The 2014 Chesapeake Bay Watershed Agreement (www.chesapeakebay.net/documents/21752/final_ches_bay_watershed_agreement.pdf), 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.”

To achieve this outcome in Virginia, the Chesapeake Bay Program’s Sustainable Fisheries Goal Implementation Team convened oyster restoration workgroups—now known as the Hampton Roads Oyster Restoration Workgroup (for the Lafayette and Lynnhaven rivers) and the Western Shore Oyster Restoration Workgroup (for the Piankatank, Lower York, and Great Wicomico rivers). These workgroups comprise representatives from federal and state agencies, municipalities, academic institutions, and nongovernmental organizations; they plan, coordinate, and implement large-scale oyster restoration in each tributary. Each is working to set tributary-specific restoration goals and develop plans describing how the tributaries will be restored, consistent with standards described in the Chesapeake Bay Oyster Metrics Report (www.chesapeakebay.noaa.gov/images/stories/fisheries/keyFishSpecies/oyster-metricsreportfinal.pdf).

On behalf of each workgroup, the National Oceanic and Atmospheric Administration (NOAA) develops and maintains GIS geodatabases with relevant data on each tributary, available at www.habitat.noaa.gov/chesapeakebay/gis/Oyster_Restoration_Geodatabases/.

An overview of Bay-wide progress toward the Chesapeake Bay Watershed Agreement oyster outcome is available at www.chesapeakeprogress.com/abundant-life/sustainable-fisheries/oysters.

An overview of Maryland progress toward the Chesapeake Bay Watershed Agreement oyster outcome is available at chesapeakebay.noaa.gov/oysters/oyster-restoration.

Please cite this document as:
NOAA Chesapeake Bay Office and NOAA Restoration Center. 2019. 2018 Virginia Oyster Restoration Update: Progress in Five Tributaries. Annapolis, MD.
Hampton Roads Oyster Restoration Workgroup

The Hampton Roads Oyster Restoration Workgroup, which coordinates restoration efforts in the Lafayette and Lynnhaven rivers, includes the National Oceanic and Atmospheric Administration (NOAA) (cochair), U.S. Army Corps of Engineers’ Norfolk District (USACE) (cochair), Chesapeake Bay Foundation (CBF), Christopher Newport University (CNU), City of Norfolk, City of Virginia Beach, Elizabeth River Project (ERP), Virginia Commonwealth University, Virginia Institute of Marine Science (VIMS), Lynnhaven River NOW (LRN), Pleasure House Oysters, and Virginia Marine Resources Commission (VMRC).

Lafayette River

<table>
<thead>
<tr>
<th>Goal</th>
<th>Restoration Completed in 2018</th>
<th>Remaining to Be Restored</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 acres</td>
<td>6.1 acres</td>
<td>0 acres</td>
</tr>
</tbody>
</table>

Planned oyster restoration work on the Lafayette River was finished in 2018, making it the first river in Virginia to be considered complete under the 2014 Chesapeake Bay Agreement oyster outcome. To complete the planned work, in 2018 ERP constructed three reefs totaling just over six acres, with funding from the Environmental Protection Agency and NOAA. These projects incorporated stripes of substrate across the reef sites, rather than using the traditional method of covering the entire reef area with substrate. The reefs were built 12 inches high from a combination of crushed concrete, shell, and stone. CBF, with funding from the Environmental Protection Agency via the National Fish and Wildlife Foundation, produced more than 8 million spat-on-shell, and planted them over portions of all three reefs.

Restoration work in the Lafayette River has been ongoing for two decades, but Workgroup members banded together under the 2014 Chesapeake Bay Watershed Agreement oyster outcome and in 2017 produced the Lafayette River Oyster Restoration Tributary Plan (see https://chesapeakebay.noaa.gov/images/stories/habitats/lafayetteoystertribplanau2017.pdf). This Plan called for a total of 80 acres of restored reefs in the river. Of these, 70 acres were either older existing restoration projects (22 acres) or relict (historic) reefs (48 acres). This left a balance of 10 acres for the partners to complete per the Plan. Partners slightly exceeded that 10-acre goal by constructing a total of 11 acres in 2017 and 2018, at a cost of just over $716,000. This represents only funds expended on reef construction and seeding. Associated costs, such as staff time, design, permitting, monitoring, and partner coordination, are not reflected.

Outlook

Completion of the planned restoration work launches the Workgroup into the monitoring phase of the project. As this is the first tributary restored in Virginia under the Chesapeake Bay Watershed Agreement oyster outcome, it will be the first Virginia area where a cohesive monitoring program is developed under this outcome. Oyster reef sampling on older restoration projects shows high densities of oysters, boding well for the newer Lafayette projects. The Workgroup has developed a GIS geodatabase of spatial information relevant to oyster restoration (maintained by NOAA). This was used for restoration planning and progress tracking, and will be used to plan and track monitoring.
Lynnhaven River

<table>
<thead>
<tr>
<th>Goal</th>
<th>Restoration Completed in 2018</th>
<th>Remaining to Be Restored</th>
</tr>
</thead>
<tbody>
<tr>
<td>152 acres</td>
<td>0 acres</td>
<td>61.4 acres</td>
</tr>
</tbody>
</table>

In 2018, the Workgroup set a restoration goal for the Lynnhaven River of 152 acres (89% of currently restorable oyster habitat) and completed a tributary restoration plan. Both the restoration goal and the restoration plan were guided by a GIS geodatabase of Lynnhaven spatial information relevant to oyster restoration that was developed and is maintained by NOAA. In order to establish this goal, the Workgroup developed an assessment of both the currently restorable oyster habitat on the river bottom and the extent of oyster reefs present in the river.

USACE, LRN, and VMRC have completed the restoration of approximately 54.6 acres of oyster reefs in the river, including 44.6 acres constructed by USACE\(^1\), 7.5 acres constructed by VMRC, and 2.5 acres by LRN. In addition, the Workgroup determined that there are 36 acres of naturally occurring intertidal reefs functioning at a restored level. The Workgroup estimates that 90.6 acres of existing oyster reef have either been restored or are functioning at a restored level. Restoration partners will need to construct an additional 61.4 acres of reef habitat to reach the 152-acre goal the Workgroup set for the river.

USACE and the City of Virginia Beach plan to implement the multiphase Lynnhaven River Basin Ecosystem Restoration project in the river, which will ultimately restore 31 acres of reef habitat. In 2018, USACE began planning the implementation of phase one of this project, which will include the construction of oyster reef habitat.

USACE, in partnership with VIMS and CNU, started a survey of constructed subtidal reefs in the river in late 2018. Anticipated completion timeframe for the data collection and assessment is spring 2019.

\(^1\) Note: This is a correction from the 2017 Virginia Oyster Restoration Update that reported that USACE had completed 46 acres.

### Outlook

In 2019, several restoration partners plan to construct reef habitat in the Lynnhaven. USACE plans to construct up to 8 acres as part of the Lynnhaven River Basin Ecosystem Restoration project. In a separate project, VRMC plans to construct approximately 10 acres with funding from NOAA. CBF and LRN plan to construct an additional 5 acres of reef habitat with grant funds they received in late 2018 from the National Fish and Wildlife Foundation.
Western Shore Oyster Restoration Workgroup

The Western Shore Oyster Restoration Workgroup coordinates restoration efforts in the Piankatank, Great Wicomico, and Lower York rivers and includes NOAA (cochair), USACE (cochair), The Nature Conservancy (TNC), Chesapeake Bay Foundation, Christopher Newport University (CNU), Virginia Commonwealth University (VCU), Virginia Institute of Marine Science (VIMS), Lynnhaven River NOW, Pleasure House Oysters, and Virginia Marine Resources Commission (VMRC).

Piankatank River

<table>
<thead>
<tr>
<th>Goal</th>
<th>Restoration Completed in 2018</th>
<th>Remaining to Be Restored</th>
</tr>
</thead>
<tbody>
<tr>
<td>437.67 acres</td>
<td>15.44 acres</td>
<td>159.66 acres</td>
</tr>
</tbody>
</table>

In 2018, the Workgroup developed a goal of restoring 437.67 acres of oyster reefs in the River. Currently, there are 75.01 acres of existing restoration projects in the river, and another 203 acres of ‘premet’ reefs (reefs with sufficient oyster density and biomass to be considered already functioning at a restored level). Restoring another 159.66 acres will bring the river in line with the established definition of a restored tributary under the 2014 Chesapeake Bay Watershed Agreement. The Workgroup has developed a GIS geodatabase of Piankatank spatial information relevant to oyster restoration. The geodatabase, maintained by NOAA, is used for restoration goal setting, planning, and progress tracking.

In summer 2018, TNC and VMRC constructed three reefs totaling 15.44 acres in the Piankatank River. These reefs were constructed from stone (crushed granite) approximately two inches in diameter. The $200,000 project was funded evenly by TNC and VMRC for the stone material and labor. The VCU Oyster Shell Recycling Program planted 1,200 bushels of recycled shell set with 7 million juvenile oyster onto the new reefs. The shell contribution was completed with funding from VCU’s charitable donors. The reefs were constructed on a combination of existing shell bottom with low oyster densities, sandy mud bottom, and sandy shell bottom. The reefs were built to a height of approximately 3 inches. Natural oyster recruitment is generally high in the Piankatank River, and the Workgroup expects the reefs will self-seed with juvenile oysters, enhanced by the planted spat-on-shell.

Outlook

The Western Shore Workgroup has drafted an oyster restoration tributary plan for the Piankatank River. It is expected to be final in early 2019.

VMRC and TNC plan to construct reefs in the Piankatank River in spring and summer 2019. The size of the reefs will be determined by the level of funding that is available. The construction methods will most likely be similar to those used
in 2018. The areas that were constructed by TNC and VMRC in 2018, as well as any potential 2019 construction, will be incorporated into the existing monitoring program (the Virginia Oyster Stock Assessment and Replenishment Archive—VOSARA).

USACE, in partnership with VMRC, plans to construct an additional 165 acres as part of its Chesapeake Bay Native Oyster Recovery Program’s Piankatank River Restoration Project. Designs are under way; however, additional funding will be required to complete the next phase of construction.

In late 2018, USACE funded VIMS and CNU to perform oyster monitoring work in the Piankatank River, which is already under way. The purpose is to assess the 25-acre reef constructed by USACE in 2017 relative to Oyster Metrics success criteria, and to determine suitability of other sites for potential restoration. Divers, patent tongs, and a remotely operated vehicle (ROV) are being used for the monitoring work. Anticipated completion timeframe for the data collection and assessment is spring 2019.

VMRC intends to monitor the 15+ acres of reefs built in 2018 as part of the annual VMRC/VIMS fall patent tong survey (the Virginia Oyster Stock Assessment and Replenishment Archive—VOSARA), as well as continuing to monitoring the 203 acres of ‘premet’ reefs (see definition above). In 2019, VCU intends to continue to add spat-on-shell to the 15 acres of reef.

**Lower York River**

The Lower York River was selected by the Virginia Interagency Oyster Team and approved by the Sustainable Fisheries Goal Implementation Team in late 2017 as the fourth tributary for large-scale restoration. In 2018, the Workgroup developed a GIS geodatabase of Lower York River spatial information relevant to oyster restoration. The geodatabase, maintained by NOAA, is being used to help the Workgroup in restoration goal setting and planning.

In 2018, NOAA conducted an extensive sonar survey of the river bottom in the Lower York River, and from this developed a habitat assessment. The bottom characteristic data and assessment will be used by the Workgroup in 2019 to determine which areas in the river are suitable for oyster restoration and to help set a restoration goal for the River. Minimal oyster restoration work has occurred to date in the Lower York River.

**Great Wicomico River**

The Great Wicomico River was selected by the Virginia Interagency Oyster Team and approved by the Sustainable Fisheries Goal Implementation Team in late 2017 as the fifth tributary for large-scale restoration. In 2018, the Workgroup developed a GIS geodatabase of Great Wicomico River spatial information relevant to oyster restoration. The geodatabase, maintained by NOAA, will be used to help the Workgroup set restoration goals and track progress.

Older oyster restoration work exists in the Great Wicomico River. In 2003 and 2004, USACE used shell to construct 85 acres of sanctuary reefs. In 2015, USACE used reef-building substrate (shell) to raise the height of 13 of those acres that contained low-relief, degraded, and poached reefs as an adaptive management effort. The successfully restored oyster reefs in the Great Wicomico River support a population of nearly 200 million oysters and have been self sustaining since 2004, as indicated by multiple surveys through 2016. The only reefs that have not persisted over this period are those that have been poached and some that were constructed either at low relief or on suboptimal bottom.

In late 2018, USACE funded VIMS and CNU to perform oyster-monitoring work in the Great Wicomico River. The purpose is to reassess previously constructed USACE reefs in the river relative to Oyster Metrics success criteria. A remotely operated vehicle (ROV) and patent tongs will be used for the monitoring work. Anticipated completion timeframe for the data collection and assessment is 2019. Preliminary results of this assessment determined that at least 61 acres of reef currently meet the Oyster Metrics success criteria.
Factors Influencing Successful Completion of the Chesapeake Bay Watershed Agreement Oyster Outcome

Many factors may influence the successful completion of the Chesapeake Bay Watershed Agreement oyster outcome. These include restoration funding, poaching, water quality, oyster disease, acquisition of real estate rights, fluctuations in natural oyster recruitment, and availability of suitable reef-building substrate.

That oyster restoration can succeed in the Chesapeake Bay has been validated by successful oyster restoration efforts in the Lafayette, Piankatank, Great Wicomico, and Lynnhaven rivers 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 sanctuaries. Virginia experiences relatively high natural oyster recruitment rates, which minimizes the need for augmentation with hatchery oysters. Recent declining trends in disease mortality rates may increase on-reef survival and sustainability of restoration efforts.

The 2018 Virginia Oyster Restoration Update was compiled by the Hampton Roads and Western Shore Restoration Workgroups of the Chesapeake Bay Program’s Sustainable Fisheries Goal Implementation Team:

- National Oceanic and Atmospheric Administration (NOAA), cochair
- U.S. Army Corps of Engineers’ Norfolk District, cochair
- Chesapeake Bay Foundation
- Christopher Newport University
- City of Norfolk
- City of Virginia Beach
- Elizabeth River Project
- Lynnhaven River NOW
- The Nature Conservancy
- Pleasure House Oysters/Ludford Brothers Oyster Company
- Virginia Commonwealth University
- Virginia Institute of Marine Science
- Virginia Marine Resources Commission