

2014 Oyster Restoration Implementation Update

Progress in the Choptank Complex (Harris Creek, Little Choptank River, and Tred Avon River)

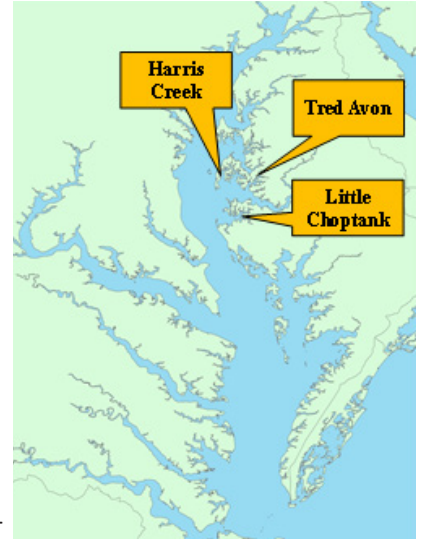
May 2015

The Chesapeake Bay Watershed Agreement, signed in June 2014, calls for state and federal partners to “restore native oyster habitat and populations in 10 Bay tributaries by 2025 and ensure their protection.” This overlaps with existing policy drivers, including Chesapeake Bay Executive Order 13508, the U.S. Army Corps of Engineers’ Oyster Restoration Master Plan, and Maryland’s Oyster Restoration and Aquaculture Development Plan.

To achieve this outcome, the U.S. Army Corps of Engineers’ Baltimore District (USACE), the National Oceanic and Atmospheric Administration (NOAA), the Maryland Department of Natural Resources (DNR), and the Oyster Recovery Partnership (ORP) formed the Maryland Oyster Restoration Interagency Workgroup.

This group, with guidance from consulting scientists and the public, is working to advance and coordinate oyster restoration in selected Maryland tributaries. This document describes progress made in implementing oyster restoration tributary plans for:

- Harris Creek (www.chesapeakebay.noaa.gov/images/stories/habitats/harris creek blueprint 1.13.pdf)
- Little Choptank River (www.chesapeakebay.noaa.gov/images/stories/pdf/oyster trib plan little choptank.pdf)
- Tred Avon River (draft) (www.chesapeakebay.noaa.gov/images/stories/habitats/draft tred avon trib plan.pdf)

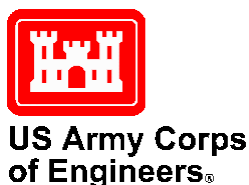


These plans detail how each tributary will be restored consistent with the restoration success metrics developed in the Chesapeake Bay Oyster Metrics report (see www.chesapeakebay.noaa.gov/images/stories/fisheries/keyFishSpecies/oyster metrics report final.pdf). Combined, these three plans call for the restoration of more than 950 acres in the Choptank River complex, focusing on Harris Creek, the Little Choptank River, and the Tred Avon River.

Summary of Restoration Progress in the Choptank Complex

Year	Acres Restored <i>(reefs constructed and seeded)</i>	Acres Constructed <i>(constructed and awaiting seeding)</i>	Oyster Seed Planted	Funds Spent†
2014	82	112	511.34 million	\$24.57 million*
2011-2014	275	112	1.71 billion	\$34.77 million

†These costs represent only funds expended on reef construction and seeding. Costs associated with focusing existing resources into the Choptank Complex (such as benthic surveys, oyster population and disease surveys, and water-quality monitoring) are not reflected; nor are staff salaries. Similarly, the cost estimate described in each river’s tributary plan is for reef construction and seeding only, plus a small amount for monitoring required in excess of ongoing monitoring programs.



Additional partners include the National Fish and Wildlife Foundation, The Nature Conservancy, University of Maryland, Virginia Institute of Marine Science, and the Chesapeake Bay Foundation.

Reef restoration treatment generally falls into two categories: areas that need only additional seed, and areas that first need reconstruction of reef substrate and then additional seed. The substrate construction and seeding may happen in the same year—or in different years. Throughout this document, the term ‘constructed’ refers to areas where reef-building substrate material has been placed, but oyster seed has not yet been added. ‘Restored’ areas are where all necessary restoration treatment has occurred (substrate has been added, where necessary, and oyster seed have been planted). ‘Planted’ refers to placing seed oysters on top of a reef (either one that has had reef substrate added already, or one where no reef-building substrate was required).

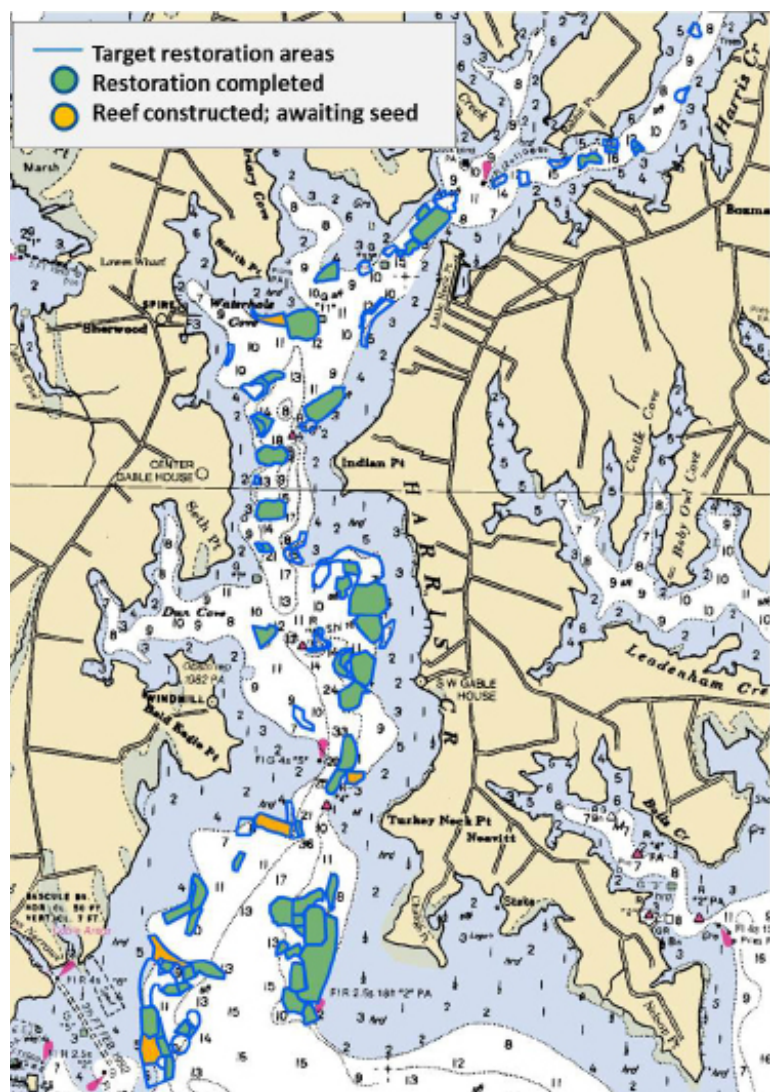
Restoration Progress Summary

Since 2011, 275 acres of sanctuary oyster reefs have been restored in the Choptank Complex (258 acres in Harris; 17 acres in Little Choptank). An additional 112.2 acres have been constructed, to be seeded in subsequent years (27 in Harris; 95.2 in Little Choptank). These 112.2 acres are noteworthy, as reef construction is generally several times more expensive than seeding. As planned, these acres will be seeded in 2015, as hatchery production allows. Seed oysters were produced by the University of Maryland’s (UMD) Horn Point hatchery, with funding from NOAA, DNR, and UMD. This is the largest oyster restoration project on the U.S. East Coast.

Harris Creek

2014 Implementation Progress

- USACE constructed 23.3 acres of oyster reefs in Harris Creek, using 25,002 cubic yards of rock and 10,888 cubic yards of mixed shell (clam, scallop, whelk). The substrate work started December 2013 and continued through April 2014. The \$1.8 million contract was performed by Argo Systems, LLC.
- DNR constructed 61.7 acres of reef substrate, using fossil shell from Florida and rock. DNR spent \$8.4 million on this project; CSX subsidized substrate transport worth \$648,000. The National Fish and Wildlife Foundation (NFWF) helped establish the DNR-CSX partnership.
- ORP seeded 65 acres with 430 million spat-on-shell, with funding from NOAA, DNR, and UMD. These oysters were produced by the UMD’s Horn Point hatchery.
- The remaining 27 acres that were constructed, but not yet seeded, are slated for seeding in 2015. These acres were built in fall 2014, after the seed production season ended.
- The Chesapeake Bay Foundation (CBF), with volunteer help and \$50,000 in NOAA funding, produced and planted 14.3 million seed into Harris Creek.
- The Harris Creek Tributary Plan calls for the restoration of 372 acres of reefs. This number was originally 377 acres, but some acres have since been set aside as project controls, and will not receive restoration treatment.



Colored polygons show restoration progress in Harris Creek.

Monitoring

- Four sentinel sites on Harris Creek are monitored annually for oyster growth and survival. These sites, together with additional monitoring performed on each reef within two months of planting, show that survival of Harris Creek planted oysters has been nearly twice that of past restoration efforts. Improved restoration site selection, informed by NOAA and DNR side-

scan sonar data and confirmed by diver groundtruthing of bars prior to planting performed by Paynter Labs at the University of Maryland, with support from DNR and ORP, is thought to have improved survivorship.

- In Harris Creek, 2014 prevalence levels of the oyster disease *Perkinsus marinus* (which causes Dermo disease) were variable, ranging from 10% to 100% (average = 63%) in both hatchery plantings and natural populations. Intensity of infection tended to be relatively low (sub-lethal levels). Dermo data was collected by DNR, Paynter Labs at the University of Maryland, and volunteers with DNR’s Marylanders Grow Oysters program. Given the high dermo prevalence, a dry-weather year (leading to high salinity) could result in increased dermo intensity and mortality. Allowing disease-resistant adult oysters to survive disease outbreaks, so they can potentially pass along resistant traits to their offspring, could be a benefit of oyster sanctuaries.



Natural spat set on fossil shell from Florida in Harris Creek in 2014.

- With funding from The Nature Conservancy, DNR monitored three water-quality stations on Harris Creek (mddnr.chesapeakebay.net/eyesonthebay/). Water conditions were favorable for oysters throughout 2014.
- Harris Creek, and the Chesapeake Bay in general, received a natural spat set in 2014 that was below the 30-year median. Based on the spat set observed during the fall survey, fossil oyster shell from Florida appears to be a viable alternative to natural shell.

Summary of Harris Creek Restoration Progress

Year	Acres Restored <i>(reefs constructed and seeded)</i>	Acres Constructed <i>(constructed and awaiting seeding)</i>	Oyster Seed Planted	Funds Spent [†]
2014	65	27	444.30 million	\$9.09 million*
2011-2014	258	N/A	1.63 billion	\$19.29 million

*Funding breakdown: Corps: \$1.8 million (reef construction); NOAA: \$715,000 (seeding; \$50,000 to CBF; \$665,000 to ORP); DNR: \$5.9 million (\$4.9 million on reef construction, \$1 million on seeding); CSX: \$675,000 (in-kind reef substrate transport).

†These costs represent only funds expended on reef construction and seeding. Costs associated with focusing existing resources into Harris Creek (such as benthic surveys, oyster population and disease surveys, and water-quality monitoring) are not reflected; nor are staff salaries. Similarly, the \$31.6 million project cost described in the Harris Creek Tributary Plan was for reef construction and seeding only, plus a small amount for monitoring required in excess of ongoing monitoring programs.

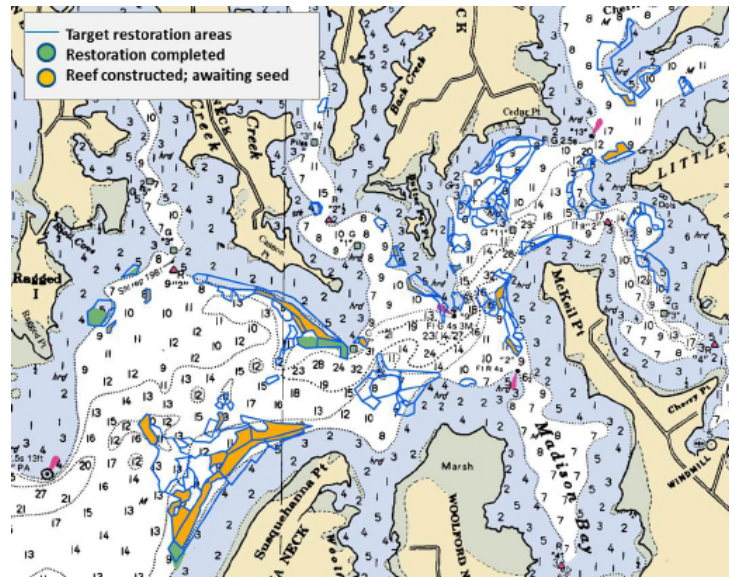
Outlook for 2015

- USACE Baltimore District plans to construct 57 acres of reefs in Harris Creek in early 2015. These will be constructed from rock and mixed shell, similar to the 2014 reef construction. Placement is expected to occur January-May. Contract cost for this work is \$5.1 million, awarded to Argo Systems, LLC, in July 2014.
- These 57 acres, plus seeding anticipated in summer 2015, are expected to complete initial in-water restoration work on Harris Creek. (Note that future seed plantings may be required to maintain target oyster density, based on on-going monitoring information.)
- In 2014, The Nature Conservancy contributed \$50,000 to DNR toward water-quality monitoring related to Choptank Complex oyster restoration projects. The funds will be used to purchase three water-quality meters and contribute to salaries of employees involved in water-quality monitoring.
- NFWF, through ORP, contributed \$20,000 to purchase an additional water-quality meter. NFWF also plans to support ORP with an additional \$520,000 in 2015 for restoration and monitoring for Harris Creek and Little Choptank.

Little Choptank River

2014 Implementation Progress

- An oyster restoration plan was finalized for the Little Choptank River (www.chesapeakebay.noaa.gov/images/stories/pdf/oystertribplanlittlechoptank.pdf). The plan calls for restoring 440 acres of reefs, requiring 1.9 billion seed oysters and 314,600 cubic yards of reef-building substrate, at an anticipated cost of \$29 million. Of the 440 acres, 40 acres already meet the Oyster Metrics definition of a restored reef. These acres will be monitored as part of the plan, but may not require any restoration treatment.
- In-water restoration work began on the Little Choptank oyster sanctuary in 2014.
- DNR constructed 95.2 acres of reef substrate, using fossil shell from Florida and rock. DNR spent \$17.26 million on this project; CSX subsidized substrate transport worth \$1.75 million. NFWF helped establish the DNR-CSX partnership. Some of these reefs are slated for seeding in 2015.
- ORP, with funding from NOAA, DNR, and UMD, planted 81.34 million oysters in the Little Choptank in 2014. These were planted on 17 acres of existing reefs where oyster populations were low. These sites did not require reef-building substrate prior to seeding for restoration.



Colored polygons show restoration progress in the Little Choptank River.

Summary of Little Choptank Restoration Progress

Year	Acres Restored <i>(reefs constructed and seeded)</i>	Acres Constructed <i>(constructed and awaiting seeding)</i>	Oyster Seed Planted	Funds Spent†
2014	17	95	81.34 million	\$15.48 million*

*Funding breakdown: NOAA: \$175,000 (seeding); DNR: \$13.5 million (\$13.2 million on reef construction, \$267,800 on seeding); CSX: \$1.8 million (in-kind reef material transport).

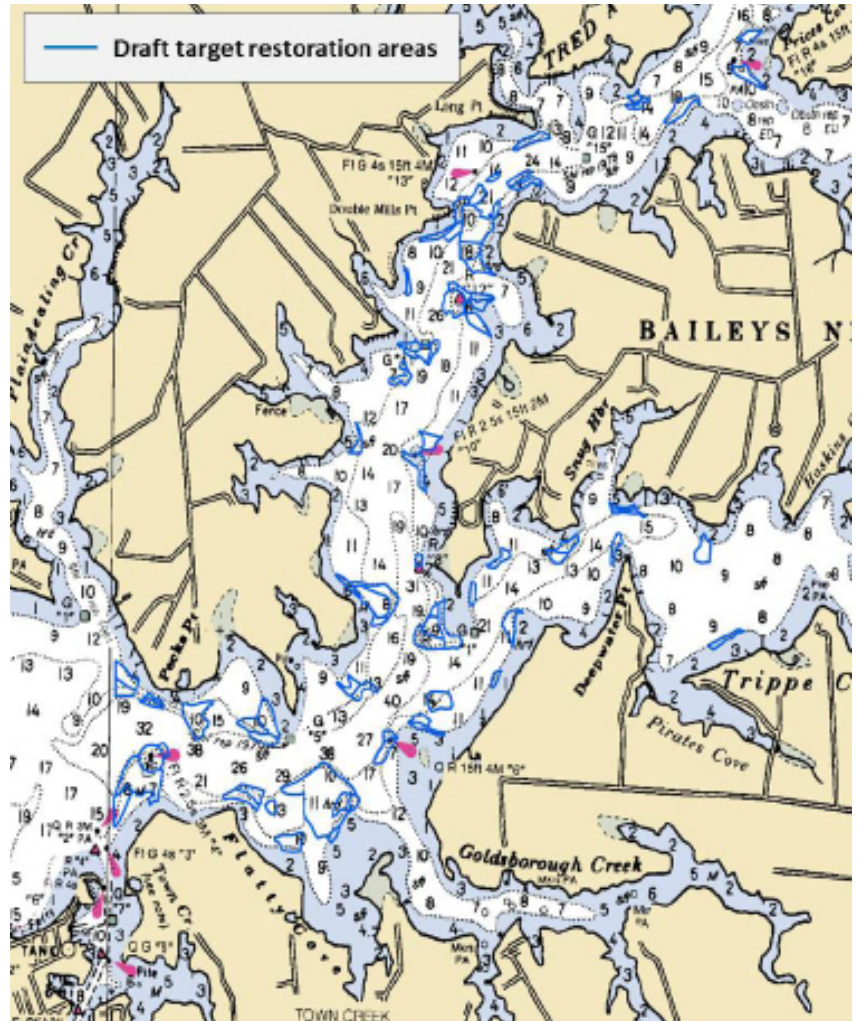
†These costs represent only funds expended on reef construction and seeding. Costs associated with focusing existing resources into Little Choptank (such as benthic surveys, oyster population and disease surveys, and water-quality monitoring) are not reflected; nor are staff salaries. Similarly, the \$29 million project cost described in the Little Choptank Tributary Plan was for reef construction and seeding only, plus a small amount for monitoring required in excess of ongoing monitoring programs.

Outlook for 2015

- Some of the DNR-constructed reefs may be seeded in 2015, if hatchery seed production is sufficient. Seed are produced by UMD, planted by ORP, and funded by NOAA, DNR, and UMD.
- In late 2013, DNR applied to the Maryland Department of the Environment and USACE regulatory branch for a permit to place reef substrate (fossil shell from Florida and rock) another 169 acres of reefs in the Little Choptank River. Further reef substrate placement cannot occur unless this permit is granted. However, there are some sites in the Little Choptank that do not require reef substrate, they need only seed. These sites can be planted with seed under the existing permit. This permit modification application has been temporarily suspended at DNR's request to allow time to evaluate industry concerns.
- In 2014, The Nature Conservancy contributed \$50,000 to DNR toward water-quality monitoring related to Choptank Complex oyster restoration projects. The funds will be used to purchase three water-quality meters and contribute to salaries of employees involved in water-quality monitoring.
- NFWF, through ORP, contributed another \$20,000 to purchase an additional water-quality meter. NFWF also plans to support ORP with an additional \$520,000 in 2015 for restoration and monitoring for Harris Creek and Little Choptank.

Tred Avon River

- The draft Tred Avon Tributary Plan calls for restoring nearly 200 acres of oyster reefs in the Tred Avon oyster sanctuary. The Workgroup is consulting with scientists and the public to complete this plan in 2015.
- USACE plans to construct 24 acres of reefs in the Tred Avon in 2015. These will be constructed from rock and mixed shell, similar to the 2014 reef construction in Harris. Placement is expected to occur spring 2015. Contract cost for this work is \$2.2 million, awarded to Argo Systems, LLC, in July 2014.
- Some of these reefs may be seeded in 2015, if hatchery seed production is sufficient. Seed are produced by UMD, planted by ORP, and funded by NOAA and DNR.
- USACE is developing a supplemental environmental assessment to allow more reef construction on the Tred Avon River. These reefs would be constructed on a portion of the blue-outlined areas on the map. These areas would allow 6 feet of navigational clearance over the top of constructed reefs (the current environmental assessment requires eight feet of clearance). The supplemental environmental assessment is planned for completion in 2015, and would be required for any future reef construction activities beyond the 24 acres already contracted.
- In response to concerns raised by commercial watermen, the USACE, DNR, and NOAA have modified planned placement of material in the Tred Avon River in order to minimize conflicts with commercial fishing activities. The federal and state agencies have committed to work more closely with industry regarding the material type and location of future restoration activities.



Outlined polygons show target restoration areas in the Tred Avon River.



Substrate is placed at targeted sites to provide a hard surface on which spat can grow.

Choptank Complex Restoration Project: A Monitoring and Research Platform

The large-scale oyster restoration projects on Harris Creek, Little Choptank, and Tred Avon are serving as important platforms for scientific research and monitoring. Because the tributary plans describe where reefs will be built and what restoration treatment each will receive, scientists design suitable experiments without needing to construct reefs exclusively for research. In collaboration with the Maryland Oyster Restoration Interagency Workgroup, they plan research to take place on or near restored reefs--as well as get prerestoration baseline data and track the situation at areas that do not receive any restoration effort. This means that these three tributaries can serve as unique, *in situ* laboratories.

- NOAA's Oyster Reef Ecosystem Services project (ORES): This project will help quantify the benefits restored oyster reefs provide to other species and the environment. This includes field work to determine what species are present on oyster reefs before, during, and after oyster restoration work; economic analysis to place dollar values on these services; and funding research at leading academic institutions to further improve understanding of the suite of services oyster reefs deliver to the Chesapeake Bay ecosystem. See www.chesapeakebay.noaa.gov/images/stories/fisheries/oysterecosystemservicespresentation.pdf for more information.
- Related work by Lisa Kellogg and Mark Brush (both from the Virginia Institute of Marine Science), funded by NFWF and ORP, resulted in an online calculator to help estimate the ecosystem service value of various Harris Creek oyster restoration scenarios. Services estimated include denitrification, nitrogen, and phosphorous sequestration and burial, water filtration, and chlorophyll and total suspended solids filtered. The preliminary model framework is complete and available at netsim.vims.edu/netsims/brush/harris_creek_model/index.html. It will be updated with data from the ORES projects in Harris Creek as they become available and as funding allows.
- Researchers Keryn Gedan (University of Maryland), Lisa Kellogg (Virginia Institute of Marine Science), and Denise Breitburg (Smithsonian Environmental Research Center) used oyster reef restoration planned for Harris Creek, together with laboratory data and computer modeling, as the basis to help quantify water-quality benefits from oysters and associated organisms. The work was published in July 2014 in the journal *Restoration Ecology*, and was the

cover story at onlinelibrary.wiley.com/doi/10.1111/rec.2014.22.issue-4/issuetoc. A summary is available at www.wm.edu/news/stories/2014/study-puts-some-mussels-into-bay-restoration123.php.

- USACE is working with researchers at the University of Maryland to investigate larval transport in the Choptank complex—specifically, which areas are likely to see increased larval recruitment following Harris Creek restoration efforts.

- USACE contracted Paynter Labs at the University of Maryland in fall 2014 to conduct monitoring of restored reefs at Cook Point in the Choptank River. Oyster reef habitat at this restoration site was constructed using granite at a variety of elevations off the bottom. Some sites have shell placed on top of the granite base. The sites are being studied to provide information on how the various substrates perform for restoration purposes.



The Oyster Reef Ecosystem Services project is working to quantify fish utilization of oyster reefs.

The 2014 Implementation Update was compiled by the Maryland Oyster Restoration Interagency Workgroup of the Chesapeake Bay Program's Sustainable Fisheries Goal Implementation Team:

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