2024 Chesapeake Bay Oyster Restoration Update

Summary of Progress toward the Chesapeake Bay Watershed Agreement's 'Ten Tributaries by 2025' Oyster Outcome

Prepared by the Chesapeake Bay Program's Maryland Oyster Restoration Interagency Workgroup and Virginia Oyster Restoration Workgroup

Contents

Photo: U.S. Army Corps of Engineers
Cover photo: Oyster Recovery Partnership

Report Context

The 2014 Chesapeake Bay Watershed Agreement, which guides the work of the Chesapeake Bay Program, calls for state and federal partners to "restore native oyster habitat and populations in 10 Bay tributaries by 2025, and ensure their protection" (hereafter, "Ten Tributaries initiative"). Five tributaries are being restored in Maryland and five in Virginia. To achieve this outcome, the Chesapeake Bay Program's Sustainable Fisheries Goal Implementation Team convened Interagency Oyster Restoration Workgroups in each state. With guidance from consulting scientists and the public, these groups set tributary-specific restoration goals and developed plans (hereafter, "Restoration Blueprints,") describing how the tributaries will be restored, consistent with success criteria described in the Chesapeake Bay Oyster Metrics Report (hereafter, "Oyster Metrics"). These Workgroups develop a report annually to describe progress toward this outcome. Summaries of progress made Bay wide, and broken down by state and by tributary, follow. Progress is reported through the end of calendar year 2024.

Photo: Sue Mangan Photography

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 Workgroup. Stephanie Reynolds Westby, NOAA, is chair of both workgroups; stephanie.westby@noaa.gov.

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

Members of the Virginia workgroup include: 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; Virginia Marine Resources Commission.

Photo: Oyster Recovery Partnership

Numbers in this document are rounded.

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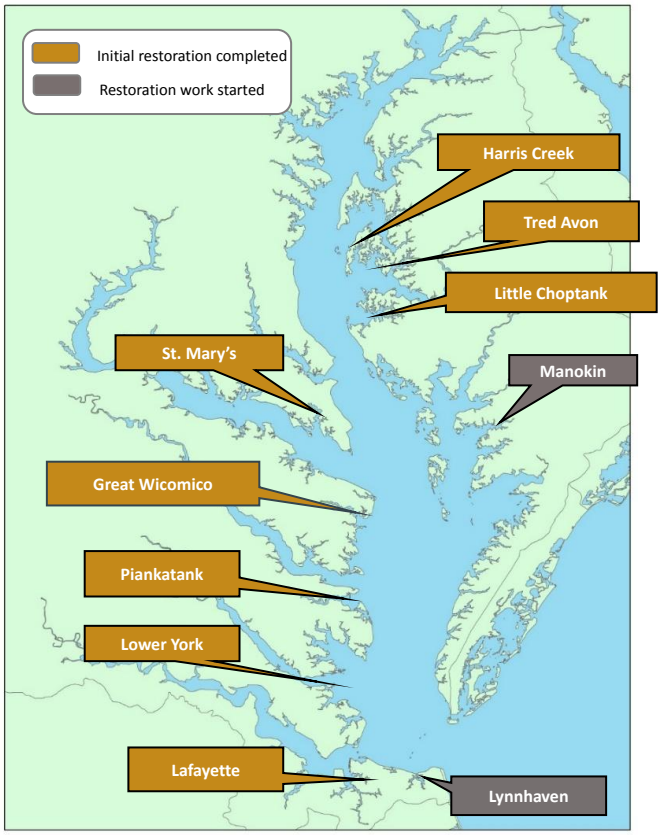
Executive Summary:
Bay-wide Progress through the End of 2024

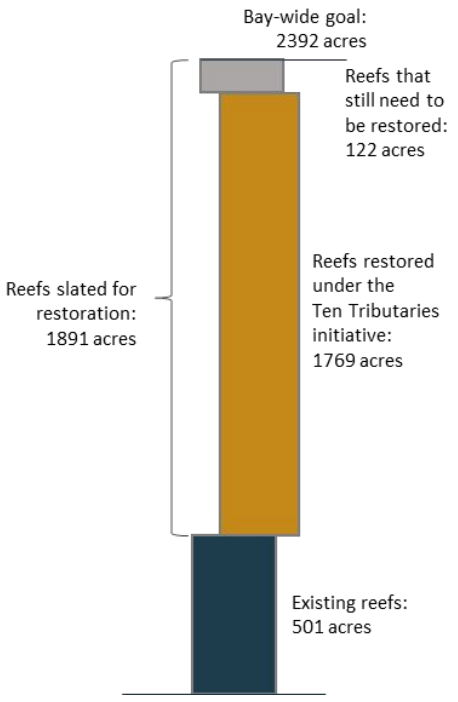
The 2014 Chesapeake Bay Watershed Agreement, which guides the work of the Chesapeake Bay Program, calls for state and federal partners to "restore native oyster habitat and populations in 10 Bay tributaries by 2025, and ensure their protection" (hereafter, "Ten Tributaries initiative"). Five tributaries are being restored in Maryland and five in Virginia. To achieve this outcome, 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 plans (hereafter, "Restoration Blueprints") describing how the tributaries will be restored, consistent with success criteria described in the Chesapeake Bay Oyster Metrics Report (hereafter, "Oyster Metrics"). Detailed summaries of progress Bay wide, and in Maryland and Virginia, follow.

Tributaries Complete: Eight of Ten Planned, Bay Wide



Acres of Reefs Restored Bay Wide 1,769 of 1,891 planned

That is more than 2.76 square miles—or 1,340 football fields—as of the end of calendar 2024.



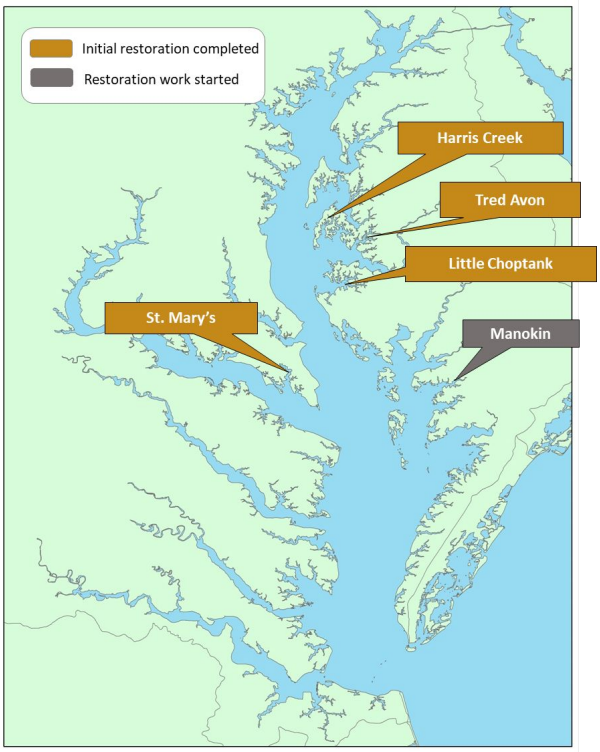
Bay-wide Cost to Date: $114.68 million

This cost is Bay-wide, through the end of 2024, for reefs restored under the Ten Tributaries initiative. This includes 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.

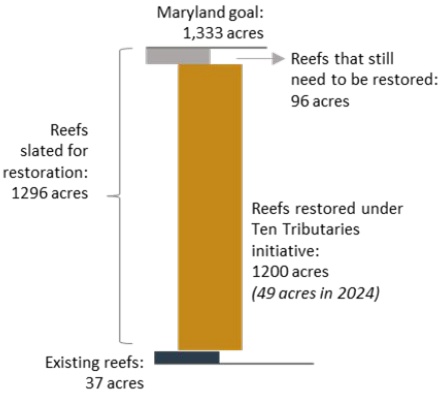
Summary of Maryland Progress

Restoration work in four Maryland tributaries toward the Ten Tributaries initiative has been completed. Work in each tributary followed a Restoration Blueprint. Restoration in the last planned river, the Manokin, started in 2021 and continued throughout 2024. To date, partners have restored 1,200 acres of oyster reefs across all five tributaries at a cost of approximately $92.82 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 remnant reefs. Monitoring results show strong success relative to preestablished success criteria.

Tributaries Complete: Four of Five Planned



Acres of Reefs Restored: 1,200 of 1,301 planned



Seed Planted in Maryland under the Ten Tributaries Initiative: 7.19 billion

(340.32 million planted in 2024)

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.

Maryland Cost to Date: $92.82 million *($5.46 million in 2024)*

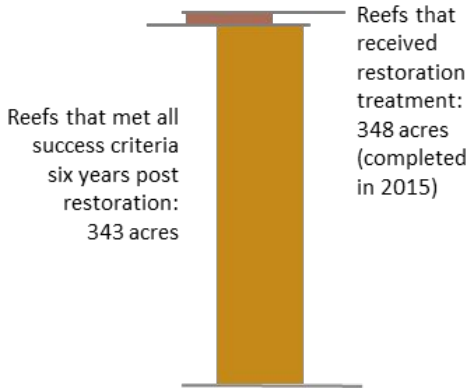
This cost is through the end of 2024, for reefs restored under the Ten Tributaries initiative. This includes reef construction and seeding only; costs such as benthic surveys, planning, permitting, and monitoring are not reflected. Restoration cost per acre varies due to factors including material type, reef configuration, hydrologic factors, agency and community preferences, and other factors.

Harris Creek

Per the success criteria established in Oyster Metrics and the Harris Creek Restoration Blueprint, Harris Creek can now be considered fully, successfully restored. Initial restoration work was completed in 2015, followed by planned second-year-class oyster plantings where needed through 2020. As of 2021, all 348 acres of reefs in Harris Creek have 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. 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. At six years of age, monitoring results show all but five acres of reefs (343 of the 348 acres that received restoration treatment) met the success criteria.

Acres Restored: 343

(*restoration complete*)



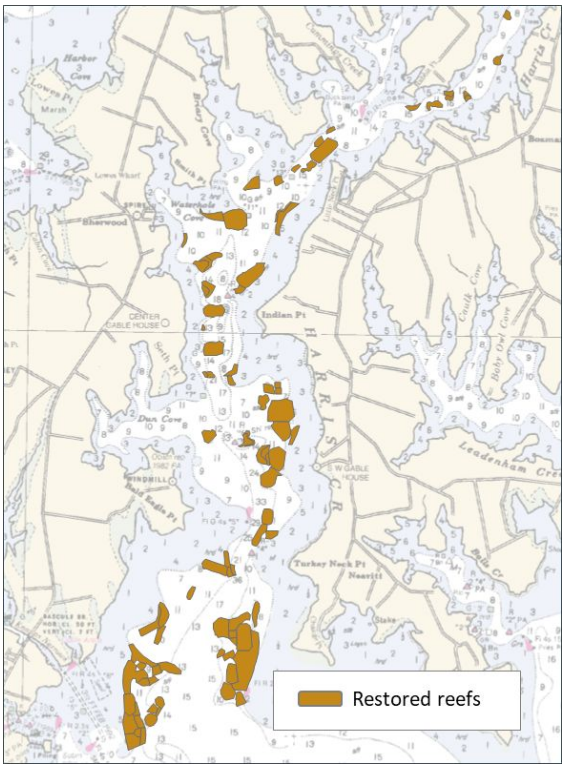
Cost $29.06 million

This cost is for reefs restored under the Ten Tributaries initiative. This includes 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 configuration, hydrology, agency and community preferences, and other factors.

Seed Planted: 2.49 billion

(planted 2011–2020)

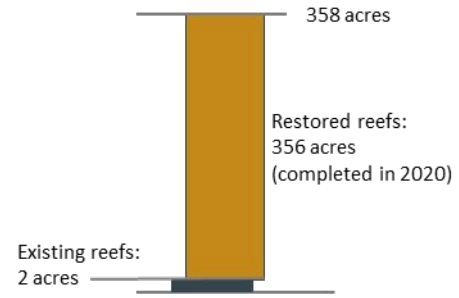
All seed was spat-on-shell, produced primarily at the University of Maryland's Horn Point oyster hatchery. Some additional seed was produced and planted by the Chesapeake Bay Foundation.



Little Choptank River

Initial restoration work in Little Choptank River started in 2014, and was completed in 2020. Work in subsequent years has focused on reef monitoring and implementing the scheduled second-year-class oyster seedings called for in the Little Choptank River Restoration Blueprint. 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 the in Oyster Metrics document.

Acres Restored: 356
(initial restoration complete)

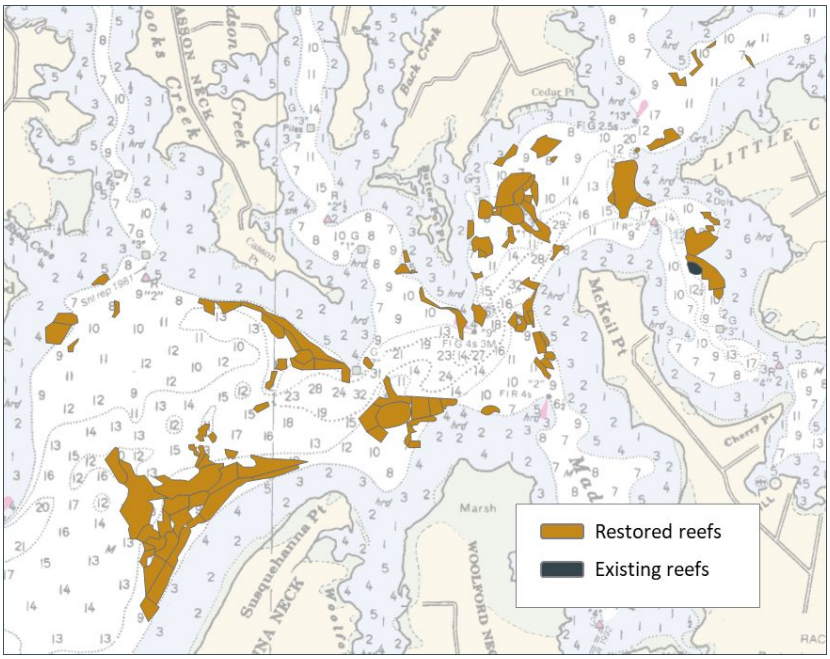


Cost to Date: $28.89 million
($701,000 in 2024)

This cost is for reefs restored under the Ten Tributaries initiative. This includes 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 configuration, hydrology, agency and community preferences, and other factors

Seed Planted: 2.16 billion
(67.69 million in 2024)

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.

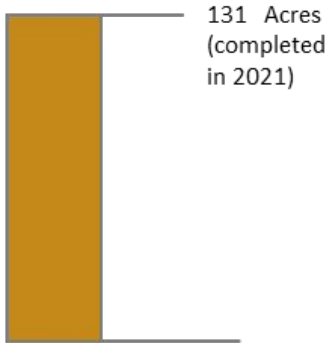


Tred Avon River

Initial restoration work in the Tred Avon River started in 2015, and was completed in 2021. Work in subsequent years 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. Partners in 2024 were also able to restore an additional 0.84 acres of reef, which had previously been designated as a control (unrestored) site for a now-complete research project. Monitoring data show that nearly all the reefs in the river are meeting at least the minimum oyster biomass and density called for the in Oyster Metrics document.

Acres Restored: 131

(initial restoration complete)



Cost to Date: $12.42 million

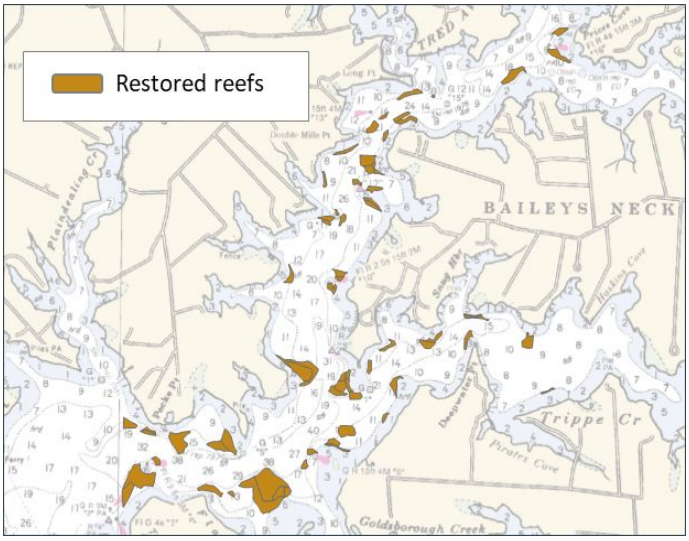
($329,000 in 2024)

This cost is for reefs restored under the Ten Tributaries initiative. This includes 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 configuration, hydrology, agency and community preferences, and other factors.

Seed Planted: 1.2 billion

(31.76 million in 2024)

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 also produced oysters as well.

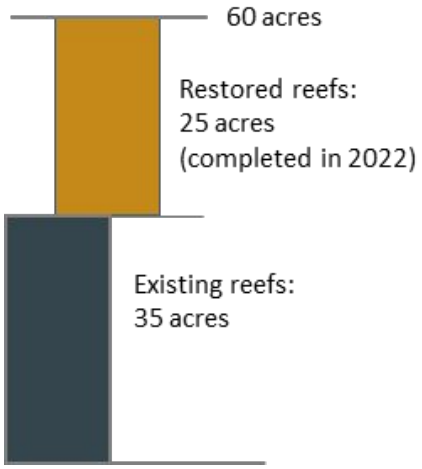


Upper St. Mary's River

Initial restoration work in the St. Mary's River started in 2021 and was completed in 2022. Partners have restored 25 acres of reefs. These reefs, in addition to the existing 35 acres of healthy reefs, bring the total to 60 acres, as called for in the St. Mary's River Restoration Blueprint. The Maryland Department of Natural Resources funded the stone reef construction; oyster seeding was funded by the Maryland Department of Natural Resources and NOAA. Future work will focus on second-year-class seedings, as needed, per the St. Mary's River Restoration Blueprint, and on reef monitoring per the Oyster Metrics success criteria. In 2024, Coastal Conservation Association and Chesapeake Bay Foundation placed 600 reef balls onto an existing reef in the river to increase reef complexity and fish habitat.

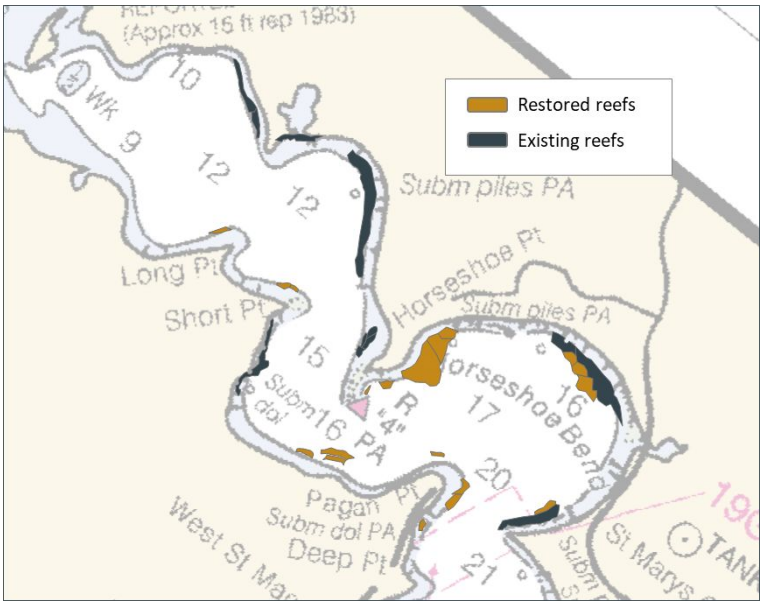
Acres Restored: 25

(initial restoration complete)



Cost to Date: $1.55 million

This cost is for reefs restored under the Ten Tributaries initiative. This includes 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 configuration, hydrology, agency and community preferences, and other factors.



Seed Planted: 151.1 million

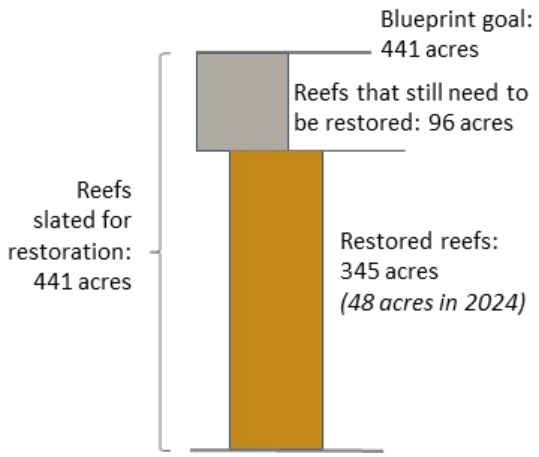
The majority of the seed was spat-on-shell, produced at the University of Maryland's Horn Point oyster hatchery. Marylanders Grow Oysters, St. Mary's Watershed Association, and The Nature Conservancy's Supporting Oyster Aquaculture & Restoration program produced oysters as well.

Manokin River

The Manokin River Restoration Blueprint sets a goal of restoring 441 acres of reefs. In-water restoration work started in 2021. In 2024, partners planted oysters onto 48 acres of reefs. In addition, Murtech Inc., under contract from the Maryland Department of Natural Resources, completed construction of all the planned stone reef bases in the river. These reefs are scheduled to receive oyster plantings in 2025. Due to good natural oyster recruitment in recent years, 75 acres of previously constructed stone reefs now meet target oyster densities, and will not require the planned additions of hatchery-produced seed oysters. This river is the most ambitious of the Ten Tributaries Bay wide, as its Restoration Blueprint calls for partners to restore the largest amount of reef acreage. All initial restoration work is slated for completion in 2025.

Acres Restored: 345

(48 acres in 2024)



Cost to Date: $21.60 million

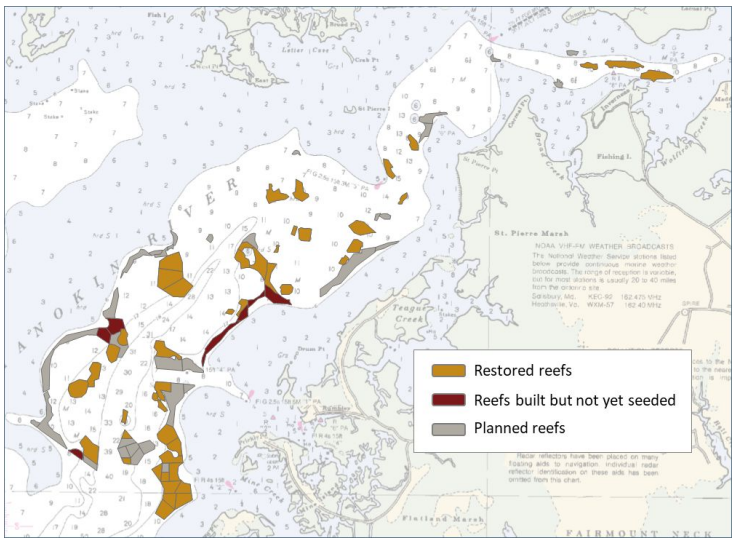
($4.43 million in 2024)

This cost is for reefs restored under the Ten Tributaries initiative. This includes 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 configuration, hydrology, agency and community preferences, and other factors.

Seed Planted: 1.12 billion

(240.87 million in 2024)

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



Maryland Notes

2024 Highlights

- Maryland partners are on track to complete initial oyster restoration in all five planned tributaries by the end of calendar 2025, barring unforeseen circumstances. Combined with completed and planned work in Virginia's five tributaries, this means partners are also on track to meet the '10 tributaries by 2025' oyster outcome of the 2014 Chesapeake Bay Watershed Agreement.
- Partners in Maryland have now restored 1,200 acres of reefs across all five tributaries.
- Monitoring data shows success across the vast majority of three-year-old and six-year-old reefs.
- The Manokin River is the largest tributary yet in terms of the number of acres of reefs that need to be restored. Reef base construction is complete, and projections show all reefs can be completed by the end of 2025.
- 2024 Maryland-wide spat set was above the 40-year median.
- Bay wide, partners are working to determine what the next large-scale, collective oyster restoration goal should be under the Chesapeake Bay Program, as we near the finish line of the Ten Tributaries initiative.

2024 Challenges

- Heavy rainfall in the Chesapeake Bay watershed in the winter and spring of 2024 prolonged low-salinity conditions in the Bay. This impeded hatchery oyster production across the Chesapeake region, which reduced seed availability for restoration projects.
- Oyster shell is in high demand and low supply across the oyster restoration, aquaculture, and wild harvest sectors in the Chesapeake region and nationally. Although reef base construction has largely switched to using alternative materials such as stone, oyster shell is still required for hatchery production of juvenile oysters (spat-on-shell). Partners across all sectors are exploring alternatives under an initiative led by the Oyster Recovery Partnership.
- Individuals in some user groups (e.g., boating public, adjacent private lease holders, waterfront property owners, watermen) have expressed opposition to some proposed projects in Maryland.

Factors Influencing Success

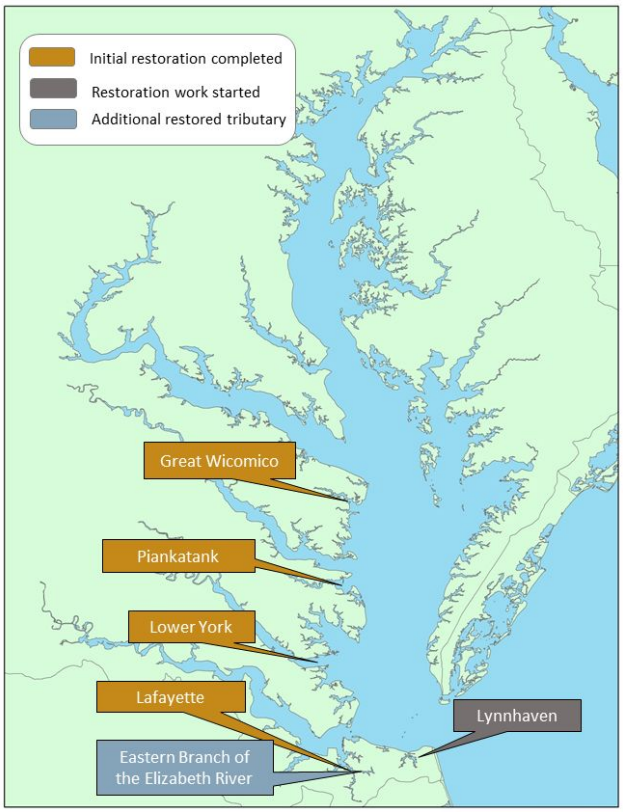
Many factors may influence the success of the Ten Tributaries initiative. These include water quality, oyster disease, fluctuations in natural oyster recruitment, fluctuations in hatchery production, and availability of suitable reef-building substrate. Despite these challenges, oyster restoration efforts in the Maryland waters of the Chesapeake Bay are showing success with the completion of Harris Creek and the Little Choptank, Tred Avon, and St. Mary's rivers. Maryland is on track to meet its goal to restore five of the ten targeted tributaries Bay wide. These tributaries serve as evidence that oyster populations can prosper in Chesapeake Bay sanctuaries, either naturally or due to restoration efforts. If recent trends of low disease mortality rates continue, on-reef survival and sustainability of restoration efforts may increase.

Photo: Oyster Recovery Partnership

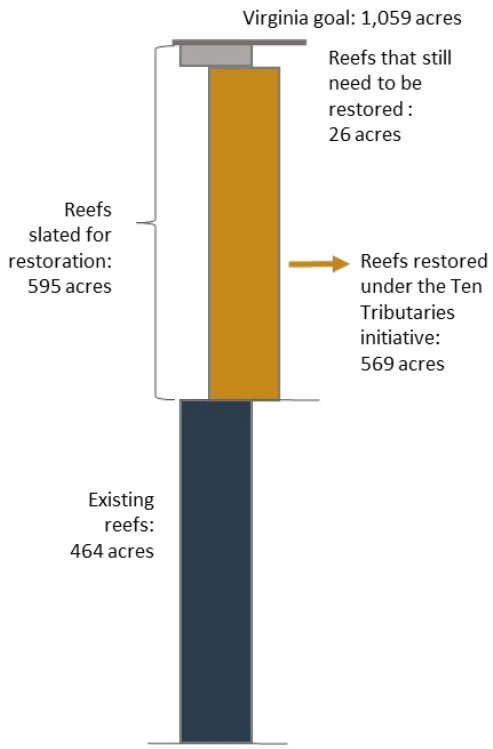
Summary of Virginia Progress

Restoration work in four Virginia tributaries toward the Ten Tributaries initiative has been completed. Work in each tributary followed a Restoration Blueprint. Additional restoration work, beyond the goals in the Ten Tributaries initiative, is also being planned in some of these rivers. In-water restoration work is well under way in the final tributary, the Lynnhaven River. To date, partners have restored 569 acres of oyster reefs at a cost of approximately $21.86 million. Above and beyond the ten tributaries planned for restoration Bay-wide, Virginia partners have also restored the Eastern Branch of the Elizabeth River to the same standards, making this an additional 'bonus' tributary.

Tributaries Complete: Four of Five Planned



Acres of Reefs Restored: 569 of 595 planned



Virginia Cost to Date: $21.86 million

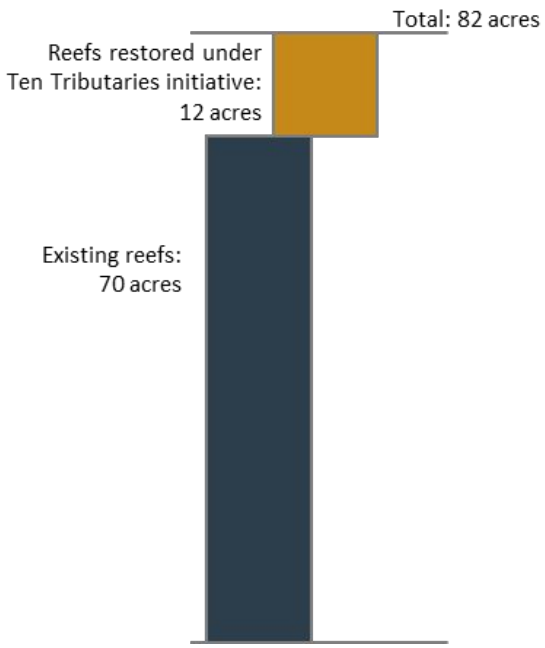
This cost is through the end of 2024, for reefs restored under the Ten Tributaries initiative. This includes reef construction and seeding only; costs such as benthic surveys, planning, permitting, and monitoring are not reflected. Restoration cost per acre varies due to factors including material type, reef configuration, hydrologic factors, agency and community preferences, and other factors.

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 Ten Tributaries initiative. The focus now is on monitoring the restored and existing reefs in the river. Earlier restoration projects show high densities of oysters representing numerous year classes, boding 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 Restored: 12

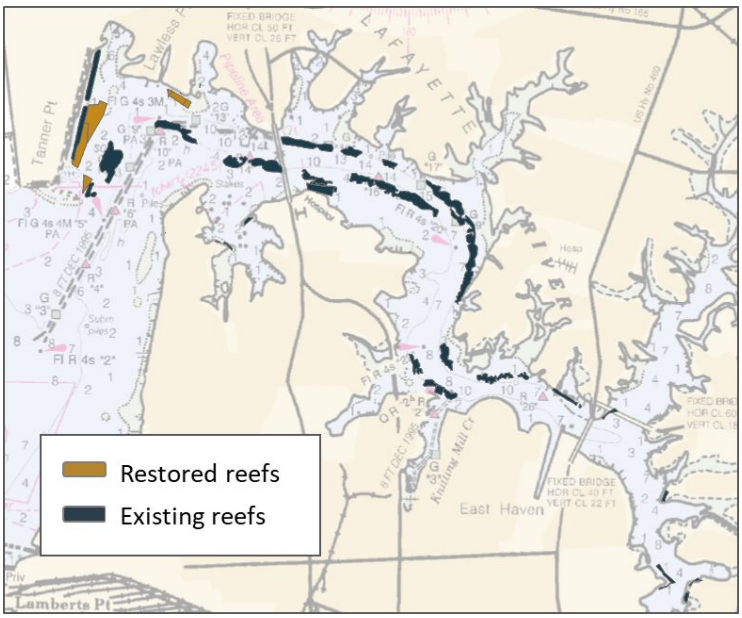
(restoration complete)



Cost to Date: $716,000

(restoration completed in 2018)

This cost is for reefs restored under the Ten Tributaries initiative. This includes 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 configuration, hydrologic factors, agency and community preferences, and other factors. Cost is approximate.

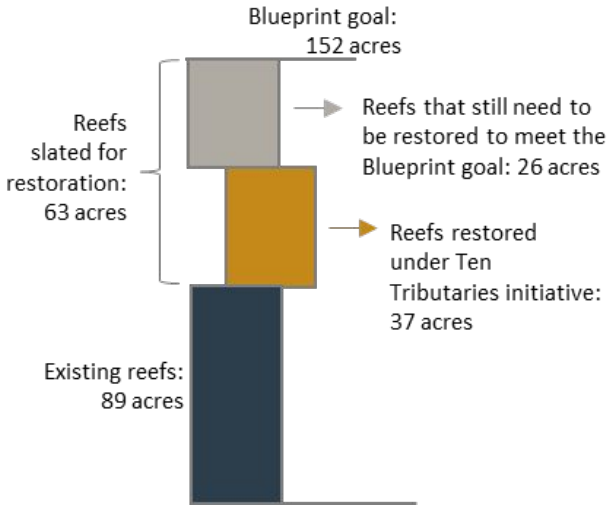


Lynnhaven River

The Lynnhaven River is the final remaining Virginia tributary planned for oyster restoration under the Ten Tributaries initiative. Its Restoration Blueprint sets a goal of 152 acres of reefs. The most recent completed reef construction in the River was in 2022, when the Chesapeake Bay Foundation and Lynnhaven River Now constructed new reefs. After receiving final state approval in 2024 to remain in the water, 11 acres of these reefs are now being counted toward the total reef restoration acreage for the River (see graphic). Monitoring data shows these reefs more than meet the Oyster Metrics targets for oyster density and biomass.

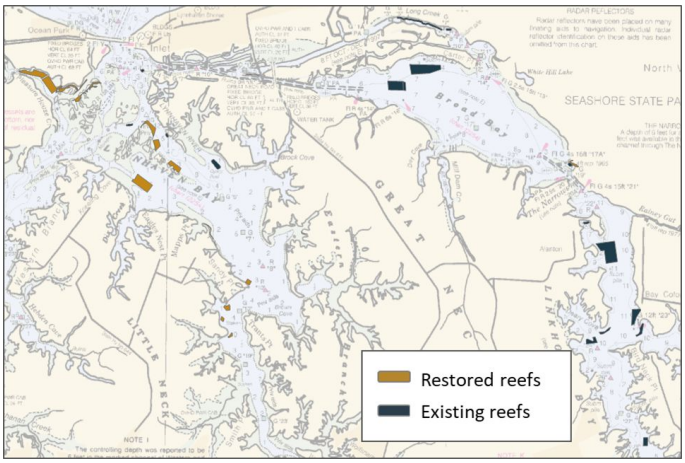
The U.S. Army Corps of Engineers' Norfolk District, with the City of Virginia Beach as its cost-share partner, awarded a contract to Coastal Design & Construction Inc. to construct 23.2 acres of new reefs in the Lynnhaven River using crushed stone and fossil shell. The contractor started reef construction work in October 2024; completion is expected in spring 2025. Recent monitoring on an 8-acre reef constructed in 2021 by U.S. Army Corps of Engineers' Norfolk District, consisting of more than 28,000 reef balls, shows that the reef far exceeds Oyster Metrics targets for oyster density and biomass.

Acres Restored: 37 of 63 Planned



Cost to Date: $3.43 million

This cost is through the end of 2024, for reefs completed under the Ten Tributaries initiative. This includes reef construction 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 configuration, hydrologic factors, agency and community preferences, and other factors. Cost is approximate.

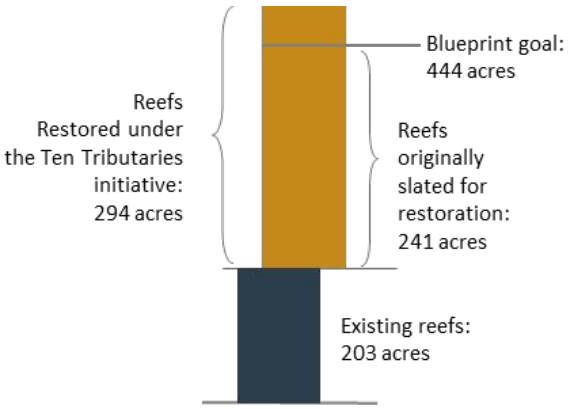


Piankatank River

Oyster reef restoration work was completed in the Piankatank River in 2021, per the Piankatank River Restoration Blueprint. 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 acres of stone reefs in the Piankatank River in 2023.

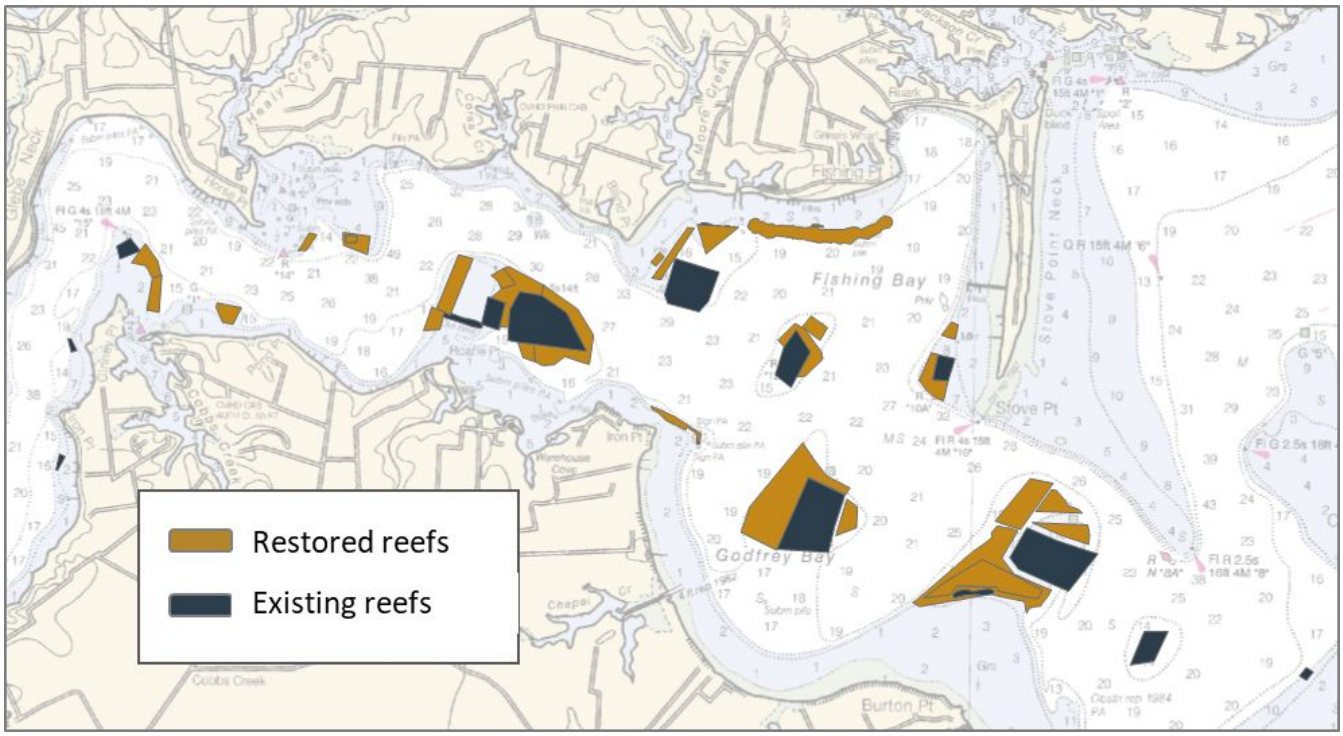
Acres Restored: 294

(restoration completed in 2021; additional reefs restored in 2023)



Cost to Date: $11.1 million

This cost is for reefs restored under the Ten Tributaries initiative. This includes 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 configuration, hydrologic factors, agency and community preferences, and other factors. Cost is approximate.

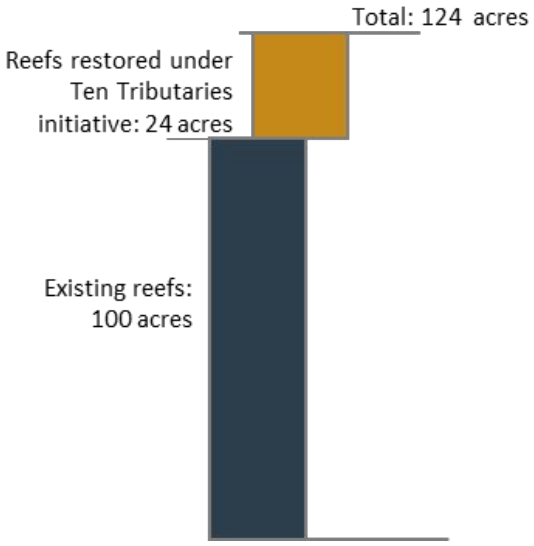


Great Wicomico River

Oyster reef restoration work was completed in the Great Wicomico River in 2021, per the river's Restoration Blueprint. The U.S. Army Corps of Engineers' Norfolk District, in partnership with the Virginia Marine Resources Commission, has begun planning efforts to perform adaptive management on existing reefs in the Great Wicomico River. Efforts include 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. Project design is ongoing; construction is projected to begin in 2025.

Acres Restored: 24

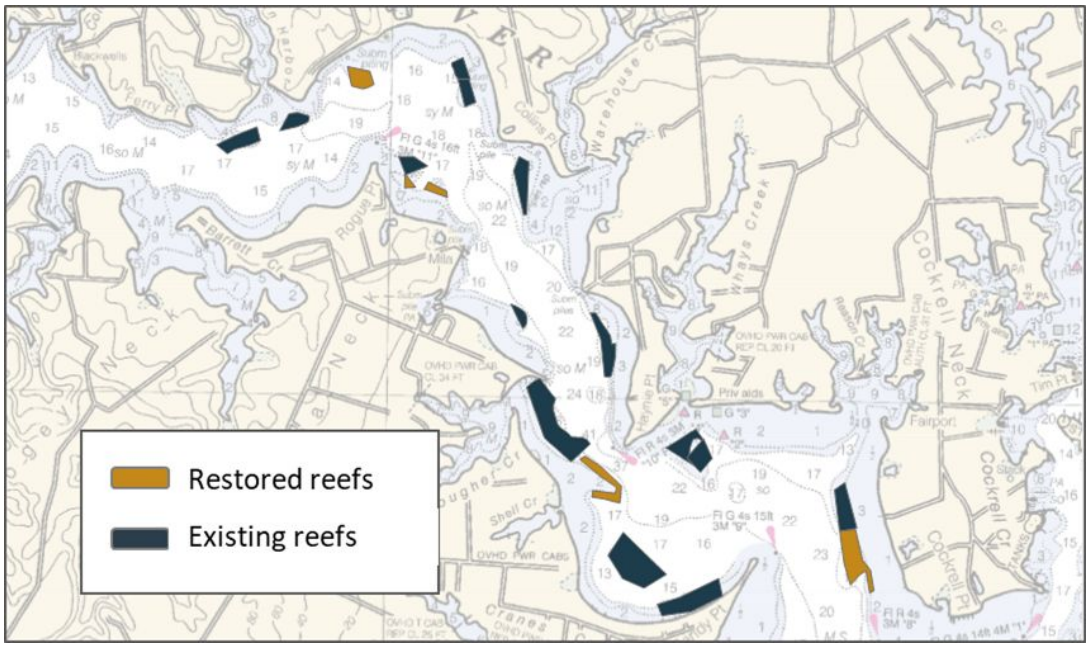
(restoration complete)



Cost to Date: $907,000

(restoration completed in 2021)

This cost is for reefs restored under the Ten Tributaries initiative. This includes reef construction 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 configuration, hydrologic factors, agency and community preferences, and other factors. Cost is approximate.

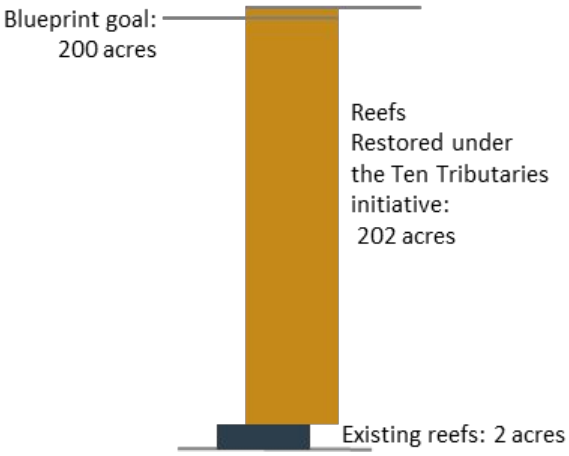


Lower York River

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

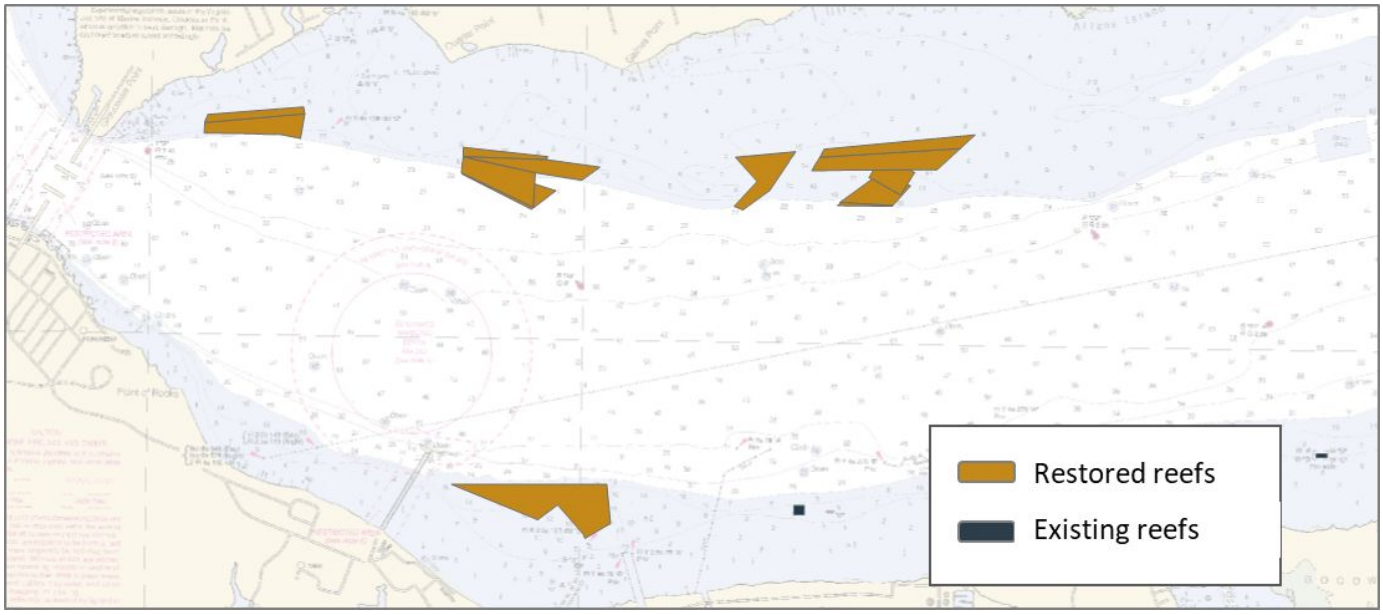
Acres Restored: 202

(9 acres in 2023)



Cost to Date: $5.71 million

This cost is for reefs restored under the Ten Tributaries initiative. This includes 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 configuration, hydrologic factors, agency and community preferences, and other factors. Cost is approximate.



Virginia Notes

2024 Highlights

- Virginia partners are on track to complete initial oyster restoration in all five planned tributaries by the end of calendar 2025. Combined with completed and planned work in Maryland's five tributaries, this means partners are also on track to meet the '10 tributaries by 2025' oyster outcome of the 2014 Chesapeake Bay Watershed Agreement.
- VMRC also completed restoration work on an additional tributary, the Eastern Branch of the Elizabeth River, in 2020.
- Partners in Virginia have now restored 569 acres of reefs across all five tributaries.
- Monitoring data shows high oyster densities across restored reefs.
- Bay wide, partners are working to determine what the next large-scale, collective oyster restoration goal should be under the Chesapeake Bay Program, as we near the finish line of the Ten Tributaries initiative.

2024 Challenges

- 2024 Virginia-wide spat set was below the 20-year average, and the lowest on record in the past decade. However, it was notably above those in the early 2000s, and follows several years of above-average recruitment.
- Oyster shell is in high demand and low supply across the oyster restoration, aquaculture, and wild harvest sectors in the Chesapeake region and nationally. Although reef base construction has largely switched to using alternative materials such as stone, oyster shell is still required for hatchery production of juvenile oysters (spat-on-shell). Partners across all sectors are exploring alternatives under an initiative led by the Oyster Recovery Partnership.
- Individuals in some user groups (e.g., boating public, adjacent private lease holders, waterfront property owners, watermen) have expressed opposition to some proposed projects in Virginia.
- Typically, the most suitable areas for reef restoration, and the less-contentious areas, are the first completed. Therefore, as targets are almost reached, the last remaining acreage may become more difficult and/or expensive per acre of restoration on some tributaries.

Factors Influencing Success in Virginia

Factors influencing success of the Ten Tributaries initiative include restoration funding, water quality, oyster disease, acquisition of real estate rights, fluctuations in natural oyster recruitment, and availability of suitable reef-building substrate. Also, older shell reefs were, and may still be, susceptible to poaching, but stone reefs are less so. That oyster restoration can succeed in the Virginia waters of the Chesapeake Bay has been validated by past successful oyster restoration efforts, and by the discovery of a relict, self-sustaining oyster population in the Lafayette River. These serve as evidence that oyster populations can prosper in the Chesapeake Bay, either naturally or due to restoration, in non-harvest areas. Virginia experiences consistent natural oyster recruitment, which minimizes the need for augmentation with hatchery-produced oysters. Recent declining trends in disease mortality rates have increased on-reef survival and sustainability of restoration efforts. Unpredictable environmental disturbances (e.g. freshets; sediment influx due to extreme weather events; temperature changes; hypoxia) may affect long-term reef success. These kinds of effects may become more likely in the face of climate change.

Photo: U.S. Army Corps of Engineers