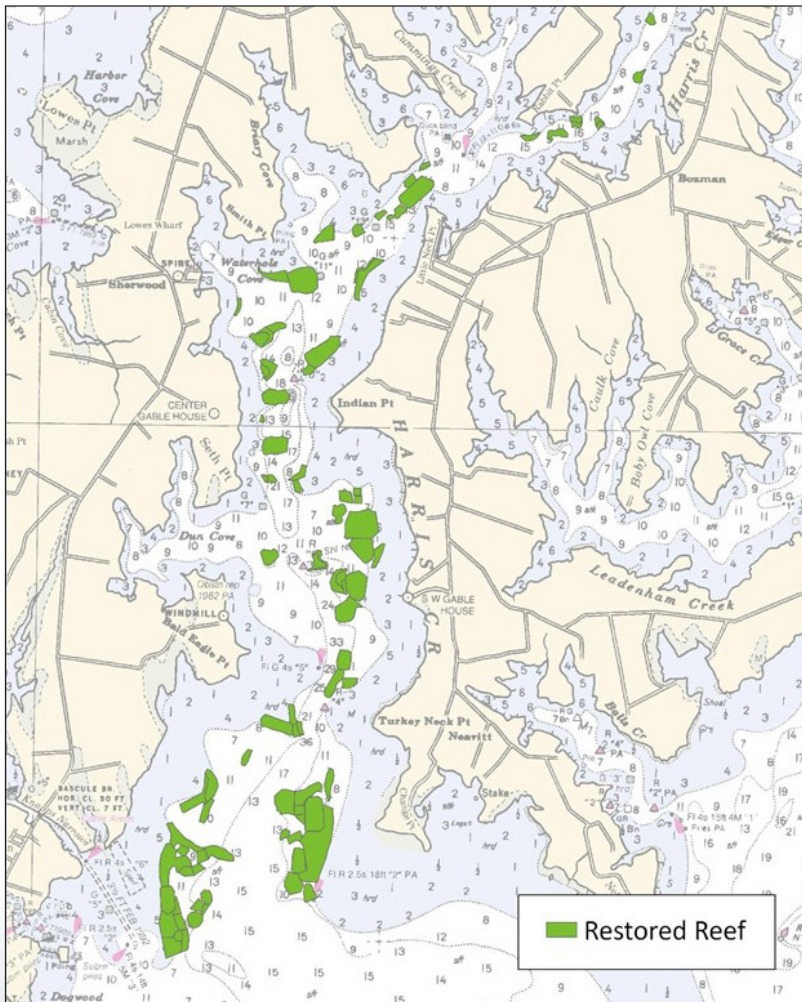


Reef monitoring. Photo: Oyster Recovery Partnership

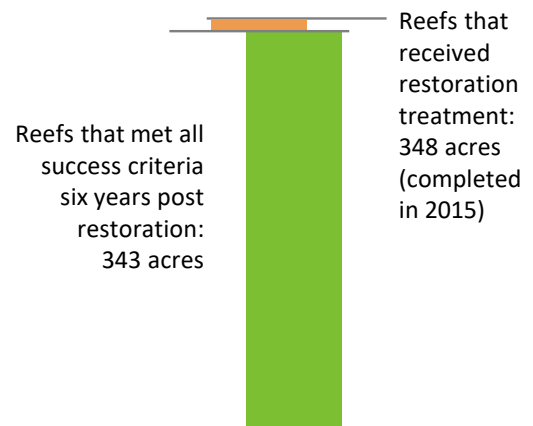
# Harris Creek

In-water restoration in [Harris Creek](#) was completed in 2015, followed by planned second-year-class oyster plantings through 2020. The Maryland Department of Natural Resources and the U.S. Army Corps of Engineers, Baltimore District, funded the reef construction; oyster seeding was funded by the Maryland Department of Natural Resources and NOAA.

In 2021, all 348 acres of reefs in Harris Creek had been monitored as they matured to six years—the point where a reef can be considered successfully restored if it meets all of the [Oyster Metrics](#) success criteria. At six years of age, [monitoring results](#) showed all but five acres of reefs (343 of the 348 acres that received restoration treatment) met the [success criteria](#). Harris Creek is the first tributary, Bay wide, where not only has restoration work (reef construction and seeding) been completed, but also where the recommended six-year post-restoration monitoring period has been completed. More information on the Harris Creek effort is available in a [2026 paper in Restoration Ecology](#).



**Acres of reefs restored: 343**



**Seed Planted: 2.49 billion**

All seed was spat-on-shell, produced primarily at the University of Maryland's Horn Point Oyster Hatchery. Some additional seed was produced and planted by the Chesapeake Bay Foundation.

**Cost: \$28.37 million**

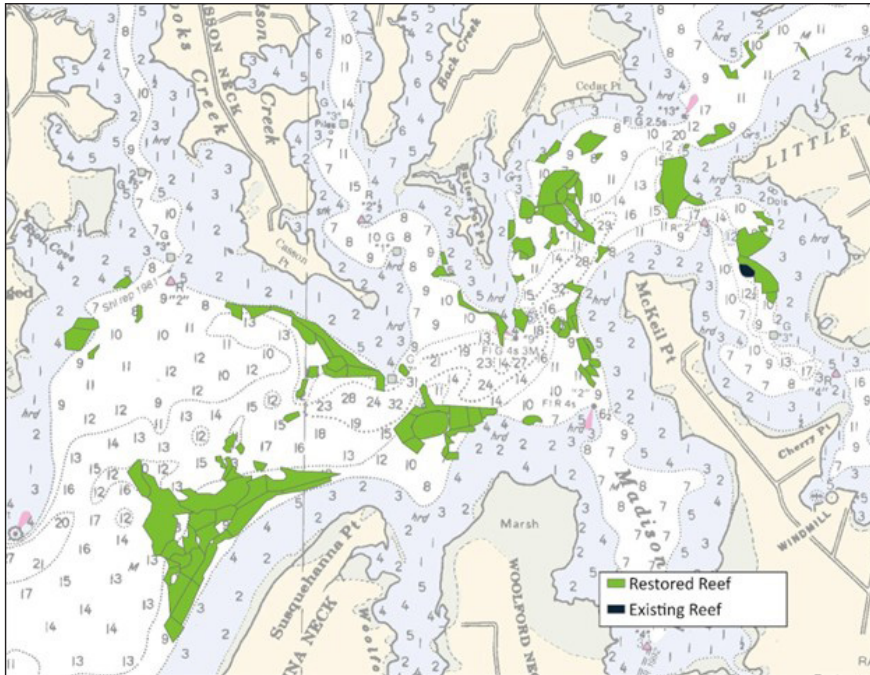


Horn Point Oyster Hatchery. Photo: Will Parson/Chesapeake Bay Program

# Little Choptank River

Restoration work in Little Choptank River started in 2014 and was completed in 2020. Partners restored 356 acres of reefs. These reefs, in addition to the existing 2 acres of healthy reefs, bring the total to 358 acres, as called for in the [Little Choptank River Restoration Blueprint](#). The Maryland Department of Natural Resources funded the reef construction; oyster seeding was funded by the Maryland Department of Natural Resources and NOAA.

Work since 2020 has focused on reef monitoring and implementing the scheduled second-year-class oyster seedings as needed. On reefs where monitoring showed oyster densities and biomass higher than projected, the scheduled second seedings were not implemented. On reefs where densities and biomass were as projected, or lower, the scheduled second-year-class seedings were implemented. [Monitoring data](#) show that nearly all of reefs in the river are meeting at least the minimum oyster biomass and density called for in the [Oyster Metrics](#) document.



## Acres of reefs restored: **356**

Total:  
358 acres

Reefs restored  
under the 10  
Tributaries  
initiative:  
356 acres  
(completed in 2020)

Existing reefs:  
2 acres

## Seed Planted: **2.16 billion**

All seed was spat-on-shell, produced primarily at the University of Maryland's Horn Point Oyster Hatchery. Some additional seed was produced and planted by the Chesapeake Bay Foundation.

**Cost: \$28.90 million**

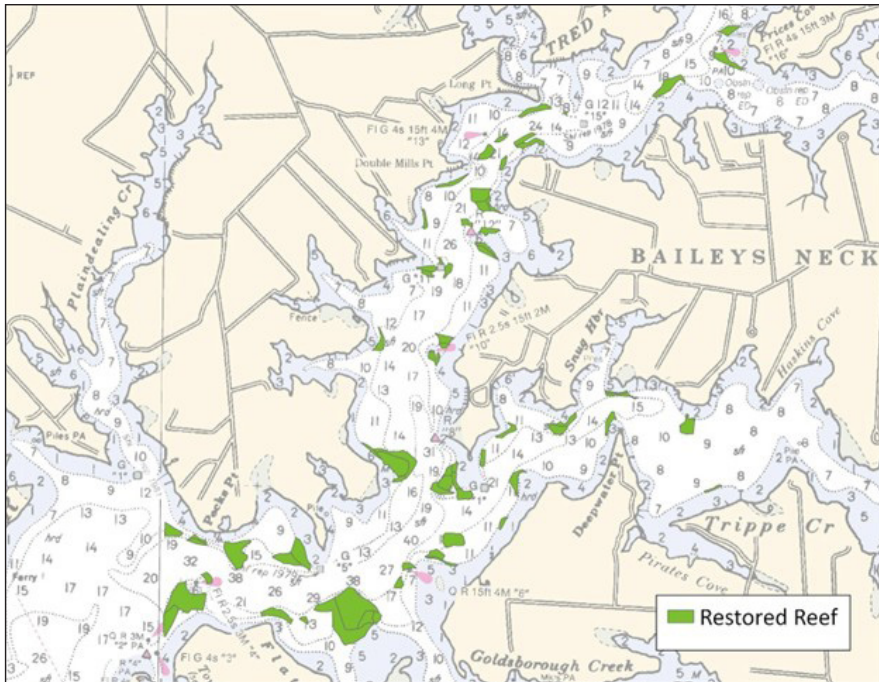


Reef monitoring. Photo:  
Oyster Recovery Partnership

# Tred Avon River

Restoration work in the Tred Avon River started in 2015 and was completed in 2021. The Maryland Department of Natural Resources and the U.S. Army Corps of Engineers, Baltimore District, funded the reef construction; oyster seeding was funded by the Maryland Department of Natural Resources and NOAA.

Work since then has focused on monitoring and on implementing the scheduled second-year-class oyster seedings called for in the [Tred Avon River Restoration Blueprint](#). On reefs where monitoring showed oysters densities and biomass higher than projected, the scheduled second seedings were not implemented. On reefs where densities and biomass were as projected, or lower, the scheduled second-year-class seedings were implemented. [Monitoring data](#) show that nearly all the reefs in the river are meeting at least the minimum oyster biomass and density called for in the [Oyster Metrics](#) document.



**Acres of reefs restored: 131**

Reefs restored under the 10 Tributaries initiative: 131 acres (completed in 2021)

**Seed Planted: 1.21 billion**

All seed was spat-on-shell, produced primarily at the University of Maryland's Horn Point Oyster Hatchery. Chesapeake Bay Foundation and Marylanders Grow Oysters produced oysters as well.

**Cost: \$12.57 million**



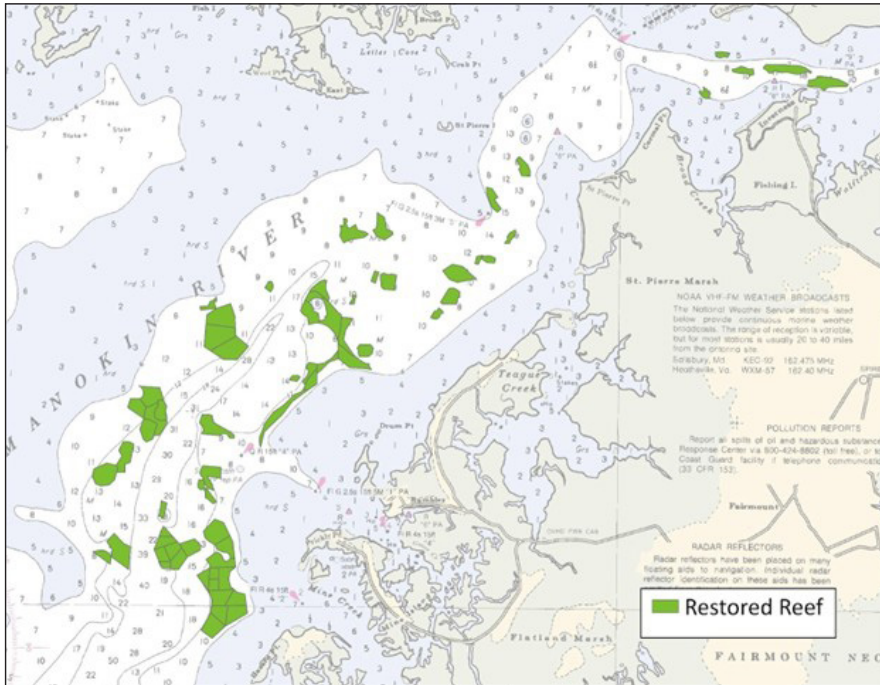
Planting oysters in the Tred Avon River.  
Photo: Will Parson/Chesapeake Bay Program



# Manokin River

The [Manokin River Restoration Blueprint](#) set a goal of restoring 441 acres of reefs. In-water restoration work started in 2021 and was completed in 2025. Partners completed more reef acreage than required, restoring a total of 455 acres of reefs. The Maryland Department of Natural Resources funded the reef construction; oyster seeding was funded by the Maryland Department of Natural Resources and NOAA.

This river is the most ambitious of the 10 Tributaries Bay wide, as its Restoration Blueprint calls for partners to restore the largest amount of reef acreage. Future work will focus on second-year-class seedings, as needed, per the Manokin River Restoration Blueprint, and on reef monitoring per the [Oyster Metrics](#) success criteria.



**Acres of reefs restored: 455**



**Seed Planted: 1.32 billion**

All seed was spat-on-shell, produced primarily at the University of Maryland's Horn Point Oyster Hatchery.

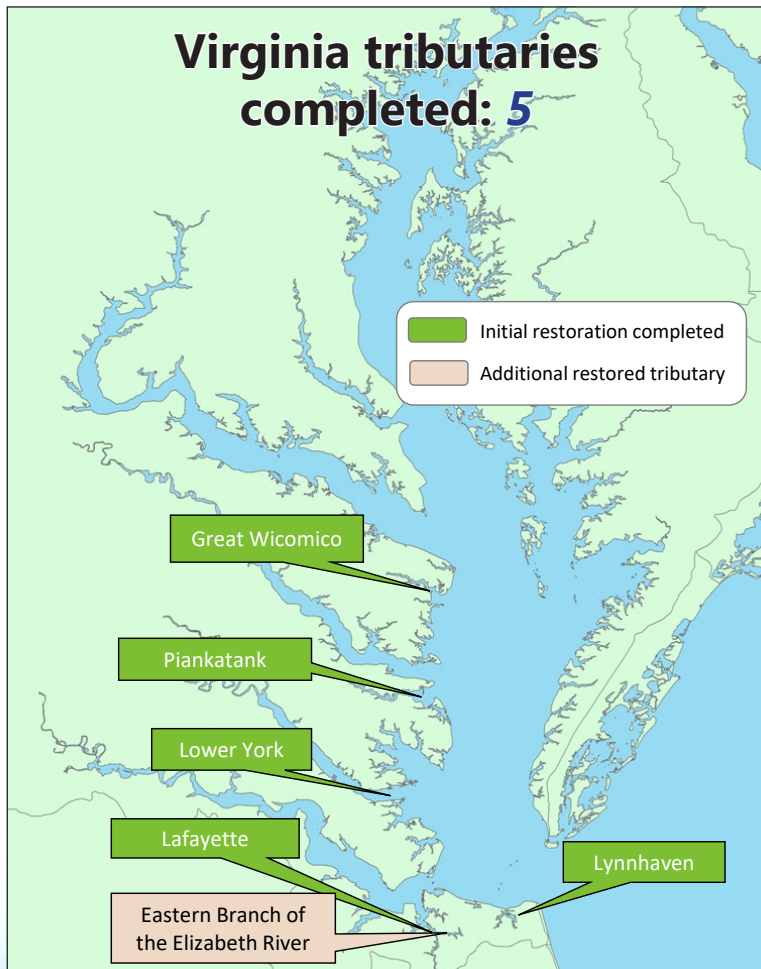
**Cost: \$24.65 million**



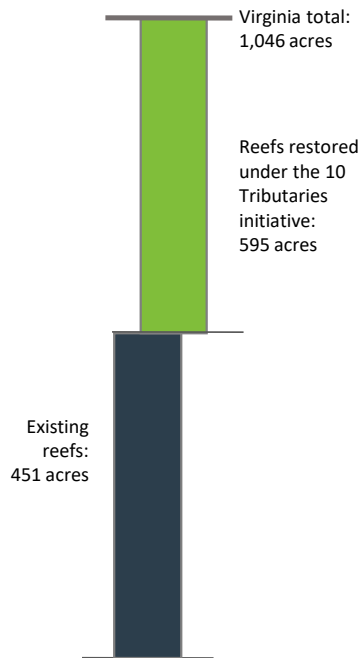
Spat-on-shell destined for the Manokin River.  
Photo: Charlie Nick/Chesapeake Bay Program

# Virginia Overview

Restoration work in all five Virginia tributaries toward the 10 Tributaries initiative is complete. Work in each tributary followed a [Restoration Blueprint](#). Together, partners restored nearly 600 acres of oyster reefs at a cost of just over \$25 million. Above and beyond the 10 Tributaries work, Virginia partners have also restored the Eastern Branch of the Elizabeth River to the same standards, making this a 'bonus tributary.'



**Acres of reefs restored: 595**



**Cost: \$25.12 million**

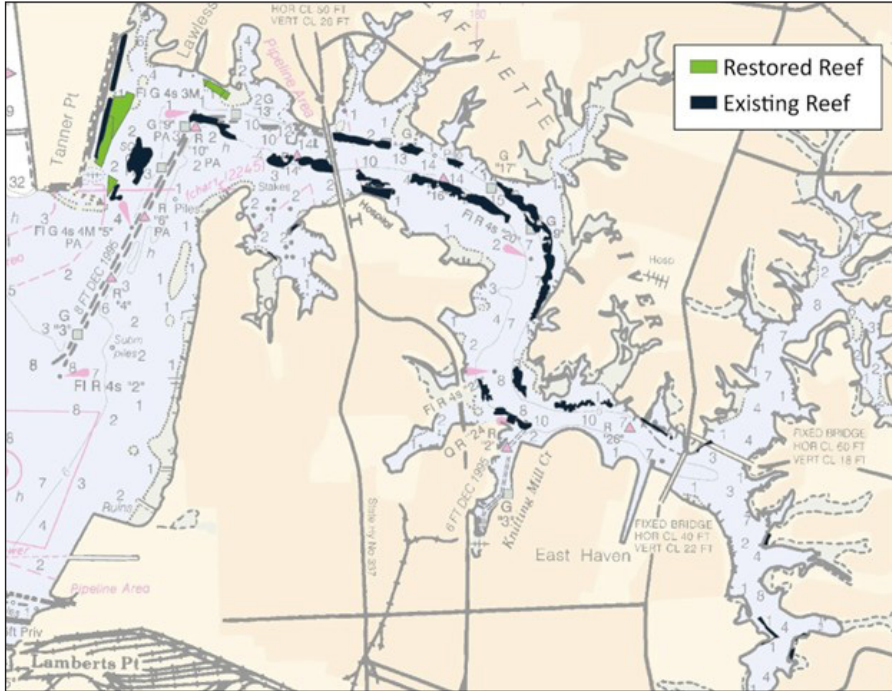


Reef in the Piankatank River. Photo: USACE/Kevin Gormley

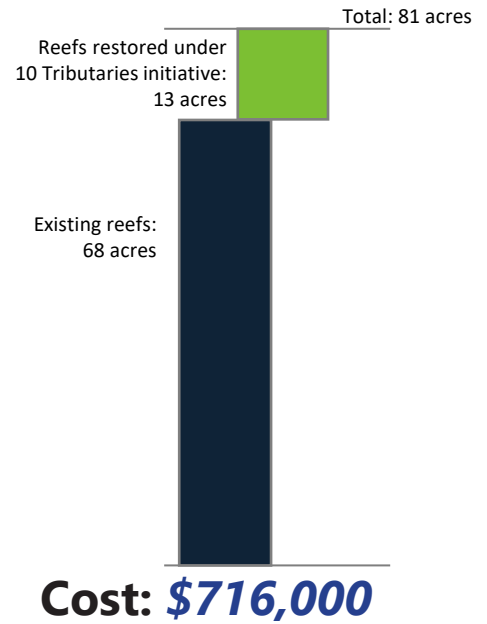
# Lafayette River

Planned oyster restoration work in the [Lafayette River Restoration Blueprint](#) was completed in 2018, making it the first river in Virginia to be considered complete under the 10 Tributaries initiative.

The focus now is on monitoring the restored and existing reefs in the river. Earlier restoration projects have high densities of oysters representing numerous year classes. This bodes well for the newer Lafayette reefs. In 2022, VIMS conducted bathymetric and video surveys of three restored reefs in the river. The two largest reefs exceed the [Oyster Metrics](#) success targets for biomass and density, while the third met threshold criteria. Working above and beyond the Restoration Blueprint, the Elizabeth River Project continues to coordinate the construction of shoreline oyster restoration projects through its partnership with the U.S. Navy's Lafayette Annex and waterfront residential property owners.



## Acres of reefs restored: 13

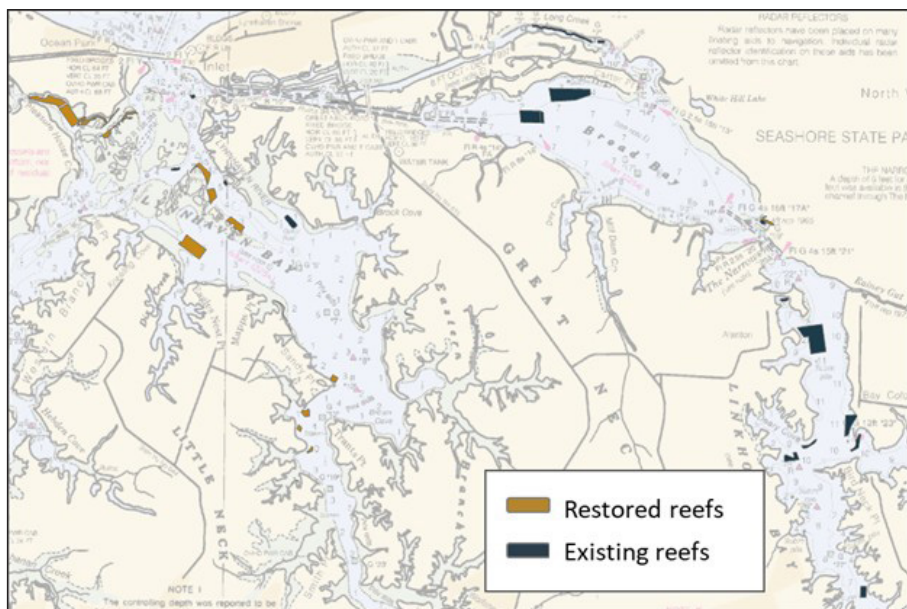


A yellow-crowned night heron walks by intertidal oysters on the Lafayette River. Photo: Will Parson/Chesapeake Bay Program

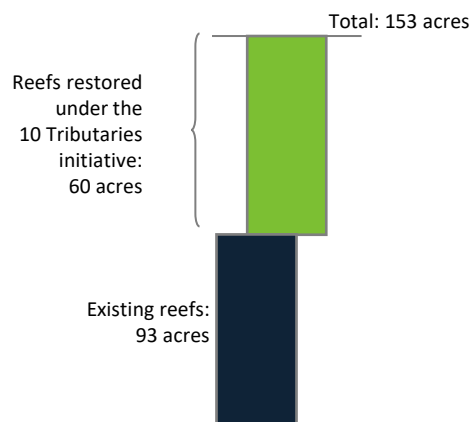
# Lynnhaven River

Restoration work in the Lynnhaven River under the 10 Tributaries initiative was completed in 2025. The [Lynnhaven River Restoration Blueprint](#) set a goal of 152 acres of reefs. In 2025, 23.2 acres of crushed stone and fossil shell reefs were constructed, funded by the U.S. Army Corps of Engineers, Norfolk District, and the City of Virginia Beach.

Recent monitoring on an 8 acre reef constructed in 2021 and consisting of more than 28,000 reef balls, also funded by the U.S. Army Corps of Engineers, Norfolk District, and City of Virginia Beach, shows that the reef far exceeds [Oyster Metrics](#) targets for oyster density and biomass. Similarly, monitoring data from Chesapeake Bay Foundation and Lynnhaven River Now also shows that the 11 acres of reefs they constructed in 2022 more than meet the Oyster Metrics targets for oyster density and biomass.



**Acres of reefs restored: 60**



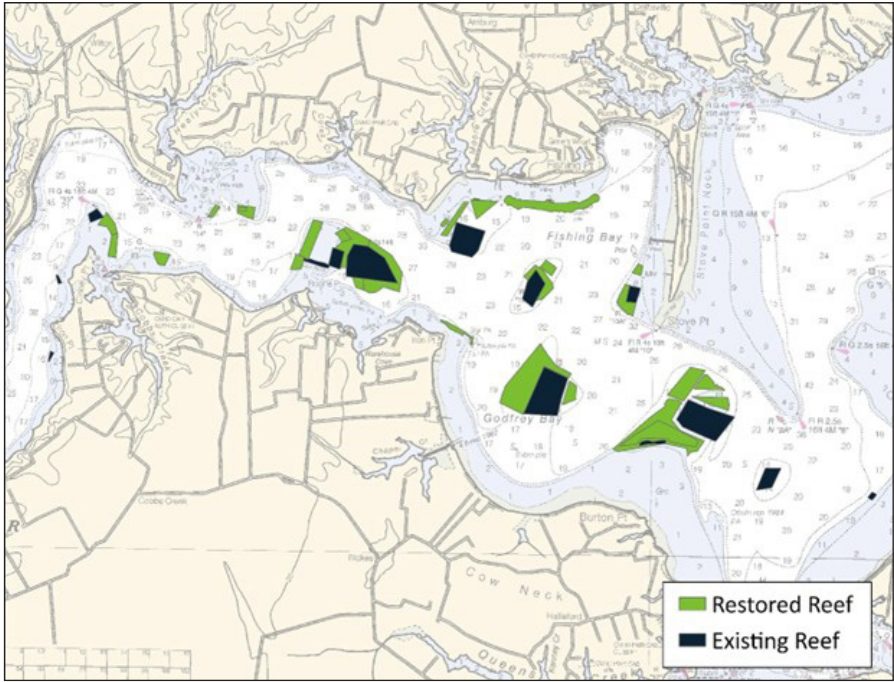
**Cost: \$6.76 million**



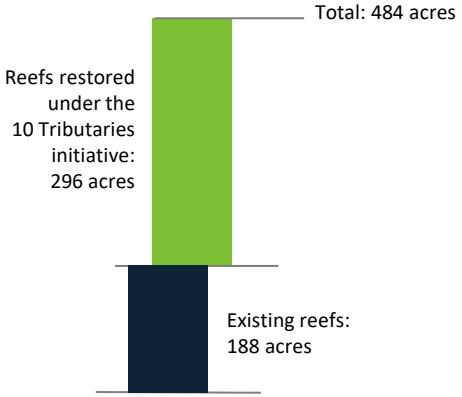
Planting spat on shell in the Lynnhaven River.  
Photo Lynnhaven River Now

# Piankatank River

Oyster reef restoration work was completed in the Piankatank River in 2021. The [Piankatank River Restoration Blueprint](#) set a goal of 444 acres of reefs. Partners exceeded this goal, and 484 acres of reefs now exist in the river. Above and beyond completing the initial planned restoration, the U.S. Army Corps of Engineers, Norfolk District, with the Virginia Marine Resource Commission as its non-federal cost-share partner, constructed 53 additional acres of stone reefs in the Piankatank River in 2023.



**Acres of reefs restored: 296**



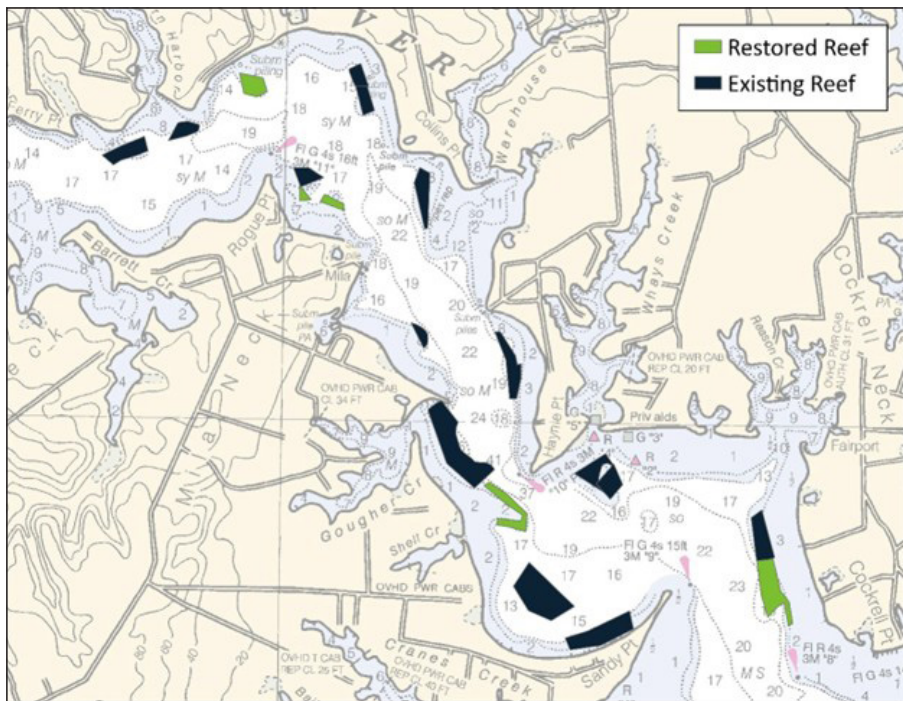
**Cost: \$11.1 million**



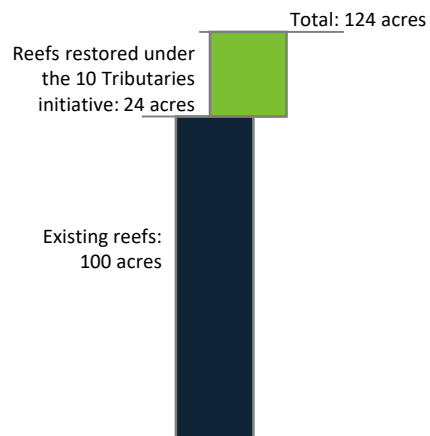
Reef construction on the Piankatank River.  
Photo: USACE Norfolk/Alysia Rigano

# Great Wicomico River

Oyster reef restoration work was completed in the Great Wicomico River in 2021, per the [Great Wicomico River Restoration Blueprint](#). Following initial completion, the U.S. Army Corps of Engineers, Norfolk District, in partnership with the Virginia Marine Resources Commission, performed adaptive management on existing reefs in the Great Wicomico River. Efforts included raising some of the 2004-constructed reefs to a higher elevation, placing habitat stones on areas prone to degradation, and expanding the footprint of an existing reef. Construction was completed in 2025.



**Acres of reefs restored: 24**



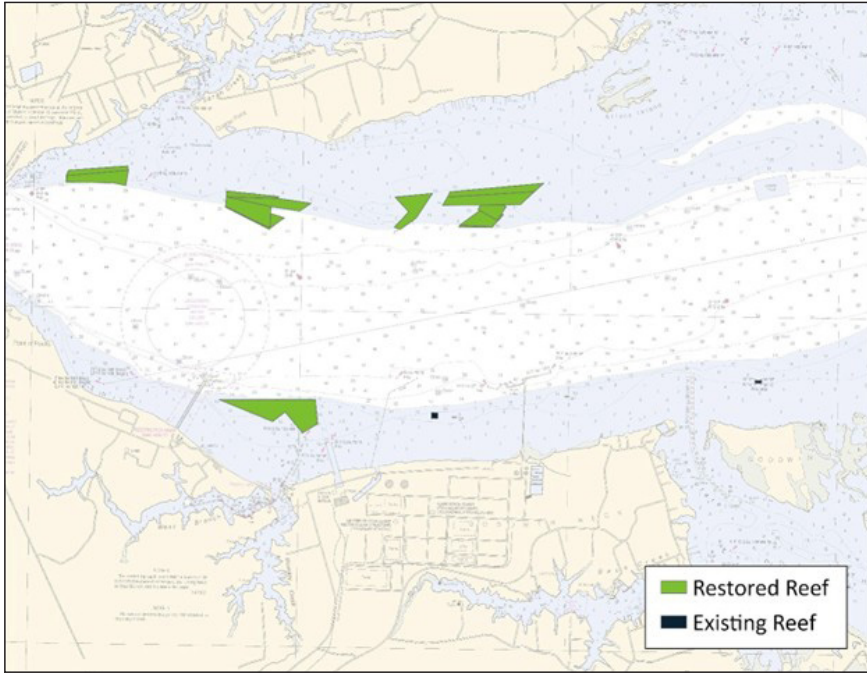
**Cost: \$907,000**



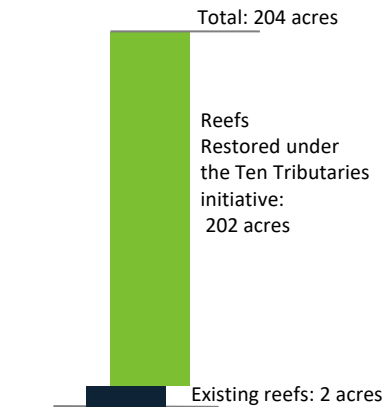
Reef construction on the Great Wicomico River.  
Photo: USACE/Patrick Bloodgood

# Lower York River

Oyster reef restoration work was completed in the lower York River in 2023, per the [Lower York River Restoration Blueprint](#). Reef construction by the Virginia Marine Resources Commission in that year, combined with earlier reef construction, slightly surpassed the Restoration Blueprint goal of 200 acres of reefs. This River was the fourth of five planned Virginia tributaries to be restored under the 10 Tributaries initiative. Future efforts will focus on monitoring to ensure these reefs are meeting established [Oyster Metrics](#) success criteria.



**Acres of reefs restored: 202**



**Cost: \$5.71 million**



Shell destined for use in Virginia. Photo: Virginia Marine Resources Commission


# Work Continues

## *Beyond the 10 Tributaries Initiative*

The revised [Chesapeake Bay Watershed Agreement 2025](#) was adopted by the Chesapeake Executive Council, comprising the governors of Maryland, Virginia, Pennsylvania, Delaware, New York, and West Virginia; the Mayor of Washington, D.C.; the EPA Administrator; and the Chair of the Chesapeake Bay Commission. This revised Agreement includes specific targets for Chesapeake Bay oyster restoration:

- ◇ By 2040, restore or conserve at least 2,000 additional acres of oyster reef habitat, concentrated primarily in restoration focus areas, to provide ecosystem service benefits.
- ◇ Maintain reefs established under the Chesapeake Bay Watershed Agreement to achieve restoration success metrics.
- ◇ Maintain sustainable oyster abundance through oyster fisheries and aquaculture practices.

This revised language will guide the Bay-wide oyster restoration work of the Chesapeake Bay Program through 2040, much as the 2014 Chesapeake Bay Watershed Agreement oyster outcome guided work over the past decade. Bay Program partners have already started constructing reefs toward the revised Chesapeake Bay Watershed Agreement oyster outcome.



Planting spat on shell on the Manokin River.  
Photo: Charlie Nick/Chesapeake Bay Program

# Report Notes and Authorship

This report was developed under the Chesapeake Bay Program's Sustainable Fisheries Goal Implementation Team by the Maryland Oyster Restoration Interagency Workgroup and the Virginia Oyster Restoration Interagency Workgroup. Stephanie Reynolds Westby, NOAA ([stephanie.westby@noaa.gov](mailto:stephanie.westby@noaa.gov)), chaired both workgroups.

Members of the Maryland workgroup include the Oyster Recovery Partnership, Maryland Department of Natural Resources, National Oceanic and Atmospheric Administration, and the U.S. Army Corps of Engineers.

Members of the Virginia workgroup include the Chesapeake Bay Foundation, Christopher Newport University, City of Norfolk, City of Virginia Beach, Department of Defense/U.S. Navy, Elizabeth River Project, Lynnhaven River NOW, National Fish and Wildlife Foundation, National Oceanic and Atmospheric Administration, The Nature Conservancy, The Pew Charitable Trusts, Pleasure House Oysters/Ludford Brothers Oyster Company, U.S. Army Corps of Engineers, Virginia Commonwealth University, Virginia Institute of Marine Science, and Virginia Marine Resources Commission.

Numbers in this document are rounded. In developing this report, partners undertook a detailed review of collective GIS reef construction records. This review showed very minor differences in premet and restored acreages in a few of the tributaries relative to what has been reported in the past. This document shows the corrected acreages.

Please cite this document as:

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Oyster reefs support healthier waters, which in turn support recreational opportunities. Photo: Will Parson/Chesapeake Bay Foundation.

Cover photo: Oyster Recovery Partnership