CHESAPEAKE
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Independent environmental news for the Chesapeake region

New plan in place for pollution problems at Conowingo Dam

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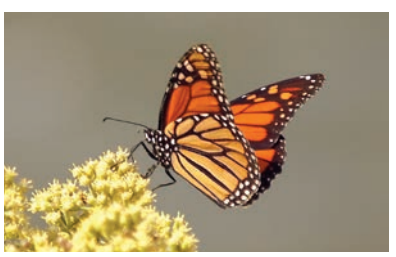
MONITORING MONARCHS



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CELEBRATING 'HAZEL'

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WATER CHESTNUT TROUBLE

Aquatic invader spreads from Virginia to Maryland PAGE 15

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Oyster restoration in Pleasure House Creek, a tributary of Virginia's Lynnhaven River, relied on 190 barge-loads of crushed, recycled concrete to form the base of new oyster reefs. Now, project partners are being told to remove the reefs because of troublesome materials mixed in with the concrete. See article on page 24. (Lynnhaven River Now)

ON THE COVER

The Conowingo Dam is located on the lower Susquehanna River in Maryland. Most of the land that drains into the river is in Pennsylvania. (Dave Harp)

Bottom photos: Left by Dave Harp. Center and right by Whitney Pipkin.

CORRECTION

An article in the July-August issue, "Deer caught in the crosshairs as the population grows," attributed a quote about deer in Rock Creek Park to the wrong staff member at the Animal Welfare Institute. The comments should have been attributed to D. J. Schubert, the group's wildlife biologist. The Bay Journal regrets the error.

EDITOR'S NOTE

Let's hear from you! It's time for the Bay Journal readers survey

The 2022 *Bay Journal* readers survey is under way. If you subscribe to the *Bay Journal*, you may have already received our survey in your mailbox. If not, rest assured it's on the way.

If you browse the *Bay Journal* at your school, workplace or library, you can participate by taking the survey online at https://tinyurl.com/BayJournalSurvey2022. Anyone can take the online survey, so please do that if you prefer. (But many readers tell us that they like to take a break from screens and read things on paper — we've learned that from past reader surveys!)

Reader surveys are so important. They are incredibly valuable in helping us learn what we are doing well and how we can improve. When we redesigned our website and print edition, your feedback played a role. When we considered producing a podcast and holding reader events, your enthusiasm for those ideas made them a reality.

And your survey responses help us decide how to make the most of our reporting. As a regional newspaper with a small reporting staff, we have to make tough choices about priorities. Are we covering the topics you care about most? Are the articles the right length? Do we explain things well? What might we be missing?

We also gain vital insight into the ways you use information from the *Bay Journal*. Grantmakers who support our work often ask us to describe our impact. We need help from you, our readers, to answer that question! When you share the *Bay Journal* with friends, coworkers, politicians and teachers, that's impact. When you help clean a local stream or plant trees — or launch your own project — that's impact. When you use the *Bay Journal* in your classroom or get involved with local land use issues, that's impact!

The survey is a great way to let us know such things. I hope you'll take a few minutes and share your thoughts with us. I look forward to reading them.

— Lara Lutz

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BY THE numbers

1/3
Portion of total nitrogen in the Chesapeake Bay that comes from the air, from sources such as vehicles, power plants, and emissions from manure

570,000
The square mileage of the Bay's airshed (the area of land over which airborne pollutants can travel to enter the Bay and its rivers)

85%
The approximate amount of nitrogen that forests can capture from the air above them

60,000
Number of temperature readings collected in Richmond during the summer of 2017 for a study of "heat island" effects

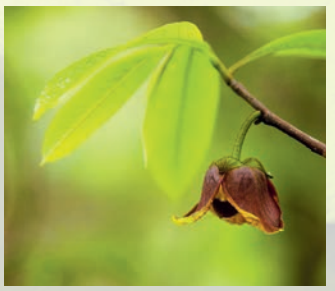
16
Approximate average difference in Fahrenheit degrees between the hottest and coolest places in Richmond during the summer of 2017

Pawpaws: a 'forgotten fruit'

Pawpaw trees grow in many forests of the Chesapeake Bay region and produce an edible fruit that ripens from late August through September. The flavor is often described as a mixture of banana and mango.

Dubbed a "forgotten fruit," pawpaws were once a common food for Native Americans, European settlers and those who followed them. George Washington and Thomas Jefferson were pawpaw fans. Enslaved people used pawpaws to supplement their diets, and Civil War soldiers relied on them, too.

- The pawpaw is an understory tree, reaching a height of approximately 35 feet.
- Dark velvety flowers bloom on the tree in April and May.
- It usually takes four–eight years for a new tree to begin bearing fruit.
- Some people are allergic to pawpaw fruit.
- The bark, leaves and twigs are distasteful to deer, rabbits and insects.
- The caterpillars of zebra swallowtail butterflies feed on young pawpaw leaves, gaining protection from predators by ingesting the same chemical that deters browsing by other wildlife.



Maroon pawpaw flowers bloom in April and May. Maryland's Pawpaw Tunnel takes its name from the trees. Long pawpaw leaves grow in clusters. (Will Parson/Chesapeake Bay Program; Doug Kerr/Creative Commons; Flickr Plant Image Library/Creative Commons)

bayjournal.com/podcast

LOOKING BACK

30 years ago

Bay cleanup heads upstream

New regional agreements expanded Bay restoration efforts to tens of thousands of miles of streams and rivers that send freshwater to the estuary. ■

— *Bay Journal,* Sept. 1992

20 years ago

Nonnative catfish reach the Susquehanna

The Pennsylvania Fish and Boat Commission confirmed that flathead catfish had entered the Susquehanna River, and officials worried that the large predatory fish could cause problems for other species. ■

— *Bay Journal,* Sept. 2002

10 years ago

Comments sought for water access plan

Comments on the draft *Chesapeake Bay Watershed Public Access Plan* were being collected. The plan was developed to add 300 public access sites along the Bay and its rivers by 2025. ■

— *Bay Journal,* Sept. 2012

ABOUT US

The *Chesapeake Bay Journal* is published by Bay Journal Media, an independent nonprofit news organization dedicated to environmental reporting in the Chesapeake Bay region. *Bay Journal* reporting reaches well over 250,000 people each month through news articles, columns, films and the *Chesapeake Uncharted* podcast.

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BAY JOURNAL NOTEBOOK

The Bay Journal's Jeremy Cox and Whitney Pipkin work together to produce an article and video about the effort to battle invasive water chestnuts at a lake in Northern Virginia. (Jeremy Cox)

Small staff at work in a big watershed

You probably know that the Chesapeake Bay watershed — the land that drains into the Bay through an enormous network of streams and rivers — is pretty big. It covers approximately 64,000-square-miles across parts of six states and the entire District of Columbia.

That's why, even before the COVID pandemic made remote work more common, the *Bay Journal* staff has always worked from disparate locations across the region. We have staff in Pennsylvania, Maryland and Virginia. But we have five writers, so it's still a big job. During the last few months, they have been especially busy traversing the Bay watershed.

Whitney Pipkin and **Jeremy Cox** teamed up to report on problems with invasive water chestnuts in Northern Virginia, producing a video to accompany the article. Whitney also journeyed into Alexandria, VA, to see the new machine that will carve out a massive stormwater tunnel, and Jeremy waded into a West Virginia stream to learn more about the imperiled sculpin (a small fish).

Ad Crable has been exploring the "other" Grand Canyon in north-central Pennsylvania, "railbiking" in Western Maryland and snorkeling in a Pennsylvania stream. Also in Pennsylvania, **Karl Blankenship** attended the state's No Till Alliance field day on a York County farm and was a speaker on the closing panel.

Tim Wheeler and our photographer, **Dave Harp,** paddled the Bohemia River along a new state park in Maryland, unexpectedly encountering a swarm of invasive spotted lanternflies on the water's surface. Dave also joined Jeremy on a trip with scientists who study sturgeon in Marshyhope Creek, a tributary of Maryland's Nanticoke River.

We'll soon be sending Jeremy far up the Susquehanna as he wraps up reporting for a new season of the ***Chesapeake Uncharted*** podcast — a deeper look at the phenomenal impacts of Hurricane Agnes in 1972 and what, if anything, the region has been doing to help communities prepare for a similar storm in the future. Watch for the release this fall at BayJournal.com/podcasts or from your favorite podcast streaming service.

And if you'd like a look at the water chestnuts video, no need to wade into the lake. Just visit the "Chesapeake Bay Journal" YouTube channel.

— Lara Lutz

NEWS briefs

LOCAL
REGIONAL
NATIONAL

Update: Data center decisions won't wait for water study

Elected officials in a Northern Virginia county have rejected a move that would have paused decisions on several major development projects until experts could evaluate the potential impacts to a major drinking water supply.

The Prince William County Board of Supervisors voted unanimously Aug. 2 to go forward with the study. But board members first removed legislative language that would have required the study to be completed before they could consider three proposals to greatly expand the county's acreage set aside for data centers.

Supervisor Jeanine Lawson (R-Brentsville), the meeting's lone supporter for postponing the development decisions, argued that the provision wasn't a delay tactic. She said the information would help determine the potential consequences the data centers might have on the Occoquan Reservoir. The reservoir supplies 30–40% of the drinking water to the Fairfax County Water Authority, which serves more than 2 million people in the region.

"It is clear the experts need to run the model before we make these massive land use policy decisions," Lawson said.

County planners say the study could take six months to one year to complete. Such a wait, other board members said, would needlessly delay the completion of the latest update of the county's comprehensive plan, which would pave the way for more data center development and revise other critical policies.

The most controversial of the development proposals, known as the Prince William Digital Gateway, would rezone more than 2,000 acres next to Manassas National Battlefield. Almost all of the acreage drains to the Occoquan Reservoir.
The study approval carried on a 5-0 vote, with three members, including Lawson, not participating.

— J. Cox

Update: PA poultry company settles suit for $1 million

A southcentral Pennsylvania poultry-slaughtering and processing plant will fund $1 million worth of stream restoration projects in the region as part of a settlement with the Lower Susquehanna Riverkeeper Association.

The association had sued Keystone Protein in federal court in 2019 for violations of the Clean Water Act, alleging that discharges from the Lebanon County plant over a period of eight years had caused algae blooms and slime in Swatara Creek and had reduced recreational enjoyment of the stream, Susquehanna River and the Chesapeake Bay.

A federal judge ruled that the environmental group had legal standing to bring the lawsuit and found Keystone guilty of the pollution in 2021.

Keystone has upgraded its wastewater treatment plant. In addition, in a consent decree, the company will make payments for these projects:

- $238,800 to the Doc Fritchey Chapter of Trout Unlimited for the Hammer Creek Headwaters Alternate Restoration Plan for the restoration of more than a half-mile of a stream on a Lebanon County farm
- $446,300 to the Watershed Alliance of York for the Muddy Creek Watershed Project in York County
- $75,000 to the Conservation Foundation of Lancaster County for the restoration of a portion of Conowingo Creek
- $162,500 to the Conservation Foundation of Lancaster County for a restoration project on Donegal Creek, a wild trout stream in Lancaster County
- $77,400 to Dickinson College's Alliance for Aquatic Resource Monitoring (ALLARM) to support community monitoring of water quality and stream health in the Lower Susquehanna River watershed

— A. Crable

Oyster restoration effort gets under way in MD's Eastern Bay

A new front opened in Maryland's efforts to restore the Chesapeake Bay's oyster population. On July 28, the Oyster Recovery Partnership's vessel, Robert Lee, planted 18.5 million hatchery-spawned juvenile oysters in Eastern Bay on the Eastern Shore.

That was the first installment in a campaign launched by a partnership involving the watershed group ShoreRivers, the Oyster Recovery Partnership and the Maryland Department of Natural Resources to plant 100 million juvenile oysters in Eastern Bay by the end of 2023. DNR has committed to fund the planting of 70 million oysters there, while ShoreRivers has pledged to underwrite an additional 30 million oysters.

Eastern Bay, including its tributaries the Miles and Wye rivers, was historically a productive source of wild-caught oysters. But Dermo and

See **BRIEFS**, *page 6*

briefs

From page 5

MSX diseases decimated the bivalve population beginning in the late 1980s, and the area has only occasionally yielded much wild harvest since, despite previous restoration efforts. In 2010, about a quarter of the habitat was set aside as a sanctuary.

Last year, the DNR Oyster Advisory Commission recommended a sustained effort to restore Eastern Bay's oyster population. The group called for spending $2 million annually to rebuild and replant reefs there over the next 25 years, with the funding to be evenly divided between the sanctuary and public fishery areas. The initial July 28 planting targeted a sanctuary reef off Tilghman Point.

Gov. Larry Hogan included funding for Eastern Bay restoration in the fiscal year 2023 budget approved earlier this year. The General Assembly followed up by passing legislation requiring the governor to continue funding the effort through 2026, with subsequent spending dependent on project evaluations every five years.

— T. Wheeler

New VA facility will treat wastewater, replenish aquifer

State and local officials gathered at the James River Treatment Plant in Newport News on July 21 to break ground on a full-scale facility that will use treated wastewater to help replenish groundwater in the Potomac aquifer.

Dubbed SWIFT, short for Sustainable Water Initiative for Tomorrow, the project will used advanced technology to restore wastewater to drinking water standards, treat it to match existing groundwater chemistry and inject it into the Potomac aquifer. The aquifer is the primary source of groundwater in eastern Virginia.

Managed by the Hampton Roads Sanitation District, the James River SWIFT facility is expected to be operational in 2026. Official say it will be able to replenish the Potomac aquifer with up to 16 million gallons of water per day.

"With the benefit of the research data we've gained from more than four years of replenishing the aquifer at our SWIFT Research Center, I am confident this facility will be one of the most advanced water treatment facilities in the commonwealth," said district manager Jay Bernas.

— L. Lutz

Crow's Nest Natural Area in VA expands by 59 acres

Virginia has added 59 acres of forested wetlands to its Crow's Nest Natural Area Preserve in Stafford County. According to the state Department of Conservation and Recreation, the expansion will provide protected habitat for bald eagles, great blue herons, at least 25 species of waterfowl, several rare plant populations and many neotropical migratory birds.

A year ago, the state agency identified the property called Accokeek Bottomlands as a high-priority acquisition opportunity to increase protection for Crow's Nest, an ecological sanctuary within a rapidly developing area near Fredericksburg. Its location, along the preserve's previous northwest boundary, preserves a visual and ecological buffer along a main public access route.

Purchase of the land from the Bowling family was made possible in part by a partnership with the Northern Virginia Conservation Trust. Private donors also contributed.

"It is a great day for anyone who loves this special place," said Alan Rowsome, the trust's director.

The acquisition brings the size of the preserve to 3,115 acres. A dedication and ribbon-cutting ceremony to mark the expansion is expected this fall and will be open to the public. Details will be provided at nvct.org.

— L. Lutz

Veto blocks PA bill aimed at community energy choices

Pennsylvania Gov. Tom Wolf vetoed legislation on July 12 that would have barred any municipality from requiring all-electric heating, cooling and appliances in new homes and buildings.

Only a small number of U.S. cities and communities, including New York City and San Francisco, have adopted such regulations to mandate electric-only energy sources for new construction. Their goal is to help combat climate change by reducing gas and oil-based energy emissions that contribute to global warming.

The natural gas industry has pushed for preemption laws to prevent that from happening in more locations, saying consumers should have access to all energy sources. Legislatures in 20 states have passed "energy choice" laws that help protect gas and oil energy sources.

Democratic Gov. Wolf refused to sign the measure, saying local governments should have the option "to address the global threat of climate change in future years." Advocates of the move to renewable energy say an all-electric grid is needed to accommodate solar, wind and hydro power.

Natural gas emits carbon dioxide and methane, both greenhouse gases. While the burning of natural gas releases much less carbon dioxide than coal or oil, methane is a much stronger greenhouse gas than carbon dioxide.

Pennsylvania produces more natural gas than any state except Texas.

Republican legislators who are opposed to gas bans by municipalities said the state, not local governments, should determine Pennsylvania's energy policies. Shutting out gas as an energy source would hit consumers in the pocketbooks, they argue.

In promoting the bill, state Sen. Gene Yaw said it would "preserve access to reliable electricity, no matter where residents live, and prevent a chaotic patchwork of regulations that ultimately undermine statewide environmental and energy policies."

— A. Crable

briefs

'Precision' stream conservation gets federal funding in PA

An initiative to "rapidly delist" 18 polluted streams in six Pennsylvania counties that drain to the Chesapeake Bay can soon kick into high gear with nearly $10 million in federal funding.

The Chesapeake Conservancy and 13 partners have more than 30 farms lined up to put practices in place that will help address water quality issues and wildlife habitat concerns in Huntingdon, Centre, Clinton, Lycoming, Union and Snyder counties in the central part of the state.

Pennsylvania classifies all 18 streams as "impaired" under the Clean Water Act. Project partners say they targeted these streams because of the likelihood that concentrated conservation measures to reduce soil and nutrient runoff can clean them up relatively swiftly and remove them from the impaired list.

The Chesapeake Conservancy and other partners hope to use "precision conservation" to restore at least 30 streams in Pennsylvania by 2030. They will use high-resolution lidar images taken from low-flying planes to pinpoint locations with runoff problems and erosion-prone streambanks.

The U.S. Department of Agriculture awarded the grant through its Regional Conservation Partnership Program. Other partners are contributing $11.5 million to the project.

The USDA announced the grant on Aug. 12. Three days later, U.S. Sen. Bob Casey toured one of the farms in Warriors Mark, Huntingdon County, where restoration of a streamside buffer is under way. He spoke of the need for increased federal assistance for such projects.

The Pennsylvania Department of Agriculture also received $7.9 million from the program. That grant will support soil health practices on farms to help capture greenhouse gases and fight climate change. Another goal is to help farmers transition to less-polluting organic farming. *— A. Crable*

Potentially toxic algae mats return to Shenandoah River

An all-too-familiar scourge has returned to the Shenandoah River's waters this summer: thick, green mats of algae.

The Virginia Department of Health issued an alert Aug. 5 warning the public to avoid contact with the potentially toxic algae. The alert applies to about 11 miles of the river's North Fork, extending from just above Strasburg at VA Route 644 to just below the town at Route 611.

The slimy mats are patchy to widespread along that stretch of river, the agency said. Recreational uses can continue in the river as long as people don't touch the blanket of scum.

Algal blooms occur throughout the Chesapeake Bay system. Experts say that they usually are a symptom of an ecosystem out of balance. Among the causes: nutrient pollution from fertilizers and sewage, as well as increasing problems from climate change, such as extreme wet and dry spells and warmer water temperatures.

This 2021 photo shows cattle along the North Fork of the Shenandoah River in Rockingham County, VA, where a harmful algal bloom closed more than 50 miles of the waterway to recreational uses. (Alan Lehman/Shenandoah Riverkeeper)

The North Fork is no stranger to algae. Last year, health officials placed 52 miles of its length under advisory from early August to mid-September after discovering cyanobacteria in the water. That type of blue-green algae can release toxins that, when touched or swallowed, can lead to rashes and gastrointestinal illness. It can be fatal to dogs and other animals.

So far this time, cyanotoxins have been below or just above the detection level in water samples tested — not high enough to trigger advisories, health officials say. The department continues to conduct water column tests to determine if the bacteria cells are present in higher concentrations. *— J. Cox*

Navy golf course proposal on Bay shoreline hits roadblock

Lease process paused but golf association plans to push ahead

By Jeremy Cox

Should Greenbury Point become a conservation area or a golf course?

The answer, according to the U.S. Navy, is neither — for now.

The Naval Academy Golf Association had petitioned the Navy, which owns the skinny peninsula on the Chesapeake Bay's western shore near Annapolis, to lease the property so it could be turned into an 18-hole course.

Anne Arundel County Executive Steuart Pittman, an opponent of the proposal, formally submitted a competing plan in August to have the county operate it as a recreation area. Although it is part of Naval Support Activity Annapolis, the wooded acreage is partially open to the public for hiking and viewing wildlife.

The Navy can't consider more than one proposal at a time for a "sole source lease" at the site, said Ed Zeigler, director of public affairs for Naval District Washington. The existence of a second lease request "makes it no longer possible to consider either party's request" under the sole-source process, he said in an Aug. 15 statement.

The announcement handed a temporary victory to residents and environmental groups who have been fighting to maintain public access to the 230-acre property.

"I am hopeful that this reflects a positive change of course for the Navy," said Joel Dunn, president and CEO of the Chesapeake Conservancy. "But I know with absolute certainty that the community will continue to advocate strongly for the permanent conservation of the Greenbury Point Conservation Area and for continued equitable public access until that outcome is achieved."

The move may have slowed the golf course's momentum, but it hasn't stopped it. Naval Academy Golf Association President Chet Gladchuk told Rick Hutzell of *Meanwhile, in Annapolis* that the association will continue moving forward with the project in a competitive-bidding process.

The east shore of Greenbury Point near Annapolis, where the Naval Academy Golf Association wants to build a second golf course, offers views of Whitehall Bay. (Susan Mays)

The Naval Academy has operated an 18-hole golf course on the upper portion of the peninsula for more than 80 years. The course is open only to midshipmen, academy faculty and staff, active and retired military and civilian members.

In his statement, Zeigler said that NSA Annapolis is evaluating the status and future of the property in an effort to align it with its mission, but he provided no further details. ■

New guidelines for 'forever chemicals' challenge Bay states

Feds update PFAS limits for drinking water

By Timothy B. Wheeler

States across the nation will need to do more to protect the public from toxic "forever chemicals" in drinking water. How much and how soon remain up in the air.

In June, the U.S. Environmental Protection Agency proposed new lifetime health advisories for four per– and polyfluoroalkyl substances, or PFAS, indicating that even minute levels in drinking water pose unacceptable risks to the public.

PFAS are a group of thousands of widely used and highly persistent chemicals. Some have been found to cause health problems, including decreased fertility, developmental delays, weakened immune systems and increased risk of some cancers. They've been detected in private wells and public water systems throughout the nation, including the Chesapeake Bay watershed.

The EPA has yet to set an enforceable national limit on any PFAS in drinking water. Since 2016, though, it has recommended limiting the two most frequently detected compounds, known as PFOA and PFOS, to a combined concentration of less than 70 parts per trillion.

The EPA's June announcement updated its health advisories for PFOA and PFOS, greatly reducing the recommended safe level for each: 0.004 parts per trillion for PFOA and 0.02 parts per trillion for PFOS. It also set limits for two other PFAS, proposing to keep GenX to no more than 10 parts per trillion and cap PFBS at 2,000 parts per trillion.

Health and environmental agency spokespersons in Bay watershed jurisdictions said the new advisories pose daunting challenges, especially because the updated thresholds for PFOA and PFOS are below the detection limits of the usual testing methods. All said they were waiting for the EPA to issue additional direction.

Most states, including Maryland, Virginia and West Virginia, have been waiting for the EPA to establish federal regulations for PFAS in drinking water.

But several, including three in the Bay watershed, are working to set their own enforceable limits on PFOA and PFOS. New York imposed a maximum contaminant level of 10 ppt for each compound in 2020, while Pennsylvania and Delaware have proposed caps on each ranging from 14 ppt to 21 ppt. Spokespeople for those states said they would continue with those processes while awaiting further word from federal regulators.

The EPA has indicated that it will propose nationwide drinking water limits on PFOA and PFOS by the end of 2022. It's not clear how many water systems could be affected, though, because many have not been required to test for the contaminants.

A spokesperson for DC Water, which furnishes drinking water to the District of Columbia and parts of Northern Virginia, said it plans to test its supply drawn from the Potomac River in 2023 as part of an EPA-mandated survey for unregulated contaminants in water systems.

Some states where PFAS contamination was first discovered on or near military bases have already conducted widespread testing. In Pennsylvania, PFOA and PFOS have been detected in about a fourth of the 412 systems sampled, while those contaminants turned up in a similar proportion of 454 community systems checked in Maryland, according to those states' data.

The vast majority of those detections were well below the EPA's earlier health advisory, so no action has been taken. In Maryland, though, officials said they are trying address many low-level detections in anticipation that the EPA will require it. Alternative water sources have already been found for five systems, according to a Department of the Environment spokesman.

MDE officials said they are working with 42 other systems where PFOA and PFOS have been detected between 10 ppt and 70 ppt, helping them look for ways to reduce those levels.

"We're trying every approach we can," said Lee Currey, MDE's water and science administration director. Many of the systems are small, with limited resources, he noted, so the state plans to apply for federal funds included in the recently passed infrastructure law. ■

EPA to review PA's latest Chesapeake Bay cleanup plan

Influx of funds will help close budget gap, but water quality practices may draw debate

By Karl Blankenship

Pennsylvania officials hope the third time proves to be the charm when it comes to Chesapeake Bay cleanup plans.

Two earlier plans, one submitted in 2019 and another late last year, were widely panned for failing to achieve the state's pollution reduction goals and for a lack of funding.

The 2019 version triggered suits from other states and environmental groups, contending that Pennsylvania's failure to curb water-fouling nutrients would keep the region from reaching its 2025 Bay cleanup goals.

The second version, submitted in December, also fell short, spurring the U.S. Environmental Protection Agency in April to ramp up water quality inspections in the state and threaten to take further actions unless the state submitted an improved plan within 90 days.

On July 19, Pennsylvania environmental officials responded with an updated 200-page document promising that all of the state's needed cleanup actions will be in place by the end of 2025.

Acting Pennsylvania Department of Environmental Quality Secretary Ramez Ziadeh called the plan "well-grounded" and said that it "advances the extraordinary actions to reduce nutrient and sediment pollution" in the state's portion of the Bay watershed.

The plan includes a significant influx of funding thanks to the approval of a new state budget that sets aside $220 million from the federal American Rescue Plan Act to create a Clean Streams Fund. The money will help farmers install runoff control measures such as streamside buffers and manure storage facilities.

The budget also steers additional federal money to a variety of other programs that can help with water quality issues.

Unlike Maryland and Virginia, the state lacked a dedicated cost-share program to help the 33,000 farms in its portion of the Chesapeake watershed, which are its largest source of nutrients to the Bay. That shortcoming had been repeatedly flagged by the EPA and others.

The EPA's response to the funding package was positive. It organized two news conferences to praise what Adam Ortiz, administrator of the EPA's Mid-Atlantic region, called a "historic" action.

Reducing nutrient pollution from agriculture has been a challenge throughout the Chesapeake Bay region. Pennsylvania has the most farms in the Bay watershed and has fallen far short on its pollution reduction goals. (Dave Harp)

"What we're talking about today is a remarkable turning point in the restoration of clean water and the Chesapeake Bay," Ortiz said.

But he said the agency could need up to eight weeks to determine whether the plan is adequate.

The new federal funding will be spent over three years, but that appears to fall short of filling the $324 million-a-year funding gap the state had identified in its 2019 plan. And there is no guarantee that funding will continue when the federal money is gone.

Pennsylvania State Sen. Scott Martin, a Lancaster County Republican who helped negotiate the budget package, acknowledged that the state needs to come up with long-term funding.

"We got the program started. That's great," he said. "But eventually, the [Clean Streams Fund] is going to have to keep finding new resources in order to continue. And that's our next challenge that we look forward to tackling."

It's also unclear whether the EPA will agree that the plan meets the state's nitrogen reduction goal.

The aim is to reduce the state's annual load of nitrogen to the Bay by 32.5 million pounds. Most of that would be accomplished by ramping up efforts to control farm runoff, such as planting nutrient-absorbing cover crops, promoting improved soil health or planting streamside buffers.

But about 9 million pounds of that total would come from counting agricultural runoff control practices installed years ago that the EPA says have exceeded their expected lifespan and are no longer effective and by counting other actions the EPA has not accepted in the past.

Jill Whitcomb, director of Pennsylvania's Chesapeake Bay Office, said the state has had conversations with the EPA about those best management practices and hopes the issue will be addressed.

"We strongly believe, and other Bay states agree, that the EPA should provide credit for historically implemented BMPs," Whitcomb said. "Otherwise, the modeling will continue to inaccurately ignore the real-world nutrient and sediment reductions Pennsylvania has achieved, and continues to achieve, from these BMPs."

Indeed, the exact status of Pennsylvania's efforts is uncertain.

Computer model estimates — which the EPA uses to gauge cleanup progress — show Pennsylvania has made little progress in reducing nutrient-laden runoff from its farms.

But water quality monitoring shows downward trends in nutrients from the Susquehanna River, which drains nearly half of the state. Monitoring in Lancaster County, the most intensive agricultural area of the state, also shows a downward trend.

Pennsylvania does not directly border the Chesapeake but sends the largest amount of nutrient pollution to the Bay of any state.

From 2009 through 2020, the state reduced its annual nitrogen load by 7.3 million pounds, according to computer models, mostly through wastewater treatment plant upgrades. That left 32.5 million pounds of reductions to be achieved by 2025 — more than three-quarters of all nitrogen reductions needed from the entire Bay watershed.

Pennsylvania's cleanup job has always been daunting. All of the states have struggled with making significant nitrogen reductions from farms and developed lands, and Pennsylvania has far more of both than any other state in the watershed.

Maryland and Virginia have made most of their progress by upgrading wastewater treatment plants, but only a small portion of Pennsylvania's nutrients come from wastewater, and most of its plants have already been upgraded.

It's uncertain whether the new plan, and new funding, will help resolve the suit that states and environmental groups have brought against the EPA for its dealings with Pennsylvania.

Hilary Falk, president of the Chesapeake Bay Foundation, said she is hopeful of forging a settlement agreement with the EPA but that meeting Bay goals requires more than funding. "We believe that assistance must come with accountability," she said. ■

New nature center amplifies Hispanic outreach at MD park

Partnership spotlights the Chesapeake at Sandy Point State Park

By Jeremy Cox

Inside Sandy Point State Park's newly renovated nature center hangs a map of the body of water that laps onto the shoreline just a few dozen paces away. Not one but two banner headlines trundle across the top of the display: "It's Your Chesapeake" and "Es Tu Chesapeake."

It's a minor detail, but a significant one, officials say. Spanish permeates the educational outpost, sharing equal billing with English. Park managers hope that the new materials help serve Hispanic visitors, who represent a large majority of Sandy Point's users.

"We'd always have to tell them that's the Bay," said Daniel Salomón, one of two bilingual interpretative outreach assistants who staff the facility. Some thought they had reached the Atlantic Ocean, which entails another 90 miles of eastward travel.

"That was a real 'aha' moment in our programming," said Melissa Boyle Acuti, head of interpretation for the Maryland Park Service, "that there was a lack of understanding."

When it opened in April, the nature center became the first purpose-built bilingual facility in the state's system of 67 state parks, natural areas and other public assets. Some parks have grafted Spanish-language interpretive materials onto existing English ones, but none have been fully integrated the way they are at Sandy Point, Acuti said.

With its not-quite-white sandy beach — the beige color indicates the sand's iron content — Sandy Point is one of Maryland's most popular state parks. The 786-acre getaway just north of the U.S. Route 50/301 Chesapeake Bay Bridge routinely attracts more than 1 million visitors per year. Summer is easily its busiest season, with park staff frequently turning away visitors because its capacity has been reached.

For park managers and Chesapeake advocates, though, the park long represented a missed opportunity. Thousands of people were flocking daily to the shores of the nation's largest estuary and leaving without learning what an "estuary" is, among other environmental facts. (An estuary is a partially enclosed coastal body of water where freshwater and saltwater meet.)

Daniel Salomón, a bilingual outreach assistant at the Sandy Point State Park Nature Center in Maryland, discusses native fish with Jack Monin and Luke Monin, both age 6. (Dave Harp)

Part of the problem was the park's environmental education presence — or lack thereof.

The park's nature education offerings were squeezed into a corner of a concessions building, barely large enough for a lone table and some pamphlets. A 2015 visitor study conducted by an intern from the Hispanic Access Foundation showed that only 3% of the park's users were aware of the smaller nature center's existence.

The other problem was the language that educators were using. According to the 2015 survey, 80% of Sandy Point's users identified as Hispanic.

"That's when I knew there was a really big gap," said Gabrielle Roffe, manager of equity and community engagement for the Chesapeake Conservancy.

The lack of engagement with a more diverse range of communities has long been recognized as a problem for the Bay's health as well. Engaging more "minority stakeholder groups" in conservation and restoration efforts is a directive of the 2014 *Chesapeake Bay Watershed Agreement*.

In 2019, a partnership consisting of the Conservancy, National Park Service, Maryland Department of Natural Resources, Maryland Heritage Areas Authority and National Oceanic and Atmospheric Administration began funding two bilingual outreach assistant positions based at Sandy Point. Their mission: to provide translation services and develop programming to better engage the Latinx community.

Nasir Donnel Frasier, 6, uses authentic crab tongs to hold a plastic crab as part of an educational display about crabbing. (Dave Harp)

Since then, the program has expanded to a total of six positions at nine Maryland state parks. Most of the bilingual staff are locals who are either in college or recent graduates, Roffe said. To many Hispanic visitors, she noted, the staffers are a trusted face, ready to supply an interesting nugget of information or help defuse tensions with non-Spanish speakers.

Salomón was one of the first to be hired, joining in the 2019 pilot year. He studies media production at nearby Anne Arundel Community College and doesn't have a background in environmental science. But he keeps a handwritten notebook on his desk, with pages full of scripts to help him answer frequently asked questions.

Like: How many different shark species can be found in the Chesapeake? Answer: 12.

He said it also helps to keep a handy list of Spanish translations of English environmental terms. He learned that was a necessity after struggling to find the Spanish word for caterpillar (*oruga*).

When it was time for the nature center's makeover, there was a money problem. "As our exhibit designer told us, we had champagne taste on a beer budget," Acuti recalled.

The plan was to continue sharing a building with concessions but to expand into the other corner on the same side of the structure.

Filling that space, which was a little bigger than the footprint of a school bus, would fall to the staff's own creativity and handiness. Two rangers with woodworking skills, for example, transformed a donated boat into a child-size replica of a deadrise waterman's vessel. Others collected driftwood for a life-size rendition of an osprey's nest.

The literal and figurative centerpiece is a floor-to-ceiling mural by local artist Phyllis Saroff that depicts life above and in the water. Some of that life was crafted into magnets that children can attach to the artwork wherever they wish.

Ever seen a jellyfish fly above the water's surface? Here, you can. Luckily, Salomón is posted nearby to gently correct any such errors. ■

Monarchs still need your help

Planting milkweed encouraged to help butterflies rebound

Above: A monarch butterfly takes flight after being tagged (left hind wing) on Virginia's Chincoteague Island. (Dave Harp)

Top photo: A monarch hovers over one of its favorite foods — seaside goldenrod — on its fall journey south. (Dave Harp)

By Whitney Pipkin

How are monarch butterflies really doing? Could their presence in backyard gardens be a sign of stronger populations? The answer to these questions has been the subject of contentious debate in recent years. But one thing scientists agree on is that the orange-winged insects remain gateways to engagement with the local environment — and they still need our help.

In July, the International Union for the Conservation of Nature (IUCN) declared the migratory monarch to be an endangered species. The international decision comes after the U.S. Fish and Wildlife Service decided in 2020 not to recommend monarchs for protection under the Endangered Species Act.

The decision, the agency said, was not because monarch populations are in good health but because other species were considered to be in even worse condition at the time. The U.S. agency could revisit the issue in 2024, but monarch advocates with the Xerces Society for Invertebrate Conservation said the decision "cannot wait."

The monarchs (*Danaus plexippus)* is the only butterfly species that travels thousands of miles each year between its summer and wintering habitats, encountering a variety of landscapes and environmental changes. The distinct eastern and western populations in North America have both been in sharp decline in recent decades.

The IUCN said that the less-studied western population, which winters in California, has plummeted up to 99.9 % in recent decades. That's from about 10 million in the 1980s to fewer than 2,000 in 2021.

The eastern population, which visits the Chesapeake Bay watershed in the summer and fall, dropped by about 84% from 1996 to 2014, according to the IUCN.

Challenges of butterfly counting

A month before the IUCN confirmed this summer that monarchs are in trouble, a study out of the University of Georgia seemed to reach the opposite conclusion. Researchers there used survey data from the North American Butterfly Association to conclude that the summer population of monarchs has remained relatively stable over the last 25 years. The association works with citizen scientists to conduct two-day butterfly counts at popular locations in the summer.

The paper, published in the journal *Global Change Biology*, hypothesized that population growth during the summer — when monarchs mate, lay eggs and transform from caterpillars to butterflies — compensates for butterfly losses from migration and winter environmental factors.

But Karen Oberhauser, a professor of entomology and director of the arboretum at the University of Wisconsin, said there were "a lot of problems" with that study. It used observational data largely from the decade leading up to 2018, though more recent data was available. And 2018 alone skewed the numbers, having posted some of the highest monarch numbers in 16 years. The researchers also excluded observations from sites that had no monarch sightings in five years, and they failed to include any regional analysis, Oberhauser said.

"If you talk to people who notice monarchs … the numbers are, in general, going down," said Oberhauser, who founded the Monarch Larva Monitoring Project while at the University of Minnesota in 1996. "Places where people count monarchs in the summer are not the places where habitat has been lost as much. But we've lost habitat in places where people were not counting them."

For that reason, Oberhauser thinks the overwintering monarch counts that occur in Mexico for the eastern population are the best indicator of their overall health. But anecdotal information from the warmer months, she said, has shown the population declining in the Midwest and the Mid-Atlantic, including the Bay watershed states.

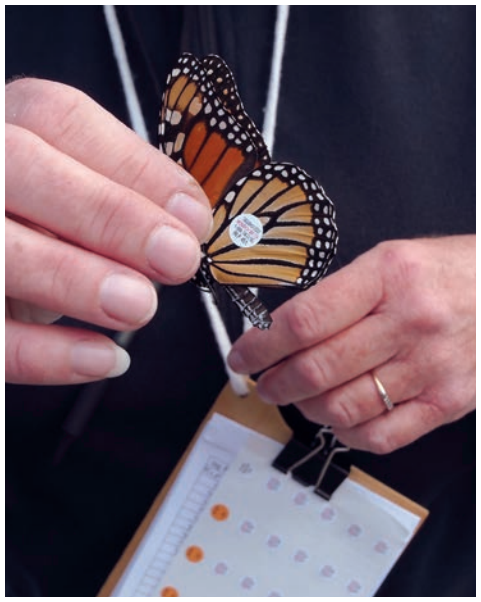
Emma Pelton, a senior conservation biologist with the Xerces Society, expressed similar concerns about the study to *National Geographic*.

"We work with a ton of community scientists, and this is another example of the really cool analyses we can do when people go out and look for insects," Pelton told the magazine. "However, you have to talk about the limitations," which she said include counting at places where butterflies are present in greater numbers.

Why is it so hard to definitively say how monarchs are doing? Like other insects, butterflies can be subject to short-term variations in their numbers that may or may not be evidence of long-term changes. Regional numbers can vary widely as well, and insects, whether they crawl or fly, are just inherently harder to count than larger species.

Nor does it help that the monarchs' annual migration spans several generations. The northward journey from overwintering grounds (primarily in Mexico) is accomplished by three or four generations, each responsible for a leg of the trip before stopping to lay the eggs of the next generation. The final generation in the fall lays no eggs — or, rather, it does so only after it has returned to its winter grounds and hunkered down until spring, when it gets the mysterious biological signal to start the trip all over again.

Monarchs lay their eggs exclusively on milkweed, which caterpillars also eat. They've lost much of that habitat over the decades as it's been replaced by crops in the country's agricultural epicenters. But that also



A monarch researcher prepares to release a captured butterfly after tagging it on Virginia's Chincoteague Island. (Dave Harp)

means that one of the best ways to help monarchs is by planting native milkweed, whether in the backyard, in a town square or on a college campus.

Back to butterfly school

Milkweed was the gateway to a broader butterfly-raising effort for a pair of biology professors at the College of Southern Maryland in La Plata. The college had already earned a Bee Campus USA designation from the Xerces Society for planting pollinator-friendly gardens, and some of those gardens had milkweed.

Biology professor Paul Billeter found monarch caterpillars on them and brought a few home. When the hungry caterpillars became more numerous than he could handle, his daughter, who works for the Humane Society of the U.S., suggested he recruit others to "foster" the caterpillars until they became butterflies.

That led to a small Butterflies for the Bay program in 2021, funded with a grant from the Chesapeake Bay Trust, to engage more of the community in growing milkweed and caring for monarchs. To find people who could raise butterflies from caterpillars at home, the program worked with a local chapter of Jack and Jill of America, Inc., a nonprofit founded by Black mothers to provide resources for children.

At the end of the project, "we sent everyone home with milkweed seeds to start home gardens," said Tracey Stuller, another professor at the college and a veterinarian who helped with the program. "We're not interested in creating caterpillar farmers. What we're interested in is people planting native plants in their yards."

The group also participated in a large monarch tagging festival in October on Cobb Island, on the Maryland side of the lower Potomac River. Tagging allows the butterflies to be digitally tracked during their migration. This year, the professors invited the rest of the campus staff to raise monarch caterpillars — and they were surprised by the interest.

"The IT guy was super enthusiastic," Billeter said.

Rather than finding the insects on nearby milkweed, Billeter this year bought monarch caterpillars with his own money from a small seller in Pennsylvania. He acknowledged that some monarch organizations discourage raising purchased caterpillars because of fears that monarchs bred in captivity could weaken the genetics of wild ones over time.

"But we look at it as using the monarch for a season to get folks inspired to be more careful with their yards long-term, to trade [nonnative plants] for natives," Stuller said.

Oberhauser said there is a spectrum of opinion on whether such monarch farms are a net good for the monarch population. She said studies have found pronounced genetic differences between wild monarchs and those raised year after year by breeders.

"On the other hand," she said, "collecting a few caterpillars and rearing them inside? I do that."

There may be some who frown at bringing monarchs inside at all, Oberhauser said, "but there are minimal risks of them changing genetically."

The bonus? Those who interact with monarchs are far more likely to plant and maintain the milkweed that the caterpillars need to grow and become butterflies. ■

Oberhauser recommends these websites to learn more about monarchs, their life cycle and how to help:

- Submit your migrating monarch observations to JourneyNorth.org/Monarchs.
- Learn to tag monarchs or find waystations at MonarchWatch.org.
- Monitor larvae on milkweed as a citizen scientist at CitizenScience.gov/monitor-monarchs.
- Find research, webinars and more at MonarchJointVenture.org.

Monarchs rest on a high tide bush along Maryland's Wicomico River on a cool September morning. (Dave Harp)

Caterpillars, patience and a time-lapse camera

For my daughter's birthday in 2021, a friend with milkweed plants brought us a bouquet of the leaves with three hungry monarch caterpillars clinging to them.

With the help of a pop-up cage, the internet and just enough milkweed, my family kept the caterpillars alive for several days until they began to pupate. One by one, our caterpillars crawled up the leafless milkweed stems to the mesh roof of the enclosure, where they threaded a barely visible strand of silk from which to hang.

Their black, yellow and white striped bodies grew still as they formed little J shapes hanging from the cage. Then began the stage of caterpillar observation that requires two things: patience and a time-lapse camera.

Thankfully, many modern phones are equipped with the latter. Without it, the incremental changes that turn the squishy caterpillar into a stiff chrysalis would have been imperceptible.

I came home from an errand to find a brilliant green shell, with a sparkly diamond half-belt around its upper half, hanging where a caterpillar had been, and then another. (I quickly learned that cocoons are not the right term. Those are what moths form. Butterflies make chrysalises, a word made even more fun when my 4-year-old added an extra -es to his pronunciation.)

Ten days later, we noticed that the chrysalises were turning darker, becoming more translucent. On the 11th day, the first butterfly emerged. We returned home from church that Sunday to find its freshly hatched frame, wings still wrinkled from confinement.

Determined to witness at least one of the other two emerging from their chrysalises, I set up my phone to take time-lapse imagery and drained its battery twice in one day.

Still, I missed the second emergence. Perhaps the best part of the time-lapse imagery was watching myself walk right by the enclosure multiple times, consumed by some household chore, while the event was unfolding.

But I did catch the last one with my camera: the tiny chrysalis vibrating just before the butterfly's head appeared, then its front legs pushing open the casing. In a flash, its entire body was out and unraveling, blood visibly pumping into its unfurling wings. I watched the video a half-dozen times and shared it with anyone I thought would care.

We gathered on the porch to release the monarchs on a warm September evening. Their spindly legs touched our hands only briefly, springboards to the great beyond. We wondered if they might make it from our Northern Virginia yard all the way to Central Mexico.

Later that week, our monarch-inspired transformation was complete. I bought a monarch book for the kids — and some seeds to grow more milkweed.

— W. Pipkin

Cora Pipkin, the author's daughter, watches the first monarch to emerge from its chrysalis near the end of the family's butterfly-nursery experiment last summer. (Whitney Pipkin)

Tunnel machine 'Hazel' to tackle Alexandria's sewage problems

Polluted storm runoff will be collected, diverted to treatment plant instead of flowing into waterways

By Whitney Pipkin

The circular face of a 380-ton machine looked a little too clean for the work it was being commissioned to do on a hot July morning. Soon, its cheery-blue facade would be plunged 100 feet beneath the Earth's surface, where the giant earthworm-shaped contraption will spend months eating its way through the dirt beneath the city of Alexandria, VA, leaving a water-holding tunnel in its wake.

The 2-mile tunnel will store polluted stormwater until it can be treated at Alexandria Renew Enterprises, or AlexRenew, the water treatment plant that's taken on the $615 million project. The effort, which should be completed by mid-2025, will prevent millions of gallons of sewage-tainted overflows from entering the Potomac River and its tributaries.

"I'll tell you one thing, people understand sewage," said Nancy Stoner, president of the Potomac Riverkeeper Network, at an event christening the tunnel-boring machine into action. "They know they don't want it in their water and they don't want to go swimming in it. The investment is worth it."

Like many centuries-old wastewater treatment systems in the country, Alexandria's captures both sewage and stormwater in its pipes. To prevent sewage backups, the system was designed to divert wet-weather overflows to the nearest water body, sending untreated sewage directly into the stream or river. This is known as a combined sewer overflow system.

The city's mandated 2025 deadline for curbing such overflows seemed virtually impossible to meet when it was first required by state legislators, who ruled that the previous 2035 goal was not soon enough. At the time, the Virginia cities of Richmond and Lexington had projects to sharply reduce overflows of sewage-mingled stormwater well under way. Across the Potomac River from Alexandria, the District of Columbia already was several years into a $2.7 billion project to build 18 miles of water-storing tunnels by 2030.

The General Assembly's 2017 law left Alexandria with what may be one of the shortest time frames in the country for addressing overflow problems. (Legislators later sent the city additional money to help do the work.) AlexRenew, formerly the Alexandria Sanitation Authority, assumed responsibility for the project in 2018, taking on what the utility's general manager and CEO, Karen Pallansch, called "the largest infrastructure project our city has seen."

Guests attend a christening ceremony on July 14, 2022, for a tunnel-boring machine in Alexandria, VA. Dubbed "Hazel," the machine will create a tunnel that will store sewage-tainted stormwater runoff and divert it to a treatment plant. (Whitney Pipkin)

"It is pretty much an impossible schedule, but the team made it only improbable," Pallansch said. "If one little thing goes wrong, we won't be able to make it."

A new tunnel-boring machine sits beside one of two wide shafts that will help reduce sewage-stormwater overflows in Alexandria, VA. One shaft will be used to lower the tunnel-boring machine into place, and the other will carry excavated earth back to the surface. (Whitney Pipkin)

So far, despite a federal government shutdown, a pandemic and supply chain issues, "we've figured out how to push things around" and stay on track, Pallansch added.

In addition to building a custom tunnel-boring machine, AlexRenew is constructing additional pump stations and increasing treatment capacity at the plant, which currently processes about 13 billion gallons of wastewater per year. In all, this RiverRenew project will prevent an additional 120 million gallons of sewage-laden stormwater from entering waterways each year, Pallansch said.

The tunnel-boring machine, custom built by a German manufacturer, was named "Hazel" — after Chicago-based environmental justice advocate Hazel Johnson — during a July 14 christening ceremony. About 500 people voting in an online naming contest chose Hazel among names of women that included an Alexandria abolitionist and public servants.

Pallansch traced the tradition of naming tunnel-boring machines after women to the 1800s, when, in the absence of modern safety protocols, underground workers turned to St. Barbara, the patron of miners, for protection.

Below the name "Hazel" painted on the side of the tunnel-boring machine were a series of handprints that officials could sign while the structure was aboveground. Hazel's helm was ceremonially christened by breaking glass bottles filled with treated wastewater.

One hand featured a tribute to Kerry Donely, a former Alexandria mayor and AlexRenew board member who died unexpectedly the day before the event. Pallansch, who considered Donely a mentor, said he had been so engaged with the tunnel project, he had nicknamed the machine the "rocket ship."

Current Alexandria Mayor Justin Wilson said he couldn't think of a more fittingly "audacious undertaking" as a tribute to Donely's legacy than the rapidly constructed tunnel project he and others gathered to celebrate that day.

"This work is generational," Wilson said. "It's going to have an impact on our region and community for generations to come." ■

Video online at BayJournal.com

Invasive water chestnut frustrates containment efforts in VA

Biologists call for action, funding as plant spreads into MD

By Jeremy Cox

Plunge your hand beneath the surface of the water. Grasp the purplish shoots firmly and yank upward. The water chestnut plant (*Trapa bispinosa)* should emerge from its mooring largely intact with little difficulty.

Easy, right? Now do it over and over again until you've removed the aquatic weed across a span roughly the size of a football field. (Maybe more.) Then, it's time to work on dozens of other lakes and ponds with documented infestations — all while racing against the plant's spread into new waters.

That's the type of challenge that water chestnut foes are facing in Northern Virginia. So far, it's proving more than they can handle.

Since 2020, the number of active water chestnut colonies has grown from 54 to 81 as newly discovered sites outpace the places where eradications efforts have succeeded.

And the plant has escaped its confines around the Virginia suburbs of the District of Columbia. This summer, observers for the first time spotted the invader in a pair of far-flung locales: nearly 200 miles to the south in Charlotte County, VA, and 30 miles to the northeast in Prince George's County, MD.

"It's a substantial increase in the perimeter we have to cover," said Nancy Rybicki, a George Mason University professor and retired U.S. Geological Survey aquatic plant expert.

But there is cause for optimism, she said. A couple of years ago, Rybicki said he felt nearly alone in the battle against the water chestnut. Now, a loose network of volunteer organizations and government agencies has joined the cause, collectively working to acquire dedicated staffing, more funding and stronger regulatory tools.

The Northern Virginia Soil and Water Conservation District recently obtained about $100,000 from Fairfax County to fund a short-term staff member to oversee treatments in at least 30 ponds countywide. That amount also covers the cost of contractors to do the eradication work. The funding is set to expire in July 2023, but district officials say they plan to apply for a second and third year.

A mat of invasive water chestnuts covers Burke Lake in Fairfax County, VA, where two dozen people worked for hours in late July to uproot and remove many of the plants. (Whitney Pipkin)

Meanwhile, the National Capital Partnership for Regional Invasive Species Management (PRISM) is seeking a $1.8 million U.S. Fish and Wildlife Service grant to fund treatments on privately owned ponds. As things stand, many property owners can't afford to quell water chestnut infestations on their own, said Sara Tangren, the coordinator of the PRISM chapter.

"We know it can get out of ponds and get into slow-moving tidal waters," she said. "If we don't get the funding to take care of this, it's just going to cost a whole lot more" in the future.

Another branch of the fight may be on the verge of bearing fruit. The Virginia Noxious Weed Advisory Committee nominated the water chestnut to be designated as a Tier 2 weed in 2019. The Attorney General's Office is reviewing the proposal.

If added to that list, the Virginia Department of Agriculture could tap its own resources to suppress populations or reduce its spread, said agency spokesman Michael Wallace. The classification also would prohibit the movement and sale of those plants into or within the state without a permit.

To John Odenkirk, the water chestnut is the "evil weed." A biologist with the Virginia Department of Wildlife Resources, he discovered the beginnings of the current outbreak in Pohick Bay along the Potomac River in 2014. With Rybicki's help, the plant was identified as a native of East Asia — not the edible variety and not the same type that blanketed much of the Potomac in the 1950s.

The fast-growing plant began spreading throughout Northern Virginia. But as invasive hunters grappled with issues over jurisdiction and funding, they clung to one positive sign: The immediate area around the infestation's Fairfax County epicenter remained the only place where the water chestnut had been found in the U.S.

"I know everyone has invasive fatigue, but this one could be really bad if it breaks open," Odenkirk said.

Once established, a colony can smother an entire pond or lake. The dense mats can block the passage of oxygen in the atmosphere to the water below and create oxygen-starved expanses where aquatic life is all but nonexistent, experts say. The plant's long tendrils also impede boat navigation.

The water chestnut plague hasn't quite broken open, but this year's long-distance jumps to southern Virginia and central Maryland are worrying, Odenkirk said. He suspects Canada geese are to blame. The plant's seed pods have opposing hook-like horns, which can latch "like Velcro" onto feathers, clothing and other surfaces, he explained.

He said that he hopes that his agency will receive a grant later this summer to fund a position for three years to coordinate volunteers and contractors in efforts to locate and eradicate invasive species, including the water chestnut.

A water chestnut-pulling event at Fairfax County's Burke Lake Park in late July illustrated the difficulties that lie ahead.

"It's like something from the Upside Down," said Casey Pittrizzi as his gloved hand emerged from the lake with a tangled clump of spade-shaped green leaves and purple roots. His reference was to the otherworldly alternate dimension in the Netflix show, *Stranger Things.*

"Luckily, it's relatively easy to pull up. I think I got pretty much most of it when I pulled it up," said Pittrizzi, a Fairfax County Park Authority staffer on loan for the day from another park. "At least here it's not everywhere, which is why we're trying to hit it now."

About two dozen people worked for several hours around the rim of the lake — some from kayaks, others clad in hip waders around the shore. Their affiliations ranged from state biologists to summer Park Authority wage earners. They filled white plastic laundry baskets with water chestnut plants and bottom gunk and hauled them ashore.

To spray herbicides certainly would be easier, Odenkirk acknowledged. And it's been done for the water chestnut. But the chemicals can drift downstream, harming other aquatic life. Experts also point out that the dying plant material tends to simply drift to the bottom, providing a ready source of nutrients for the next outbreak.

What Odenkirk initially estimated would be one day's work, though, soon overflowed to two. The main problem: He had estimated the size of the outbreak at about a half-acre at the start of the month, but it had grown in the summer heat to at least twice that size in the intervening three weeks. ■

Video online at BayJournal.com

Photo: Susquehanna River water gushes through the Conowingo hydroelectric dam in Maryland, about 10 miles from the river's mouth at Havre de Grace. For nearly a century, the dam helped trap sediment and nutrient pollution washing downstream, but research shows that the reservoir has reached its capacity. (Dave Harp)

New plan finally in place for Conowingo pollution problems

Bay partners come to agreement, but strategy lacks full funding

By Karl Blankenship

It has taken more than four years, but leaders in the Chesapeake Bay restoration effort say they've found a path forward for dealing with the added pollution stemming from Conowingo Dam.

It's a solution that could soon ramp up pollution controls in the Susquehanna River basin, which drains the Bay's largest tributary.

And over time, it may involve seeding streams with mussels, dredging sediment from behind the 94-foot-high dam and cleaning up waterways hundreds of miles upstream damaged by acid mine drainage.

The plan is not fully funded and will not achieve its pollution reduction goals by the 2025 Bay cleanup deadline.

Still, the U.S. Environmental Protection Agency, which earlier threatened to scuttle the plan, signed off in July on the "phased approach" to address the problem created as the dam lost its capacity to trap sediment and nutrients flowing downstream.

Under that approach, some work will begin soon. But states in the Bay watershed — Pennsylvania, Maryland, Virginia, New York, West Virginia and Delaware — will have time to find more money and new solutions. The EPA will evaluate progress in 2026 and decide if the approach is working.

"It's a challenging issue, not all of our making, but it's up to us to figure it out," Adam Ortiz, administrator of the EPA's Mid-Atlantic region, told officials from Bay states at a recent meeting.

To that end, the Conowingo effort has already been "extraordinary," said Ann Swanson, executive director of the Chesapeake Bay Commission. This year, Maryland approved $25 million to help implement nutrient control actions — much of it in Pennsylvania — to help partially offset the dam's impact.

It was the first time one Bay state approved spending significant money in another, which Swanson, who has led the legislative advisory commission for 34 years, called "a historic action that, at least in my career, I never saw before."

The money will come with strings attached, such as requiring that projects be completed and functioning before they would get money.

That's one example of how the Conowingo plan has given impetus for new ideas. Those involved hope it ultimately serves as a testing ground for new thinking about the decades-old Bay cleanup effort.

"It does bring a level of priority to these types of innovative solutions," said Jill Whitcomb of the Pennsylvania Department of Environmental Protection and co-chair of a committee overseeing the Conowingo work. "I really am hopeful, and optimistic, that we're going to see a lot of good things coming out of this."

A problem, if not a "ticking time bomb"

The Conowingo Dam crosses the Susquehanna River in Maryland, just 10 miles upstream from the Bay. For decades, the dam helped protect Bay water quality by trapping a portion of the nutrients and sediment flowing downstream before they reached the Chesapeake.

It also loomed as a threat. Scientists realized that the reservoir behind the dam would one day fill with sediment, causing more of it to flow past the hydroelectric facility.

Many people called it a "ticking time bomb," destined to undercut the Bay's restoration — concerns fueled by dramatic satellite images of murky brown water extending from the river far into the Bay after major storms.

But recent studies have painted a more nuanced picture. To begin with, they emphasize that most of the sediment and nutrients washing into the Bay from the Susquehanna, even during large storms, originate from the watershed upstream of the dam, not the reservoir behind it.

And while major storms add to that by flushing sediment out of the reservoir, studies show that nutrients bound to the stored sediment are often in forms not easily used by algae. If flushed into the Bay, many are harmlessly buried rather than fueling the algae blooms that harm aquatic life.

Also, the reservoir isn't technically filled. It is in a state of "dynamic equilibrium." Less sediment is trapped behind the dam as it approaches its capacity, but large storms excavate some of the stored material, clearing space to accumulate more. The amount reaching the Bay varies from year to year.

When all of that is factored together, computer models estimate that under average conditions, the Bay's water quality is being impacted by an additional 6.25 million pounds of nutrients each year. Nitrogen accounts for 6 million of it and phosphorus the rest.

In all, that's only about 5% of the river's annual nutrient load to the Bay. But it's a slug of nutrients that the region must offset to restore the Chesapeake — and it wasn't factored into the 2025 cleanup goals.

Show us the money, EPA says

When state and federal partners in the Chesapeake Bay Program set the latest Bay goals in 2010, they thought the reservoir wouldn't be filled until after the 2025 cleanup deadline. So the Conowingo impact was not accounted for when the EPA assigned nutrient reduction goals to each of the Bay states.

But research in 2012 showed that the Conowingo reservoir was essentially already filled. That meant the region would not reach its 2025 water quality goals unless the nutrients washing past the dam were directly reduced or offset by pollution reductions in other places.

States were already struggling to meet their existing goals so, rather than charge them with more work, federal and state officials agreed to create a separate plan to address the Conowingo problem.

In 2019, the Bay Program approved nearly $600,000 for the Center for Watershed Protection, Chesapeake Conservancy and Chesapeake Bay Trust to write it.

Their plan, released last year, examined the option of making additional nutrient reductions across the entire Bay watershed. Ultimately, though, it focused on the Susquehanna basin — primarily on Pennsylvania farmland, where actions would be the most effective and least expensive — with additional work in parts of Maryland and New York.

But the price tag was more than $53 million a year, and there was no money.

Earlier, officials had hoped the plan would be mostly funded by Exelon, the dam's owner, as part of its new operating license. In the end, an agreement negotiated with Maryland provided $200 million over 50 years, but largely for fish passage and habitat improvements, not the reservoir issue.

As a result, the EPA in January declared it had "no confidence" the plan would be implemented and threatened to scrap it unless states came up with money.

If they didn't, the EPA said it would instead assign more pollution reductions to each state. That would greatly increase the cost because it would force actions in places where they would be less effective.

The rationale, the EPA said, was that all of the states had benefitted when the dam was trapping nutrients, which lessened the reductions each state was assigned in 2010.

A pledge with conditions

All of the Bay states helped to pay for creating the new plan. But so far, Maryland is the only state to commit funds for enacting it.

Most of the plan's initial phase focuses on watersheds that cross the Maryland-Pennsylvania state line, with some potential work along the Pennsylvania-New York border.

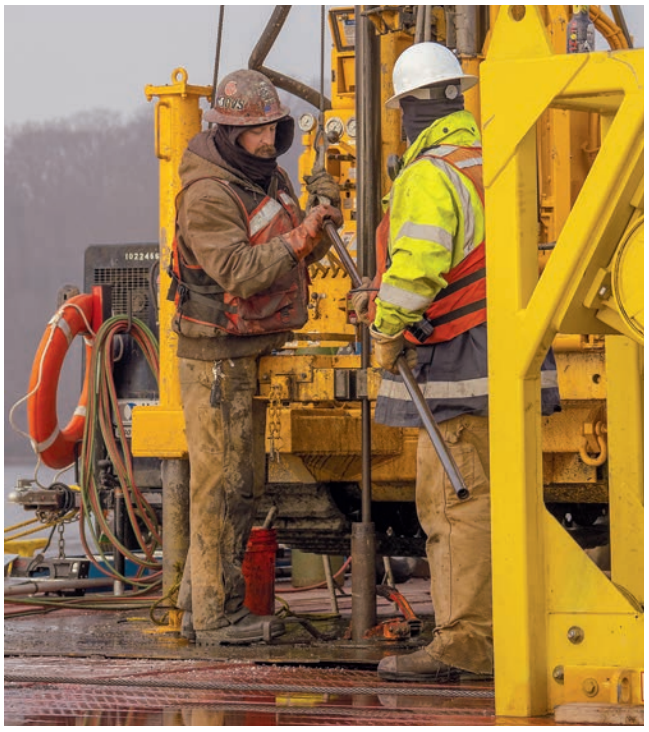
"We needed a case study somewhere to start taking a bite out of the apple," Whitcomb said. "What better way of demonstrating how jurisdictions can work across jurisdictional boundaries than focusing on watersheds that cross those boundaries?"

The workplan calls for a 1.675-million-pound nitrogen reduction by the end of next year, a goal that Matt Rowe, of the Maryland Department of the Environment and the Conowingo committee's other co-chair, called "ambitious."

"A lot of it is ramping up the capacity and the infrastructure to do implementation," Rowe said.

The money from Maryland will flow to the interstate Susquehanna River Basin Commission, which is handling financial transactions related to the plan.

In a unique twist, though, Maryland is requiring that the funds be used on a pay-for-performance basis, said Suzanne Dorsey, MDE deputy secretary. Most Bay projects are funded up front through grants, contracts or cost-share programs. But those projects don't always work: Cover crops may not grow, and streamside forest buffers may be eaten by deer.



Workers excavate sediment from the Conowingo reservoir. Maryland is spending millions to explore the practicality and potential benefits of dredging behind the dam. (Dave Harp)

To obtain the Maryland money, companies and nonprofit organizations can submit proposals for various projects, which will be selected using a ranking formula. They will be paid only when the projects are installed and working.

Dorsey said the pay-for-performance program could spur additional actions at lower cost. For instance, a company under contract to build a one-mile stream restoration may undertake an even larger project while it has equipment on site because of the promise that the additional work will be reimbursed. Or farmers enrolled in a traditional one-year cover crop program might commit to multiple years because they would get paid back.

"It's only guaranteed if they deliver us the nutrient reductions," Dorsey said. "That's where the taxpayer benefits. But the investor can benefit because they get that nice, guaranteed contract that says, 'If you deliver this, we'll pay you.' "

Still, the one-time $25 million investment is much less than the estimated $53 million needed annually to fully implement the plan. Whitcomb and Rowe said other funding options are being explored, including seeking major grants.

Funding could be impacted by a case to be heard on Oct. 11 by the U.S. Circuit Court of Appeals in the District of Columbia. Environmental groups contend the Federal Energy Regulatory Commission erred when issuing the new operating license to Exelon because the agreement between the company and Maryland failed to fully address all water quality issues associated with the dam's operation.

If they win, environmental groups say the utility may have to pay more to support cleanup efforts. "That makes everything for the [Conowingo] process easier because there's much more money on hand," said Betsy Nicholas, executive director of Waterkeepers Chesapeake.

Exelon has long contended that it is not responsible for the pollution that originates upstream and has said that paying to remove the sediment could cost more money than the dam generates.

A hunt for new approaches

The initial actions being funded will look like those in other state cleanup plans: streamside forest buffers, nutrient-absorbing cover crops and nutrient management plans for farms. But officials working on the issue say they hope the plan promotes experimentation with new approaches to meeting Bay cleanup goals.

For Conowingo, one much-touted idea is to dredge sediment from the reservoir to improve trapping capacity. Maryland is spending $6 million to continue the exploration of dredging and potential reuse of the sediment. Studies so far have shown elevated levels of arsenic, magnesium and other materials in the sediment, Rowe said, but not high enough to preclude their reuse for certain purposes.

While the reuse of dredged material often means creating products like cement or bricks, Dorsey said it could also be used for projects that protect shorelines or provide other ecosystem benefits. "It's all on the table," she said.

The Bay Program is expected to appoint a panel of experts soon to determine how much nutrient reduction could be achieved through dredging.

But officials are looking at other approaches as well — ones that meet both the Conowingo goals and help to build healthier ecosystems.

Maryland is using $4.5 million from its Exelon settlement to support mussel reintroduction on the Susquehanna, including upgrades at its Joseph Manning Hatchery.

Restoring freshwater mussels is not part of the current Bay cleanup strategy, but there's been growing interest in their potential. Like oysters in the Chesapeake, mussels in rivers and streams filter water, but their populations are a fraction of historic levels.

A report from the Bay Program Scientific and Technical Advisory Committee earlier this year, using rough estimates, said that the Susquehanna's historic mussel population might have been able to remove as much as 8% of today's nitrogen loads. The present-day depleted population would remove only a fraction of that, the report said.

"There are opportunities for other water quality benefits and potential nutrient reductions through these organisms," Pennsylvania's Whitcomb said.

Many streams in the Susquehanna basin are essentially dead because of acidic runoff from long-abandoned coal mines but bringing them back to life may also help the Bay.

Under the federal Infrastructure Investment and Jobs Act approved earlier this year, Pennsylvania will get about $250 million annually for the next 15 years to clean up abandoned mine lands and restore streams contaminated by acidic runoff.

Some research suggests that as those streams return to health and their aquatic communities recover, they will consume nutrients that otherwise flow downstream.

At Pennsylvania's request, the Scientific and Technical Advisory Committee later this year is expected to review research about whether cleaning mine drainage might also help meet goals for Conowingo and the Bay.

While most states are expected to miss their 2025 goals, those involved with the Conowingo plan are hoping that any successes it reaps will provide valuable lessons. "If we can bring some innovations, other practices, then that's going to benefit everyone," Whitcomb said. ■

Atlantic menhaden not overharvested, commission concludes

Coalition disputes findings, wants to end harvests in the Bay

By Karl Blankenship & Timothy B. Wheeler

Most of the Atlantic menhaden harvested from the Chesapeake Bay and along the Atlantic coast are caught in purse seines deployed by a fishing fleet serving Omega Protein Corp. of Reedville, VA. (Dave Harp)

An updated menhaden population assessment that considers the ecological role of the species as a popular food for other fish deems the coastwide stock to be in good shape.

The latest assessment, presented to the Atlantic States Marine Fisheries Commission Aug. 3, incorporates data collected through last year. It concluded that "overfishing is not occurring, and the stock is not considered overfished."

Menhaden are a small fish but have long stoked big controversies, especially in the Chesapeake Bay, where conservation groups contend commercial harvests leave too few of the forage fish in the water to support striped bass and other species.

That concern spurred the ASMFC, an organization made up of fishery managers from East Coast states and federal agencies, to adjust their assessment methodologies two years ago to better account for the role of menhaden in the food chain.

But even with the new methodology, the latest assessment concluded the overall stock was healthy — a finding immediately touted by the Menhaden Fisheries Coalition, a group representing commercial harvesters.

"Using these stricter standards that incorporate the forage needs of predators, the new assessment has found that the menhaden fishery is sustainable, and that menhaden fishing does not negatively affect predator populations," it said in a statement.

Some conservation groups contend the assessment evaluates the menhaden stock coastwide and does not necessarily reflect what is happening in the Bay, where much of the harvest takes place.

A coalition of 11 national and Virginia-based groups petitioned Virginia Gov. Glenn Youngkin in June to put the Bay off-limits to Omega Protein.

Omega, which operates a reduction fishery based in Reedville, VA, is responsible for about 70% of East Coat menhaden harvest, which it turns into a variety of products from fish oils for humans to feed for pets.

The remainder of the harvest is conducted by smaller operations in the Bay and along the coast which primarily capture menhaden for bait in other fisheries.

Those urging an end to Omega harvests in the Bay said their views were not swayed by the ASMFC finding.

"We have reason to believe there is localized depletion in the Bay," said Steve Atkinson, president of the Virginia Saltwater Sportfishing Association, one of the groups participating in the petition.

The groups, which include the Theodore Roosevelt Conservation Partnership, the Marine Retailers Association of the Americas and state and national sport fishing associations, contend that annual harvests of menhaden have "deprived gamefish like striped bass, bluefish and weakfish of a critical food source."

Jaclyn Higgins, spokesperson for the Roosevelt conservation group, said that while the ASMFC's latest assessment updated estimates of menhaden abundance, it relied on 5-year-old data about other fish species in the food chain, the status of which could have changed in that time.

The striped bass population has been in decline for years and conservation groups have blamed menhaden harvests in the Bay, which is a nursery area for most of the East Coast striped bass population, for playing a role in their decline. Diet studies, though, show that bay anchovy and other species tend to be more important to striped bass in the Chesapeake.

Omega spokesman Ben Landry said he wasn't surprised that "special interest groups are blaming the company for all of their self-created woes." Landry noted that the ASMFC's striped bass assessments have blamed overharvest, particularly by recreational anglers, for the decline of striped bass.

"The reason for the decline in striped bass numbers is not a lack of available menhaden in the species' diet," Landry said. "Instead, the culprit is right in front of our faces: Recreational anglers have removed too many stripers and now the species is having trouble recovering."

Omega's menhaden harvest in recent years has averaged 137,000 metric tons. Its Bay harvest is capped at 51,000 metric tons, with the rest coming from coastal waters.

If Bay harvests were closed, Landry said, it would be the "beginning of the end of the Reedville operations" because weather and sea conditions along the coast would make it "incredibly difficult and dangerous" for the fleet to extend its fishing season in the Atlantic.

Chris Moore, senior regional ecosystem scientist for the Chesapeake Bay Foundation — which is not a part of the Virginia petition — said menhaden still needed to be managed in a "precautionary manner," noting that the ASMFC at its August meeting also heard that two other fish species frequenting the Bay, Atlantic spot and croaker, are not doing well.

"That highlighted overall that a number of forage species in the Bay are not in great shape," Moore said, "and we really need to be thinking about managing the ecosystem so we have enough forage. Obviously, menhaden are a really important part of that."

Understanding the status of menhaden in the Bay has proven to be a challenge as the species migrates along the coast and moves freely in and out of the Chesapeake.

Some Bay-specific numbers may be in the offing, though. Congress approved funding in this year's federal budget to support the collection of menhaden abundance data in the Chesapeake.

Still, it will take years to collect that information, and the ASMFC indicated that its next menhaden assessment, expected in 2025, will continue to evaluate the stock coastwide. ■

Salmon farm could harm wild sturgeon, residents warn

Discharge plans for proposed MD facility meet broad opposition

By Jeremy Cox

A Norwegian company will have to overcome a flood of skepticism in its bid to build a large, indoor salmon farm in a small town on Maryland's Eastern Shore.

To move into the construction phase, the $300 million, 25-acre facility requires a litany of state and federal permits. One of the first and most critical is a wastewater discharge permit that could allow the factory to release up to 2.3 million gallons a day of treated "purge" water into Marshyhope Creek, one of the Chesapeake Bay's least degraded headwaters.

The Maryland Department of the Environment gave preliminary approval to the discharge permit in June. More than 100 people crowded into Federalsburg's town hall Aug. 10 for a hearing hosted by the agency to gather public feedback about the pending decision. Two dozen of them spoke — all but one in opposition.

They were concerned about several potential consequences, from fouling the air with fishy odors to giving a green light for the operation's effluent to overload the Marshyhope with water-fouling nitrogen. But the main worry, by far, was for a long fish with bony scutes, so rare in the Chesapeake and its rivers that not long ago it was believed to have been wiped out from the region.

"I don't want to say Federalsburg is the last nail in the coffin for the Bay and the last nail in the coffin for the sturgeon," said Susan Andrew, who lives on a small creek that empties into the Marshyhope just north of town. "The river is one of our only assets."

A little more than a decade ago, biologists thought that declining water quality had driven Atlantic sturgeons out of the Bay. But recent research confirms that spawning populations of the federally endangered species cling to life in the James and the Pamunkey rivers in Virginia as well as the Marshyhope in Maryland.

The size of the Maryland population is perilously small — probably only about 29 adults, said Dave Secor, a fisheries ecologist with the University of Maryland Center for Environmental Science. A major disturbance, such as the discharges envisioned in the MDE permit, could upend the fragile balance of water temperature and salinity that sturgeons require for successful reproduction, he told regulators at the meeting.

Above: A poster warns boaters to stay clear of gill nets placed in Marshyhope Creek near Federalsburg, MD, that researchers use to catch spawning sturgeon. (Dave Harp)

Left: Researchers, local residents and representatives from environmental groups gathered at a state hearing on Aug. 10 to discuss a potential discharge permit for a salmon farm on Maryland's Marshyhope Creek. (Jeremy Cox)

AquaCon wants to produce up to 15,000 metric tons of salmon a year at the Federalsburg facility. It's part of the company's $1 billion plan to construct three land-based salmon farms on the Eastern Shore.

The company plans to use a recirculating aquaculture system. The fish will be raised in a series of large indoor tanks filled with water from wells. That water will be almost entirely recycled, with fish waste filtered out and converted to methane to supply energy for the operation.

The aquaculture facility would discharge a portion of its wastewater into Marshyhope Creek, a tributary of the Nanticoke River that winds mostly past bucolic scenes of forests and marsh. The effluent will be from tanks used to "polish" the salmon before harvest. That process purges the salmon of the bacteria that often tarnish farm-raised fish meat with a muddy flavor. The bacteria, known as geosmin, are naturally occurring, the company says, adding that the water will be disinfected before it's released.

The purge water won't go directly into the Marshyhope. It will be sent first though a riprap-lined channel and into a constructed wetland to disperse the flow into the creek, according to the permit's fact sheet.

AquaCon estimates that up to 15% of the Marshyhope's flow at the outfall would consist of discharges from its facility.

A handful of companies have bet on the new technologies to raise salmon on such a scale in the United States in recent years. Success could prove lucrative. Salmon are Americans' second favorite seafood, after shrimp. Most of the more than 2.5 pounds each person consumes annually comes from aquaculture operations in Norway, Chile, Scotland and Canada.

But sturgeon shouldn't have to pay the price for AquaCon's gain, several residents and marine life experts said at the MDE hearing. Some pointed to the uneven operating record of similar land-based factories in Europe, notably a September 2021 fire at an Atlantic Sapphire facility in Denmark that led to a $25 million insurance payout.

"It is essentially a large experiment on a small creek," said Brad Stevens, a retired marine science professor at the University of Maryland Eastern Shore.

Representatives of several environmental groups — the Chesapeake Bay Foundation, Friends of the Nanticoke River, ShoreRivers and Wicomico Environmental Trust — were unanimous in their opposition to the project.

Matt Pluta of ShoreRivers said the factory's planned nutrient inputs into the Marshyhope are unacceptable. "When was the last time anyone has seen a salmon in the Chesapeake Bay?" he asked. "Not ever. We look for your investments in our fisheries and our crabs, but not in salmon."

The tentative permit allows the plant to discharge up to 5,400 pounds of nitrogen a year into the creek, putting the creek 700 pounds above its "total maximum daily load" for achieving better water quality in the Bay. The document suggests that AquaCon engage in nutrient trading — buying credits from entities that discharge pollutants at levels below their allotted loads — to offset the difference.

AquaCon has told MDE officials that it plans to work with Federalsburg and its wastewater plant to generate those offsets. The agency also wants the company to lower its nitrogen loads 33% by the second year of the permit to help meet the state's goal for reducing pollution from industrial facilities, which is part of its latest plan for restoring the Bay's health.

Several AquaCon representatives looked on as the public lambasted their project at the Federalsburg hearing but none addressed the audience. The company's Easton-based attorney, Ryan Showalter, didn't respond to questions submitted by a *Bay Journal* reporter.

The lone supporter at the hearing was Yonathan Zohar, director of the Aquaculture Research Center at the University System of Maryland's Institute of Marine and Environmental Technology. AquaCon's website describes him as an adviser on the fish-rearing technology the company plans to use.

Zohar, agreeing that the location is a "sensitive place," vowed that the final permit will ensure that the Marshyhope's ecosystem doesn't deteriorate. "There are challenges," he added. "We're addressing them."

MDE is accepting public comment on the salmon operation until Oct. 17. ■

More online at BayJournal.com

Protecting the water while harvesting the sunshine

Researchers say stormwater runoff from large solar arrays needs careful management

By Whitney Pipkin

Above: This solar facility, built by Utah-based Sustainable Power Group, or sPower, in Spotsylvania County, VA, covers more than 6,000 acres.

Right: Exposed soil was pervasive at the site in early 2021, before vegetation was planted to reduce runoff. (Photos by Hugh Kenny/Piedmont Environmental Council)

Solar panels are going up across the Chesapeake Bay watershed to help states reach their renewable energy targets. But, while working to achieve climate-related goals, solar fields have the potential to generate water pollution — through increased stormwater runoff.

And, until recently, little work was being done to understand the impact of solar fields on the way stormwater runs off the landscape and into local waterways.

As the science begins to come in, policymakers in Virginia are grappling with a dilemma: How much should solar fields be subject to stormwater controls? It's a pressing question because solar development in the state is charging ahead. The state ranked fourth in the nation in 2021 for its pace of new solar installations, and hundreds of thousands of acres there could be given over to solar projects in the coming years.

The crux of the problem lies with whether solar panel arrays should be considered pervious or impervious land cover. Pervious areas allow water to soak into the ground. Impervious areas, like roads, rooftops and parking lots, do not. Polluted runoff from those hard surfaces causes problems for waterways across the Bay region — making them subject to regulation.

Solar fields have both pervious and impervious elements: often enormous acreage covered by the panels and a range of soil conditions and groundcover below them.

Many states consider solar fields pervious, which cuts regulatory red tape. Also, the volume and velocity of runoff from the panels falls somewhere between that caused by farmland and parking lots, depending on the type of groundcover under the panels. That makes solar facilities difficult to regulate under existing models.

"There is a whole lot of science around stormwater regulation, but not for the kind of land use that is a 'solar farm,'" said Brian Ross, vice president of renewable energy for the Great Plains Institute for Sustainable Development, a Minnesota-based firm researching ways to improve renewable energy.

In the Chesapeake watershed, Maryland and Pennsylvania have policies that either consider the panels pervious under most conditions or exempt them from being considered impervious for the purpose of stormwater management.

Until March, Virginia did, too. That's when the state's Department of Environmental Quality Director Mike Rolband announced that solar projects there would be subject to stronger post-development stormwater regulations, effective immediately.

In a memo announcing the change, Rolband said that treating solar installations as pervious cover could "underestimate the post-development runoff volume or runoff rate from solar panel arrays, which in turn has the potential to negatively impact downstream waterways or properties." He noted that the Chesapeake Bay Program considers solar fields "unconnected impervious" when calculating the impact of land use on water quality in the Bay and its rivers.

Industry concerns rose quickly. Two weeks later, the agency said it would allow more time for projects to comply and indicated that stakeholder feedback would be considered in shaping how the policy will be applied.

The agency guidance document is awaiting approval.

As it stands, David Murray, director of solar policy for American Clean Power, said the changes Virginia regulators proposed for dealing with stormwater could require solar facilities to acquire 20% more land for projects to offset the impervious areas. That would have "a significant impact," he said.

Research that could help inform such decisions is just beginning to come out.

Seeking science

Decisionmakers are looking to the scientific community for more research that could help balance the need for cleaner energy with commitments to improve water quality.

So far, studies indicate that one of the biggest factors in reducing the impact of solar panels on runoff could be the types of soil and groundcover under them. But places that may be ideal for solar development from a big-picture perspective — using former industrial sites, for example — are often not the most economically attractive. Also, the regulatory landscape leaves solar placement decisions to individual land owners, zoning boards and county officials, all of whom stand to benefit from leasing to solar suppliers, if only indirectly in the case of county officials.

Seeing the smattering of different regulations facing solar development, the U.S. Department of Energy contracted the Great Plains Institute to study how stormwater runs off solar panels on a variety of landscapes. Their study measured how water runs off solar installations in five states, each with soil types ranging from rocky to sandy to clay-based.

In their nearly complete three-year effort, researchers found that one of the best ways to reduce problems with stormwater runoff from solar sites is to avoid compacting the soil during construction. Driving heavy equipment across a site or grading it has an outsized impact on the volume of runoff both during and after construction.

The soil type also matters a great deal. Sandy soils, like those of Minnesota where one research site was located, can quickly absorb rainfall coming off solar panels. Clay soils, like those studied in New York, struggle to absorb runoff if they are compacted or lack vegetation.

One of the best practices that nearly every site can apply is to grow the right kind of vegetative cover under the panels, preferably native grasses with deep roots that can reduce soil compaction. Spacing solar panels farther apart to provide more land to absorb the stormwater also helps, but less so than researchers originally thought. And it's one

In this 2020 photo, Steve Levitsky, then Perdue's Vice President for Sustainability, walks through the pollinator garden that surrounds the company's solar array in Salisbury, MD. (Dave Harp)

of the more-expensive mitigation tools.

The research did not study sites with bare earth under the panels "because we already know from stormwater research what that will give us," Ross said, a nod to sediment easily running off such properties.

But when vegetation covers the landscape under and around solar panels, "in almost every case, you are better off [from a stormwater perspective] with well-managed solar than with agriculture," Ross said. "Converting forest to solar is a very different circumstance. From a stormwater standpoint, the best groundcover you can have is forest."

The researchers have produced a best practices document and will soon release equations to calculate runoff from different solar practices. An instruction manual for implementing the findings at various locations is due out this fall.

There's little a solar developer can do about the soil type once a property is leased for solar construction, so more stormwater mitigation could be needed on some sites. National soil maps could help guide decisions about where to locate solar in the first place, Ross said.

Research like this "places more emphasis on finding sites that are suitable — not just considering where it is on the [energy] grid, but also taking water quality into account," Ross said.

If solar developers don't consider soils, previous land use and stormwater dynamics when selecting a site, "are [they] going to create costs for someone else who's regulating water quality?"

The solar industry also has a taskforce researching best practices for reducing stormwater impacts. Most of the measures considered best practices by researchers, though, are not required by localities.

Bay perspective

Meanwhile, the Chesapeake Bay Program, the state-federal partnership leading the Bay restoration effort, is studying how the conversion of land to solar fields will impact the region's ability to reach water quality goals.

Officials confirmed that, for calculations in the Bay Program computer model, solar sites are defined as "unconnected" impervious surfaces to account for spacing between panels. But the specifics of how solar acreage is incorporated into the model could change after additional research.

"There is the guidance on how solar should be installed and managed, but then there is the actuality of it. There may be a wide variety of compliance to those recommendations," said Peter Claggett, a researcher with the U.S. Geological Survey who coordinates the Bay Program's Land Use Workgroup. "And it's not clear to us which of these solar facilities are done well and which aren't."

The Bay Program will offer a workshop this fall to answer some of these questions and better inform the model that demonstrates how these types of changes impact water quality.

Virginia legislators are conducting another set of meetings on the subject this fall with what one senator called "the mother of all stakeholder groups." House bill 206 required the DEQ to assess the impact of smaller renewable projects on prime agricultural and forested lands, then propose mitigation measures.

Some organizations wonder if the effort will be too little, too late to keep pace with solar development while efforts are under way to meet Virginia's share of the 2025 Bay cleanup goals.

The nonprofit Piedmont Environmental Council is particularly concerned about the impact of solar development on what they consider Virginia's prime soils.

If those soils are compacted or graded, "you forever alter the runoff characteristics of that property, because you're changing the absorption rate of that soil as well," said Dan Holmes, a consultant on solar issues for PEC.

Holmes points to the largest solar installation recently built in Virginia on 6,000 acres in Spotsylvania County as an example of such projects bring sweeping change to land use. The site was previously used for rotational timber harvesting, so the land use change was considered significant. Virginia's State Corporation Commission had to sign off on it, and large stormwater retention ponds were required to filter runoff from the site.

Solar development in the state, if it continues at this pace, would represent "the biggest land use change we've ever seen," PEC President Chris Miller said.

Although technological innovations make energy generation more efficient, Miller said current projections (based on 1 megawatt of power being generated from seven to 10 acres of solar) indicate that 200,000–300,000 acres could be converted to solar fields in Virginia.

"That's bigger than Shenandoah National Park," Miller said. "So, for us, that's a land use problem that we have to consider in aggregate, not just on a site-specific basis. Like everything else, it's the sum of the acres." ■

Baltimore eyes $138 million plan to limit coastal flood damage

Proposal by Army Corps of Engineers focuses on flood walls near tunnels

By Timothy B. Wheeler

With Baltimore facing increased risks of coastal flooding from storms as sea level rises, federal officials have put forward a $138 million plan aimed at protecting the interstate highway tunnels under the city's harbor while reducing flood damage to homes and businesses in low-lying waterfront neighborhoods.

The draft plan released in July by the Baltimore District of the U.S. Army Corps of Engineers proposes to build floodwalls around the openings to the Interstate 95 and Interstate 895 tunnels that carry traffic beneath the harbor. Flood barriers would also shield the ventilation buildings that circulate fresh air into the tubes.

For the tourism-centric Inner Harbor and waterfront neighborhoods like Canton, Fells Point, Riverside and Locust Point, the plan doesn't envision erecting any levees or other structures to hold back the water. Instead, it calls for floodproofing vulnerable buildings to the greatest extent possible, given their age and condition.

"The goal is to mitigate damage," explained Joseph Bieberich, project manager for the Baltimore District's coastal storm risk management feasibility study.

The draft plan is the product of a three-year study for which the Maryland Department of Transportation picked up half of the $3 million cost. It's an outgrowth of an earlier Corps study of East Coast flood risks, which projected that sea level in the harbor could rise from 1.0 to 5.4 feet by 2100, depending on the severity of climate change.

The Baltimore metropolitan area has felt the effects of at least nine hurricanes or tropical storms since the 1950s, the Corps study noted. The most severe hit came from Tropical Storm Isabel in 2003, when storm surge and heavy rains inundated the Inner Harbor and neighborhoods in Baltimore County with up to 8 feet of water. It caused $4.8 million in property damage in the city and up to $252 million in total damages in the county. One person died in the floods, while more than 570 homes and 15 businesses were declared uninhabitable.

High-tide flooding in late October 2021 traps vehicles on Baltimore's Thames Street at Fells Point. (Andrew Roach/U.S. Army Corps of Engineers)

Even without storms, portions of the area experience tidal flooding several times a year, particularly the Inner Harbor promenade and the mix of businesses and homes in lower Fells Point. With climate change pushing the sea level higher, the National Oceanic and Atmospheric Administration predicts the city could experience anywhere from 50 to 160 nuisance flooding events per year by 2050, inundating a broader swath of the waterfront.

Between storms and nuisance flooding, the Corps plan says, more than 1,400 structures would be at risk by 2080.

The draft plan focuses almost exclusively on the city, although flood risks extend throughout the metropolitan area. Beyond looking at protecting a state-owned airport on Middle River, Corps planners did not address flood risks in Baltimore County, even though it bore the brunt of Isabel in 2003. Bieberich said that county officials declined to participate in the planning effort.

County officials contacted by the *Bay Journal* about the decision not to participate said they were unfamiliar with it and unable to explain why.

The only nonfederal partner for the study was the Maryland Department of Transportation, which runs the Martin State Airport in Baltimore County and has responsibility for the harbor tunnels.

Cars enter and exit the south end of the I-895 Baltimore Harbor Tunnel. The Corps' plan would add flood barriers at both ends of this and the nearby I-95 tunnel. (Ewillison/CC BY-SA 4.0)

The study originally looked at 11 options for dealing with flood risks along Baltimore's waterfront. Two involved building storm surge gates across the Patapsco River near where it joins the Chesapeake Bay, at a projected cost of $1.3 billion to $1.4 billion. Though the gates would have provided the broadest protection from storm-driven flooding, planners ruled them out, saying that strategy would rely too much on a single control measure and could impair water quality in the harbor.

Planners winnowed their original scenarios down to four basic alternatives that ranged in cost from $63 million to $669 million, depending on the amount of physical flood barriers proposed.

Dropped along the way were proposals to build floodwalls at the Dundalk and Seagirt marine terminals, hubs of shipping and commerce for the region. The Maryland Port Administration, part of the state transportation department, is already pursuing its own flood control plans for the Dundalk facility, according to the study.

The planners also dropped proposals that would have built levees or seawalls around the Inner Harbor and waterfront neighborhoods. While 7-foot-high barriers might keep streets and buildings dry, they would restrict access to and views of the water.

"We determined the community would not support that," Bieberich said.

The city has had its own plan since 2013 for dealing with storm and flood damage and for addressing climate change impacts, which has been periodically updated. It also has a nuisance flood plan. The Corps plan references them.

In other flood-prone areas, vulnerable homes and other structures have been physically raised above projected storm surge levels. Planners thought that wouldn't be feasible for the historic structures in neighborhoods like Fells Point and Canton. Instead, the plan calls for installing door and window barriers, raising ventilation units and other mechanical systems off the ground, and putting water-resistant materials in flood-prone basements and ground floors.

That approach "reasonably maximizes net benefits while maintaining historic neighborhood character, access to water, and enhancing community resilience," the study concluded.

If the plan is ultimately approved, the federal government would pick up 65% of the cost of designing and building seawalls around the harbor tunnel openings, with the state or other nonfederal partners covering the rest.

The $138 million projected cost is mainly for the physical flood barriers. Floodproofing the Inner Harbor and waterfront neighborhoods would be up to property owners. Bieberich said it's possible that the federal government could offer financial support to encourage their voluntary participation, but that has not been decided.

The draft plan must be finalized and receive authorization and funding from Congress before preliminary engineering and design work can begin.

The Corps and state transportation department held two public meetings to discuss the plan in August. ■

More concerns emerge for PA's abandoned oil, gas wells

Influx of public money to address problems triggers in-depth review

By Ad Crable

In 2020, an employee for the Pennsylvania Department of Environmental Protection smelled crude oil while driving to work in the northwestern part of the state.

Trusting his instincts, he asked agency crews to follow their noses. They found an old abandoned well leaking oil within 500 feet of a dozen year-round and seasonal residences. The oil was flowing directly into the South Branch of Tionesta Creek, which the state classifies as a coldwater, high-quality fishery, meaning it is among the most unpolluted in the state.

DEP found no record of the well's owner and had to use emergency funds to stop the oozing pollutant and its nuisance odors.

Elsewhere, a well borehole filled with acid mine drainage was spewing poisonous iron-rich water into a tributary of the Susquehanna River. A garage in Armstrong County that was built over an unseen abandoned gas well blew up.

These scenarios play out too often, say state environmental officials. The state has more than 200,000 wells that were constructed and abandoned by oil and gas companies — the most of any state in the nation. No one knows for sure just how many because some wells are so old that no records exist. The state did not require notification of wells until 1955.

The wells included in this tally are from conventional drilling and not the wells drilled to support hydraulic fracturing, or fracking, for natural gas.

Often obscured by vegetation or located deep in the woods, more abandoned oil and gas wells are found all the time, often leaking oil and methane. Oil can be toxic to frogs, reptiles, fish, waterfowl and other freshwater life. Methane, a global-warming gas, is highly poisonous to aquatic organisms.

In 2021, the federal government told Pennsylvania it would receive nearly $400 million to plug some of the wells as part of the $1.2 trillion Infrastructure Investment and Jobs Act.

State environmental officials cheered, calling the aid a "game-changer" in the long battle to make headway against one of the state's most lingering and harmful pollution problems.

Found under a boulder, this abandoned well in Pennsylvania was plugged by the state to stop acidic pollution from flowing into a tributary to the Susquehanna River. (Pennsylvania Department of Environmental Protection)

Workers plug an abandoned gas well that was leaking explosive methane into a stormwater impoundment surrounded by homes. (Pennsylvania Department of Environmental Protection)

But as the state prioritizes problematic wells and lines up an army of companies and environmental groups to find and plug them, the renewed focus on the problem has set off a geyser of controversies.

Taxpayers pick up the tab

One overarching issue is that even modern-day drillers in the state sometimes abandon wells without plugging them, a violation of state laws.

Research of DEP records by David E. Hess, a former DEP secretary who publishes an environmental blog, showed that from 2016 through 2022, the agency issued 4,270 notices of violations to 256 oil and gas companies for abandoning wells without plugging them. Some abandoned hundreds of wells, records showed. DEP is working with many of the owners to plug them.

If abandoned, the wells may end up being sealed at taxpayer expense. DEP estimates that it will cost $1.6 billion to plug and stop leaks on the 200,000 abandoned wells identified so far.

Pennsylvania requires drillers to post a bond that helps cover any state-incurred costs for plugging abandoned wells. But the recent increased focus on the wells highlighted the fact that the bond covers only a fraction of the actual cost.

The 1984 Oil and Gas Act requires drillers to post a bond of $2,500 per well. But DEP officials say the average plugging cost is $33,000. This summer, the state Environmental Quality Board, which issues all DEP regulations, agreed to consider a petition from environmental groups that called for increasing the bond to $38,000 per well.

This abandoned natural gas well was found to be leaking gas after a nearby garage exploded in western Pennsylvania. (Pennsylvania Department of Environmental Protection)

Before the board could take any action, the state legislature rushed through a law that blocks any increase in plugging bonding for 10 years.

In addition, it continues to exempt the owners of conventional oil and gas wells drilled before 1985 — most of the wells currently in service — from having to pay a bond.

Gov. Tom Wolf did not sign the law but allowed it to go into effect without a veto, reportedly as part of a trade to get education priorities into the state budget.

Governor calls for broad review

Less than two weeks after the budget passed, Wolf circled back to the well abandonment issues, directing DEP to "revisit whether the commonwealth is doing enough to ensure that this industry is being a good environmental steward by preventing the abandonment of wells and meeting its obligations as a prudent trustee of Pennsylvania's public natural resources for current and future generations."

"Evidence on this count is discouraging," the governor said.

Wolf said the agency will consider the need for increased scrutiny and enforcement, including possible criminal prosecution, on several well abandonment fronts.

One of them is the practice of drillers selling or transferring well permits to other companies or individuals to avoid plugging obligations.

The review will also investigate the possibility that drillers will have to report when a well is played out to delay plugging responsibilities.

There also is concern that the thwarted updated bonding requirements may jeopardize some of the eagerly anticipated federal funding earmarked for Pennsylvania's unplugged wells.

One of the prerequisites for a $20 million grant is that states take steps to reduce the likelihood that additional wells will be abandoned.

Kurt Klapkowski, DEP's acting deputy for Oil and Gas Management, told the agency's Citizens Advisory Council in July that the inability to increase bonds means the state must be "creative" to qualify for the money. ■

Oyster restoration stumbles in VA's Lynnhaven River

Groups ordered to remove reefs that contain asphalt, metal

By Timothy B. Wheeler

Recycled concrete is sprayed into a tributary of Virginia's Lynnhaven River to form the base of new oyster reefs in February 2022. (Courtesy of Lynnhaven River Now)

The drive to restore the Chesapeake Bay's oyster population has suffered a setback in Virginia after chunks of asphalt, steel rebar and metal wire were found mixed in with the crushed, recycled concrete that two environmental groups used to build artificial reefs in the Lynnhaven River.

The Virginia Marine Resources Commission ordered the Chesapeake Bay Foundation in July to remove all three reefs it had helped build after finding multiple permit violations involved with the oyster restoration project, which CBF undertook in partnership with the local nonprofit group Lynnhaven River Now.

With $500,000 from the National Fish and Wildlife Foundation, the two groups had planned to create nearly 14 acres of reefs in the Lynnhaven River. The Lynnhaven is one of five Bay tributaries in Virginia where state and federal agencies have pledged to restore 152 acres of oyster habitat. Counting reefs already there and those added in recent years, they are within roughly 40 acres of the goal.

The groups received permission from the commission to put down crushed, recycled concrete as a base for the reefs because the customary reef substrate — fossil or recycled oyster shell — is in short supply and increasingly expensive. The city of Virginia Beach donated concrete rubble for the project from various demolition and maintenance projects. CBF planned to spread a layer of oyster shells over the concrete reefs bearing millions of baby oysters.

But shortly after work began early this year, waterfront residents started to complain about seeing asphalt, metal and plastic in the water atop the reefs. State Sen. Bill DeSteph, a Republican representing Virginia Beach, held public meetings to air residents' grievances and pressed authorities to investigate. He also contacted the state natural resources secretary and Gov. Glenn Youngkin.

Karen Forget, Lynnhaven River Now's executive director, acknowledged errors had been made, noting it was the first time her group had built reefs using crushed concrete. They had every intention of fixing the problems, she said.

Adding to the pressure, the Virginia Institute of Marine Science found polyaromatic hydrocarbons in the asphalt and concrete chunks from the reefs that it was asked to analyze. Chemicals typically found in crude oil, coal and gasoline, they are toxic to humans and fish. The PAH levels in the concrete sample were relatively low but much higher in the asphalt, reported VIMS professor Michael Unger, who wrote to the state marine commission that "the asphalt material doesn't belong in the aquatic environment at all."

The commission issued a "stop work" order in early June, and CBF then submitted a plan for fixing the problem. But on July 13, the agency ordered the reefs' removal.

Randal Owen, the commission's chief of habitat management, said in an email that after reviewing the remedial plan with other agencies and the natural resources secretary, and after considering the VIMS findings and "an increasing number of comments from waterfront property owners," his agency decided that the complete removal of the reefs was warranted.

"Everybody came to agreement," said DeSteph, "that if you put something in there that shouldn't be in there, that you have to take it out." He said that while CBF and Lynnhaven River Now have done good work in the past to restore the river and the Bay, residents are disappointed by the handling of the reef projects.

Both groups say they remain committed to restoring the river's oyster population and hope to work out a mutually satisfactory remedy for the problems.

On Aug. 11, CBF submitted a plan estimating that the total removal of all three reefs could cost from nearly $1 million to $2.5 million. Before work stopped, approximately 4,200 tons of crushed concrete had been spread on the river bottom, according to Brent James, Lynnhaven River Now's oyster restoration coordinator.

In the plan, CBF asked the commission to let it remove the smallest of the three reefs in Brown's Cove and keep the other two after having crews cull unpermitted material from their surface. CBF noted that it has already pulled about 950 pounds from the largest reef in Pleasure House Creek.

"Our science-based plan responds to community and regulatory concerns while protecting underwater habitat and safeguarding nearby thriving oyster reefs, as well as the baby oysters already growing on these new reefs," Chris Moore, CBF's senior regional ecosystem scientist, said in a statement.

Shortly before the *Bay Journal*'s press time, the commission's Owen said he was still reviewing the proposal.

Meanwhile, waterfront residents have criticized plans by the U.S. Army Corps of Engineers to build 31 acres of reef starting next year as part of a broader project that includes creating new wetlands and planting underwater grasses.

The Corps had considered using crushed concrete to build the reefs but now plans to use stone and shell, according to Norfolk District spokesperson Breeana Harris. The reef layout has also been modified in response to complaints, Harris said. It now pulls the eastern border back some from nearby docks and increases space between reefs to accommodate local watermen.

But those changes aren't enough, DeSteph said, pointing out that the planned reefs extend into waters frequently used by boaters, tubers and water skiers.

Local residents have objected before to the proliferation of oyster farming, contending that the shellfish cages pose threats to boaters and others using the water. They say they support oyster restoration, at least in concept, but feel their concerns were not sought or considered in project planning.

"There's not a person around that does not believe that oysters are good for the water here and wants to see oysters flourish in the river," said Charles "Chuck" Mehle, a waterfront resident and former community association president who was among the project's vocal critics. "Oysters are good. It's the [reef-building] techniques and details that we're concerned about, the methods." ■

More online at BayJournal.com

Travel

Above: Officials and supporters gather on June 2 to celebrate the opening of the Safe Harbor railroad trestle, a new feature on the Enola Low Grade Rail Trail in Lancaster County, PA. (Ad Crable)

Left: The Safe Harbor railroad trestle, which opened in 1906, is now part of a hiking and cycling trail. The Safe Harbor Dam across the Susquehanna River is in the background. (Ad Crable)

Trestle bridge hike delivers grand view of Susquehanna River

By Ad Crable

You can now walk or cycle across one of the longest and highest railroad trestles in the nation, traveling high above the Susquehanna River for one of the river's most breathtaking views.

Visitors began streaming across the 125-feet-high steel span in the hot sun at midday June 2, after a short dedication for the eight-year, $9 million repurposing of the Safe Harbor railroad trestle in Lancaster County, PA.

The quarter-mile trestle crosses the mouth of the Conestoga River as it empties into the Susquehanna.

"It really is a bridge across a century in time," said Mark Platts, president of the Susquehanna National Heritage Area, at the dedication. "It links the amazing folks who envisioned it and built it as an industrial marvel at the beginning of the last century with the amazing folks who envisioned it and rebuilt it as a recreation marvel in this century."

Local and state officials doggedly pursued the project through unforeseen structural repairs, funding gaps, a threatening rockslide, work delays from a pair of nesting peregrine falcons — even swarms of spotted lanternflies.

They hope the spot will become a major tourist attraction, drawing visitors to the sweeping bird's-eye view of the Lower Susquehanna Gorge. It finally links two parts of the popular 28-mile Enola Low Grade Rail Trail that follows the Susquehanna and crisscrosses pastoral Lancaster County. The state Department of Conservation and Natural Resources had considered the missing link one of the top three trail gaps in the entire state.

Even without access to the trestle, a 5-mile section of the rail trail had attracted visitors from 25 states in recent years. Now, visitors have an even more striking reason to come.

The trestle, which is on the National Register of Historic Places, was finished in 1906 as part of the Enola Low Grade rail line, a globally notable engineering achievement at the time.

The freight line for the Pennsylvania Railroad was carved by the repeated blasting of sheer cliffs along the Susquehanna. Roughly 3,000 workers toiled there, including 200 workers who were killed — mostly immigrants recruited as soon as they stepped off incoming ships. The massive amount of earth-moving involved was considered second only to that of the Panama Canal.

The line eventually lost its luster, and the last train crossed one set of the double tracks atop the bridge in 1988.

But local and state officials envisioned what the trestle could mean in terms of recreation tourism and started gathering funding to repurpose the span for a new generation of users. The Pennsylvania Department of Transportation contributed more than $6 million.

Ballast and rotting wooden decking were replaced with a 22-foot-wide concrete pathway. Visitors can scope the plentiful waterfowl and raptors with binoculars mounted at two places on the span. At one end of the bridge is a picnic pavilion with tables, restrooms and historical information panels.

There's even a replica of one of the guardhouses where workers walking the rail line would warm up or hang a red lantern alerting train conductors to debris or other trouble on the tracks.

The melding of the river's industrial and scenic complexity is on full display from the path across the trestle. Below one end is Safe Harbor Hydroelectric Station's dam, always humming and churning out tailwater that attracts bald eagles, gulls and all kinds of waterfowl.

But the view of the river at its widest and most dramatic drop is undeniably the crown jewel of the trestle experience. For most of its 444-mile meandering from New York to Maryland, the river flows peacefully through valleys. But its most dramatic geologic carving is here, cutting through the steep River Hills in southeastern Pennsylvania.

From atop the trestle, visitors can see the resulting gorge. Its riverbed is littered with forested or exposed rock islands, including some with Native American petroglyphs.

"The Lower Susquehanna Gorge is our Chesapeake Bay here in Pennsylvania, and it's magnificent," said Cindy Adams Dunn, secretary of the Pennsylvania Department of Conservation and Natural Resources, at the dedication.

At two places on the trestle, visitors not subject to vertigo can stare down through glass panels into the Conestoga River and the labyrinth of steel beams that support their elevated view.

"Take a look across this bridge and across the river," Platts said. "It's a nationally important place with important stories to tell." ■

If you go

- The trailhead for the Enola Low Grade Rail Trail is at 2459 River Road, Washington Boro, PA. The distance to the Safe Harbor trestle is 5.25 miles.
- You can also reach the trestle from the Safe Harbor Dam at 1 Powerhouse Road, Conestoga, PA. Park at the signed trailhead, right before the road crosses the Conestoga River, or in the lot for the dam. It's a short but steep 10-minute walk on a gravel path and 36-step staircase to the bridge.
- For information on the 28-mile Enola Low Grade Rail Trail, visit traillink.com and enter "Enola" in the search box.

Photo: Great Bohemia Creek in Cecil County, MD, offers tranquil paddling along the verdant shore of Bohemia River State Park. (Dave Harp)

Escape the crowds, access the water at two new parks on Maryland's Eastern Shore

By Timothy B. Wheeler

Looking for someplace quiet to paddle along verdant shores? To follow butterflies flitting across fields of wildflowers and hear birds calling as you stroll through a forest? To picnic by the water or cast a fishing line?

Outdoor enthusiasts eager to get away from the crowds thronging many parks and natural areas these days have two new spots on the rural upper Eastern Shore of Maryland.

Officially opened in April, Bohemia River and Cypress Branch state parks are the latest additions to Maryland's constellation of 75 state parks, trails and natural areas. Though only partly developed so far, they are diamonds in the rough.

Bohemia River State Park, the larger of the two, offers a variety of experiences to visitors, including hiking, bicycling, horseback riding, hunting, fishing and just plain communing with the outdoors.

The park hugs the northern shore of Great Bohemia Creek just before it merges with Little Bohemia Creek and joins the river of the same name. The name harkens to natives of that western European region who settled in the area in the late 1600s.

The park's 462 acres of forest, crop fields and meadow were purchased by the state in 2017 for $4.9 million. It had been farmed for centuries by a succession of landowners.

"Most of our state parks are larger than that," explained Maryland Park Service Director Nita Settina, "but it was the access to the water that attracted us."

Improving the public's ability to reach the water is a goal of the Chesapeake Bay restoration effort. Bay states pledged to add 300 new access points by 2025 under the 2014 Chesapeake Bay Watershed Agreement.

There isn't yet any easy water access for paddlers directly from the park. There is a rudimentary spot nearby, though, just across MD Route 213 from the park.

At the eastern end of the Bohemia River bridge, paddlers can pull off the highway onto a parking pad large enough for about four vehicles. They can transport their watercraft about 75 yards along a narrow dirt path to a sandy riverbank.

Marinas are clustered along the far shore at the launch site, but the stretch of creek bordering the park is wide, relatively quiet water. Paddlers need only pass under the bridge and bear left to reach it. On a weekday visit in July, there was only one speedboat towing tubers, though boat wakes might be more of an issue on summer weekends.

The park's shore is fringed with phragmites, graced here and there with patches of purplish pickerelweed and large white hibiscus. About the only sign of civilization on this side of the creek is a lone picnic table sitting in a small clearing in the extensive waterfront forest. Leaning up against the bank at another spot is a weathered sign bearing the name of the Bayard family, who owned the land before the state bought it.

The water's surface that day was peppered with dozens of spotted lanternflies. The colorful but destructive nonnative insects have been spreading rapidly across the Bay region. While

Watercress Farm Trail at Bohemia River State Park travels 1.9 miles to Great Bohemia Creek. (Dave Harp)

Black-eyed Susans adorn a field near the parking lot at Bohemia River State Park. (Dave Harp)

this swarm posed little or no threat to the park's visitors or its trees and fields, the same could not be said for the vineyards nearby.

The park service plans to build a canoe/kayak launch on the creek in the next few years — something made more likely by the infusion of new funding for park maintenance, development and acquisition under the Great Maryland Outdoors Act passed this year by state legislators.

On land, the park offers nearly 4.5 miles of trails. One leads to an overlook with a picnic table; the other two offer views of the water and marsh. Oak Point Trail leads from the parking lot past a soybean field and a meadow where swallowtail butterflies flutter amid black-eyed Susans, cornflowers and poppies. Blackberries beckon in the tangle of bushes down the hill.

That trail connects with two others, which meander over rolling terrain through woods, across seeps and past farm fields. The trails are a mix of mown grass, dirt path and gravel farm roads used by horses. Watch your step!

The sounds of traffic fade once you're in the forest, making it easier to pick up the chitter of cicadas and the chirps of frogs and birds. A hiker encountered on her way out of the woods reported hearing scarlet tanager and indigo bunting, among other calls. Woodpeckers could also be heard drumming on the trees, a mix of black gum, tulip poplar, maple and oak.

An old farmhouse and barn still stand in the park's northern end. Work is under way to restore the exterior of the Federal-style dwelling, the core of which dates to the early 1800s. The bank barn, of similar vintage, has undergone extensive restoration, with an eye toward its eventual use as an events venue.

DNR is developing a master plan for the park, which includes building a road to the canoe/kayak launch and upgrading road access to historic structures. But Settina, the park service director, said improvements aim to enhance, not change, the park experience.

"Overwhelmingly, people are looking for us to not overdevelop the park. They want to keep it natural and so do we."

Cypress Branch State Park, on the outskirts of Millington, offers visitors a quiet spot to picnic or fish by a stocked, 3-acre freshwater pond. Once a fisheries management area, it became a state park when DNR acquired 274 acres of adjoining land for $2.8 million.

At 314 total acres, Cypress Branch is even smaller than Bohemia River State Park, but it offers open space and water access to the nearby community — which welcomed its grand opening in the spring, Settina noted.

"It's very accessible to introduce kids to fishing and kayaking," she said.

Entering the park, a short drive leads to a modest sized parking lot. There are several picnic tables in the large grassy area bordering Big Mill Pond.

Not much else is clearly accessible to a casual visitor, but it's what's behind the curtain that brims with promise, Settina said.

Down a gravel drive is a large home occupied by members of DNR's Conservation Corps. They're part of an AmeriCorps program that trains young adults in natural resource management and employs them for park conservation projects.

DNR is partnering with the Washington College Natural Lands Program to create a warm-season grass meadow there, the habitat that once-abundant bobwhite quail favor.

Oak Point Trail at Bohemia River State Park takes hikers to an overlook on Great Bohemia Creek. (Dave Harp)

In the next year or two, Settina said, the park service plans to develop trails where hikers can explore the mix of fields, meadows and woods, which extends all the way to the upper Choptank River. For now, visitors are free to roam the largely undeveloped expanse but advised to stay clear of the railroad tracks that cut through the park.

This park's mission, Settina explained, is not only to provide access to the water but to be a natural and economic asset to the town.

"If we've given people in the future a reason to go to Millington and a reason to have a nice breakfast or dinner as part of the visit, and maybe you [decide you] want to live here, that's good for the town," she said. ■

If you go

Bohemia River State Park
4030 Augustine Herman Hwy., Chesapeake City, MD.
Open 7 a.m. to sunset.
Fee: $3 per vehicle for Maryland residents, $5 for nonresidents.
Payable by credit card only at automated gate.

Cypress Branch State Park
10803 Galena Road, Millington, MD.
Open 8 a.m. to sunset.
No entrance fee.

A fall trio of southbound monarch butterflies and a lone bee pause for sustenance at a stand of seaside goldenrod. (Dave Harp)

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Late summer fawns still "in spot" browse the woods. Around October they will be 6-months-old and go through their first fur shed, losing all the spots to grow new and thicker coats. (Michele Danoff)

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An egregious gamble with Chesapeake sturgeon

By Tom Horton

There are a lot of reasons why 40 years of Bay-saving hasn't saved the Chesapeake Bay, but a dismaying example was on display recently in my hometown of Federalsburg, MD.

Maryland's Department of Environment (mission: "to protect and restore the environment") showed it is willing to gamble with the fate of the Maryland Chesapeake's last 30 or so giant, federally endangered Atlantic sturgeon, which are still spawning there against all odds.

At a public hearing, MDE proposed letting an enormous salmon aquaculture operation, untested at this scale, discharge millions of gallons of "purge" water daily into the shallow and narrow Marshyhope Creek, a main tributary of the Nanticoke River. A single day's discharge at times will be nearly a sixth of the creek's volume.

Of the Chesapeake's estimated 11,000 miles of tidal shoreline, you'd be hard put to find a worse spot for a discharge of that magnitude. Some fisheries scientists are calling it an "existential threat" to the ancient, 10-foot-long sturgeon, genetically unique even among others of their species that hang on in Atlantic river systems elsewhere.

David Secor, a University of Maryland scientist who has spent a decade studying the Marshyhope sturgeon, acknowledged that "existential threat" is a bold term. "But this is the smallest spawning population of [its] kind in the world," he said, "highly inbred, very sensitive to environmental perturbations, just on a knife's edge."

Atlantic sturgeon, which spend most of their decades-long lives roaming the coastal ocean, returning in autumn to their birthplace in little Federalsburg, "have no choice where to be ... but AquaCon [the Norwegian company behind the project] does," Secor said.

At first glance, the company's proposal looks decent. Fish wastes will be recirculated and used to generate power, and deep wells will mean no water is withdrawn from the creek. A building the size of several football fields in the town industrial park will employ hundreds, pumping out an estimated 35 million pounds of nutritious Atlantic salmon a year.

Indeed, many among the 23 citizens and representatives of environmental groups who voiced opposition said the project is a welcome alternative to the open-water pen raising of salmon that has introduced disease into wild fish. It is just in a horribly wrong place.

Even the lone supporter, AquaCon's consultant, told me after the hearing that he had warned the company "this is a bad place to try to put it ... very sensitive." That consultant, Yonathan Zohar, is the respected, longtime director of aquaculture research at the University of Maryland's Institute of Marine and Environmental Technology.

Something else he said publicly: "In three or four years, the way the technology is progressing, I think we won't even need to discharge [water into the river]."

The discharge — the 2 million-plus gallons a day of cold water that is the subject of the MDE permit — is needed now because the salmon must be "purged" of bacteria that makes them taste bad.

Why not wait a few years until this aquaculture technology is perfected?

If we lived in a world where Murphy's Law never applied, where "unexpected" was not in our vocabulary, maybe AquaCon's salmon and the sturgeon could peacefully coexist. But we live in a world where even the best aquaculture operations are subject to electrical outages, broken pipes and massive die-offs of fish crowded into tanks. The modern poultry industry, even with its long experience raising crowded animals, would not guarantee that diseases and big chicken die-offs would never happen.

AquaCon's salmon factory is on the bleeding edge of large scale for their technology, and they plan to scale up rapidly — even though neither they nor anyone else has done this before near a small and sensitive creek like the Marshyhope.

A commercial fisherman unintentionally caught this sturgeon in 2008 in the Nanticoke River, downstream from Marshyhope Creek, and immediately released it. (Dave Harp)

The tonnage of salmon expected from the plant is about three times greater than Maryland's entire blue crab harvest from the Chesapeake. A die-off could present the small sewage treatment plant in Federalsburg with the need to treat millions of gallons of contaminated water, something for which no plan yet exists.

AquaCon and MDE make much of the fact that they are locating the discharge outside the sturgeon spawning area. But as state biologists have told MDE, the true spawning area extends upstream a mile or more beyond the discharge.

The fact is, we are still learning about these great old fish, which have presumably kept returning for thousands of years to the gravely bottoms that provide the perfect substrate for their eggs.

We did not know they were still here until a 5-footer several years ago jumped into a surprised carp fisherman's skiff near Federalsburg. We then learned that despite historical evidence of Chesapeake sturgeon spawning in spring, the Marshyhope fish come back in the fall.

We have a notion of how impossible it might be to restore this unique group if we lost them. In 1997, the state released thousands of baby sturgeon of Hudson River origin into the Nanticoke. They seemed to be thriving, but none ever came back to spawn.

This year is half a century since the Clean Water Act was passed almost unanimously by Congress. It had a goal of zero discharge of pollution to the nation's waters by 1985.

Zero discharge. When's the last time you heard that?

Here we are, 50 years down the road to cleaner water, with real progress, but with Maryland still all too willing to gamble a few hundred jobs against extinction — and on a river where hundreds of millions of dollars in state, federal and private money have been spent to create one of the Bay's least spoiled waterways.

"We can't save the sturgeon with business as usual," said Mike Naylor, a biologist who testified.

He could have substituted "Chesapeake Bay" for "sturgeon." ■

Tom Horton has written about the Chesapeake Bay for more than 40 years, including eight books. He lives in Salisbury, where he is also a professor of Environmental Studies at Salisbury University.

Re-wilding our streams to save the Chesapeake Bay

By Robert Siegfried

My understanding of restoring streams and rivers has experienced a major paradigm shift recently.

It is not the first paradigm shift in my 30-plus-year career, and perhaps not the last. But it points to a way out of the current debate in the Chesapeake Bay restoration community between those who say planting and preserving streamside, or "riparian," forest buffers is the best way forward and those who see restoring wetlands and meandering streams as the Bay's best hope.

Streams and rivers are the arteries of the Chesapeake, bringing to it the water and nutrients it needs to be productive. But they also bring waste products of the landscape — excessive sediment, nutrients and toxins. It is essentially the same transport system that was in place when the English explorer Capt. John Smith wrote about the massive oyster reefs, abundant fish and deep clear water of the Bay. But it is now missing a vital component.

Our understanding of rivers and streams has been unintentionally biased by the very science we use to study and restore them. It was not until the early 1900s that research scientists headed west or to remote portions of the East to study rivers in their "natural" state. And only in the last 40 years or less have we developed working concepts for stream channel evolution, river classifications, riparian buffer functions and the ecology of benthic macroinvertebrates.

Unfortunately, our science was not studying the circulation system that was responsible for Chesapeake of 1608. The system that produced the abundance of the Bay and supported indigenous peoples for thousands of years was long gone and forgotten by the 20th century.

Beavers had been killed off early in the 1700s, eliminating the ecological engineer responsible for building and maintaining an expansive mosaic of ponds, wetland meadows, floodplains and stream channels. These wetland/stream mosaics were the Bay's kidneys and liver, places that filtered and retained sediment, large wood, organic matter and nutrients.

Restored wetlands cover the 124-acre site of a former golf course in New Berlin, NY, in the upper Susquehanna River watershed, shown here in August 2016. (Will Parson/Chesapeake Bay Program)

Then came dams for waterpower, blocking nearly every stream in the Piedmont and Coastal Plain. The dams collected millions of tons of sediment running off tobacco fields. As these dams breached or were abandoned for more modern sources of power, the floodplains were drained for farming. In the early 1900s, the drained floodplains were abandoned, often left to revert to forests.

These systems — degraded by mining, timber harvesting, damming and drainage, along with the absence of beavers — have been studied as our guiding paradigm of how a healthy stream should function. We value streams as a separate resource from wetlands, and not as a fluvial continuum. We value mature wooded riparian buffers over beaver meadows and emergent wetlands. Through our benthic sampling protocols, we value flowing oxygen-rich water over tannic beaver ponds. We value meandering single-threaded channels over dynamic, multichannel stream/wetland mosaics. These valuations are built into our stream assessment methods, our regulatory programs and our restoration industry.

For most of the history of stream restoration in the Bay watershed, we have been restoring streams to a state that itself is degraded, compared with the streams that flowed toward Smith's Chesapeake. We are restoring the arteries to deliver water and nutrients to the Bay, but not the kidneys to remove the waste nor the liver to remove the toxins.

Neither planting and preserving riparian buffers nor restoring single-threaded stream channels will "save the Bay." We need to restore the retention and filtering functions of the Bay's arteries, and that will take a paradigm shift in regulations, restoration and even the science.

Many are talking about "process-based" restoration or "beaver analog" approaches. Ellen Wohl, a professor of geosciences at Colorado State University, has coined the term "messy river." Peter Skidmore, senior program officer at the Walton Family Foundation, uses the term "riverscapes" to describe these river/wetland mosaics.

These approaches are focused on engaging the entire valley floor hydraulically, creating wetlands, ponds, floodplains and multiple stream channels to promote the retention of water, sediment, decaying wood, organic matter and nutrients.

If we want the Bay's tributaries to function as they once did, we need to embrace streams that flow through wetland mosaics instead of woody riparian buffers.

It also means we need to move away from single-threaded, "bankfull" channels stabilized by "structures." This will require regulators to allow the conversion of streams into wetlands and change their courses, erode and aggrade over time. We need to "re-wild" our streams and rivers, wherever practical, to restore those functions lost when we eliminated beaver, and in turn wetlands, from our watersheds.

Only then can we hope to see anything close to what Smith saw — and what Native Americans knew as the natural world — when he sailed into the Bay more than 400 years ago. ■

Robert Siegfried is a senior project manager for Resource Environmental Solutions (RES), an ecological restoration company. He lives in Richmond, VA.

SHARE YOUR THOUGHTS

The *Bay Journal* welcomes comments on environmental issues in the Chesapeake Bay region. Letters to the editor should be 300 words or less. Submit your letter online at bayjournal.com by following a link in the Opinion section, or use the contact information below.

Opinion columns are typically a maximum of 900 words and must be arranged in advance. Deadlines and space availability vary. Text may be edited for clarity or length. Contact T. F. Sayles at tsayles@bayjournal.com or 410-746-0519. You can also reach us at P.O. Box 300, Mayo, MD, 21106. Please include your phone number and/or email address.

Successful shorelines will require a sea change

By Jay Ford & Doug Meyers

The waterfront at Conquest Preserve on the Corsica River in Queen Anne's County, MD, includes a living shoreline that was built to withstand sea level rise. (Will Parson/Chesapeake Bay Program)

The outline of the Chesapeake Bay is changing faster than it has at any point in recorded history, with climate change leading to more intense storms and sea level rise. As our region invests hundreds of millions of dollars in flood resilience, we must prioritize projects that also benefit Bay restoration.

How we treat our waterfronts is perhaps the most visible test case. Living shorelines of native plants incrementally absorb rising waters, reduce pollution by filtering runoff and create wildlife habitat. They are often more effective, and more cost-effective over the long run, than armoring shorelines with rocks, concrete or treated lumber.

These living shorelines are key to adapting to climate change and restoring the Bay. But after years of building hard barriers along waterways, changing mindsets is difficult. Now is the time to reevaluate our relationship with the Bay's ever-changing waterfront.

Let's consider a tale of two shorelines.

In mid-May, an unusual spring nor'easter battered Hampton Roads with days of relentless wind, pushing massive amounts of water into tidal waterways. Denise Maples was at her home along the north side of the Elizabeth River, watching as water rose above bulkheads at neighboring properties, inundating lawns and scouring soil from behind the structures.

It was a real test for her own waterfront. In 2019, she worked with the Elizabeth River Project to establish a living shoreline of native grasses, as well as an oyster reef just offshore, built specifically to break the force of waves. A portion of this living shoreline lies in front of an older stretch of piled stone "riprap."

The storm's surge left just the tops of the native plants above the surface. But the real surprise came once the flooding receded. The water's powerful force had flipped a seemingly immovable large rock in the riprap. Remarkably, the seemingly delicate native grasses that bore the brunt of the water's force all stayed in place. Their roots remained firmly anchored into the soil, keeping her waterfront land from washing away.

"The natural flow of the water across the sand and grass is helping to maintain what God has put there for a purpose," Maples said. "When you start adding manmade products, you're not allowing nature to do what it's supposed to do."

Waging war with water is a losing battle. Bulkheads and riprap only work until a high tide or storm surge rises over them and starts to wash away soil, requiring costly repairs. A well-designed living shoreline, by contrast, grows and strengthens over time. In fact, bulkhead owners report four times the annual maintenance costs when compared with those of natural shorelines, according to a 2017 study published in the journal *Marine Policy*.

While Maples' property had long been shrinking, it is now gaining back land as the native plants trap sand washed in by the current. Wildlife abounds, from night herons and egrets to foxes and racoons that forage in the oyster reef at low tide.

Living shorelines also protect the rights of neighbors. Rising water has to go somewhere. Building ever-higher hard barriers pushes storm surges onto neighboring properties. Living shorelines allow water to rise bit by bit. So, waterways mostly lined with natural shorelines can slowly take in water and alleviate flooding for everyone.

That is one of the reasons that living shorelines are required by law, whenever feasible, in both Virginia and Maryland. Virginia, through its Conservation Assistance Program, even offers homeowner grants for installing living shorelines.

But waterfront homeowners may not realize the long-term benefits at first. When deciding on shoreline protection, property owners tend to choose hardened shorelines if that is what neighboring properties have, according to a survey of coastal property owners in North Carolina. The survey, published last year in the journal *Conservation Science and Practice*, showed that people tended to follow their neighbors' lead with bulkheads or riprap even if they believed that natural shorelines were more resilient and environmentally friendly.

A well-designed living shoreline can help turn the tide of public opinion. A decade ago, the Pines on the Severn community outside Annapolis had a failing bulkhead and severely eroding cliff face.

Resident Ellen Posten met considerable resistance when she first proposed a living shoreline. But that changed after the community completed the project in 2015.

"I cannot point to a single person who does not like the shoreline," Posten said. "We've really done very well. We've had no erosion. The plantings have flourished. People love going down there to spend time on the shoreline."

In the years since, the once-eroded area has actually grown as waves and currents deposit new soil. Now, other communities and homeowners looking to protect their waterfronts visit to see how beneficial a living shoreline can be.

When building resilience to climate change, working with nature will always win out in the long run. Living shorelines lead to a healthier Chesapeake Bay, less pollution and a more beautiful and resilient waterfront. Fortunately, like the marsh grasses along our waters, a new mindset is taking root. ■

Jay Ford is Virginia Policy and Grassroots Adviser for the Chesapeake Bay Foundation. Doug Myers is the foundation's Maryland senior scientist.

BULLETIN BOARD

VOLUNTEER OPPORTUNITIES

WATERSHEDWIDE

Project Clean Stream
The Alliance for the Chesapeake Bay, through its Project Clean Stream, provides supplies for stream cleanups anywhere in the watershed. To volunteer, register an event, report a site needing a cleanup: Lauren Sauder at lsauder@allianceforthebay.org.

Potomac River watershed cleanups
Learn about shoreline cleanup opportunities in the Potomac Riverwatershed. Click on "Cleanups" at fergusonfoundation.org.

Citizen science: butterfly census
Friend of the Earth, an initiative of the World Sustainability Organization, has launched a Global Butterflies Census to raise awareness about butterflies & moths, their biodiversity; collect population data; better understand their behavior. To participate: When you see a butterfly or moth, take a close picture without disturbing it, then send it by WhatsApp message to Friend of the Earth along with your position's coordinates. The organization will reply with the species' name and file the info on the census' interactive map, database. Data are used to design conservation measures to save these insects from extinction. Info: friendoftheearth.org.

VIRGINIA

Reedville Fishermen's Museum
The Reedville Fishermen's Museum needs volunteers for docents and in the gift shop, boat shop, research collections/library. Info: rfmuseum.org, office@rfmuseum.org.

Goose Creek Association
The Goose Creek Association in Middleburg needs volunteers for stream monitoring & restoration, educational outreach & events, zoning & preservation, river cleanups. Projects, internships for high school, college students. Info: Holly Geary at 540-687-3073, info@goosecreek.org, goosecreek.org/volunteer.

Check out cleanup supplies
Hampton Public Libraries have cleanup kits that can be checked out year-round, then returned after a cleanup. Call your local library branch for details.

Virginia Living Museum
Virginia Living Museum in Newport News needs volunteers and interns ages 11+ (11–14 w/adult) to work alongside staff. Opportunities include educating guests, native plant propagation, installation of new exhibits. Some positions have age requirements. Adults must complete a background check ($12.50). Financial aid applications available. Info: volunteer@thevlm.org.

MARYLAND

Certify your pollinator garden
Gardeners whose yards are planted with native, pollinator-attracting species can apply for the Lower Shore Land Trust's Certified Pollinator Garden Program. Participants receive a sign for their yards. Web search "LSLT pollinator certify." Info for landowners interested in creating these landscapes: kculbertson@lowershorelandtrust.org.

Become a water quality monitor
The Izaak Walton League Gaithersburg office invites people of all ages to join one of its free monitoring programs. Info: SOS@iwla.org or 301-548-0150 x229.
- *Clean Water Hub*: Explore water quality data in your community, around the country.
- *Salt Watch*: Test for excessive road salt in a stream.
- *Check the Chemistry*: Spend 30 minutes at a waterway with a handful of materials, downloadable instructions.
- *Stream Critters*: Use app to identify stream inhabitants. Number, variety of creatures reveal waterway's condition.
- *Monitor Macros*: Become a certified Save Our Streams monitor. Learn to identify aquatic macroinvertebrates, collect stream data.

Lower Shore Land Trust
The Lower Shore Land Trust works with individual landowners who wish to protect the natural heritage of their properties. Info: lowershorelandtrust.org/volunteer-sign-up.

Anita Leight Estuary Center
Remove invasive plants, install native species 9–11 am Sept. 11 & Oct. 9 at the Anita C. Leight Estuary Center in Abingdon. Volunteers, ages 14+, learn about problem plants, removal & restoration strategies. Wear sturdy shoes, long sleeves, work gloves. Weather permitting. Preregistration required: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

Patapsco Valley State Park
Volunteer opportunities include: daily operations, leading hikes & nature crafts, mounted patrols, trail maintenance, photographers, nature center docents, graphic designers, marketing specialists, artists, carpenters, plumbers, stone masons, seamstresses. Info: 410-461-5005, volunteerpatapsco.dnr@maryland.gov.

Annapolis Maritime Museum
The Annapolis Maritime Museum & Park needs volunteers. Info: Ryan Linthicum at museum@amaritime.org.

National Wildlife Refuge at Patuxent
Volunteer in Wildlife Images Bookstore & Nature Shop with Friends of Patuxent Research Refuge, near Laurel, for a few hours a week or all day 10 am–4 pm Saturdays; 11 am–4 pm Wednesdays–Fridays. Help customers, run the register. Training provided. Info: Visit the shop in the National Wildlife Visitor Center and ask for Ann; email wibookstore@friendsofpatuxent.org.

Ruth Swann Park
Help the Maryland Native Plant Society, Sierra Club and Chapman Forest Foundation remove invasive plants 10 am–4 pm the second Saturday in August, September and October at Ruth Swann Memorial Park in Bryans Road. Meet at Ruth Swann Park-Potomac Branch Library parking lot. Bring lunch. Info: ialm@erols.com, 301-283-0808 (301-442-5657 day of event). Carpoolers meet at Sierra Club Maryland Chapter office at 9 am; return at 5 pm. Carpool contact: 301-277-7111.

FORUMS / WORKSHOPS

WATERSHEDWIDE

Chesapeake Watershed Forum
The Alliance for the Chesapeake Bay's 17th Annual Chesapeake Watershed Forum takes place Nov. 4–6 at the National Conservation Training Center in Shepherdstown, WV. This year's theme, Nature in Your Neighborhood: Connecting Communities to the Outdoors, will showcase the local benefits of the broader Bay watershed restoration movement. It will highlight connections made to nature and the outdoors through recreation, public access, public health, stewardship, environmental education, advocacy, policy. Participants will consider how historic inequities and biases have prohibited some populations from accessing and connecting with their local waterways. All presenters and attendees are expected to abide by both the Alliance's and NCTC's COVID-related policies. They must visit fws.gov/nctc-covid-19, download, complete, print the attestation form, bring it to the forum and carry it with them at all times. Requirements related to the wearing of masks will depend on Jefferson county's COVID-19 Community Level at the time of the forum. Registration closes Sept. 23. Info: Jenny McGarvey at jmcgarvey@allianceforthebay.org.

Beginner Farmer Training
Future Harvest is accepting applications for its 2023 Beginner Farmer Training Program. The program is a free, yearlong immersive experience that combines a comprehensive classroom curriculum with hands-on learning at regional farms that employ practices that are profitable, protect land and water, build healthy communities. It is open to beginning farmers in Maryland, Virginia, Delaware, District of Columbia, West Virginia, Pennsylvania. Applicants take a quiz to determine which of the program's three levels best fits their needs (web search "Future Harvest BFPT quiz). Deadline: 11:59 pm Sept. 30. Info: Joanna Winkler at joanna@futureharvest.org

MARYLAND

CBEC LIFE class for adults
The Chesapeake Bay Environmental Center in Grasonville is accepting applications for its Legacy Institute for the Environment, an environmental

See **BULLETIN BOARD**, *page 36*

Submission Guidelines

SUBMISSIONS
Because of space limitations, the ***Bay Journal*** is not always able to print every submission. Priority goes to events or programs that most closely relate to the environmental health and resources of the Bay region.

DEADLINES
The ***Bulletin Board*** contains events that take place (or have registration deadlines) on or after the 11th of the month in which the item is published through the 11th of the next issue. Deadlines are posted at least two months in advance.
October issue: September 11
November issue: October 11

FORMAT
Submissions to ***Bulletin Board*** must be sent as a Word or Pages document or as text in an e-mail. Other formats, including pdfs, Mailchimp or Constant Contact, ***will only be considered if space allows*** and type can be easily extracted.

CONTENT
You must include the title, time, date and place of the event or program, and a phone number (with area code) or e-mail address of a contact person. State if the program is free or has a fee; has an age requirement or other restrictions; or has a registration deadline or welcomes drop-ins.

CONTACT
Email your submission to kgaskell@bayjournal.com. Items sent to other addresses are not always forwarded before the deadline.

Answers to CHESAPEAKE CHALLENGE on page 37

1. B	6. A
2. B	7. B
3. A, B, C	8. A
4. C	9. B
5. C	10. A

BULLETIN BOARD *from page 35*

education program for Maryland adults. Its purpose is to create a community of adults seeking to enhance their Bay knowledge and strengthen civic engagement through volunteerism. Participants attend classes and visit sites under the guidance of scientists, environmental educators and consultants. Once they have completed the program, they can become Legacy Stewards at CBEC and assist with environmental education, research, restoration and stewardship. Classes meet 10 am–3 pm Wednesdays, Sept. 21–Oct. 26. Classes and activities cover the Bay's geography/geology/natural history; human influences; climate change & health; plants, birds, animals, insects (including aquatic life). Fee: $150 and 20 hours volunteering at CBEC. Register: bayrestoration.org/LIFE/. Info: Anne & Dave Brunson at volunteercoordinator@bayrestoration.org

EVENTS / PROGRAMS

WATERSHEDWIDE

Taste: Celebrate the Chesapeake

Tickets are on sale for the Alliance for the Chesapeake Bay's 2022 Taste: Celebrate the Chesapeake, which takes place in multiple locations this year. Each event features food, beverages, local acoustic performances, silent auctions, raffles and presentations. Guests must fill out the bidder registration email to enable silent auction bidding during the event. Proceeds benefit work at the Alliance. Info: Tickets: $75. development@allianceforthebay.org.

- *River's Edge at Long Level/Wrightsville, PA*: 6–8 pm Sept. 15.
- *Annapolis Maritime Museum/Annapolis*: 6–8 pm Sept. 22.

Future Harvest Foodshed Feasts

Support Future Harvest's mission of advancing agriculture that sustains farmers, communities and the environment by attending a Chesapeake Foodshed Feast. Food and beverages of local farmers, ranchers, chefs, winemakers and brewers are showcased. Tickets: $125 or $1,000/ 10-ticket block. Info: web search "Future Harvest Foodshed Feasts." Feast dates are:

- *Blue Ridge/Wollam Gardens*: 12–3 pm Sept. 18. in Jeffersonton, VA.
- *Baltimore County/Starbright Farm*: 12–3 pm Sept. 25. White Hall, MD.
- *Eastern Shore/Pop's Old Place*: 6–9 pm Oct. 1. Hurlock, MD.
- *Common Good City Farm/Washington, DC*: 5:30–8:30 pm Oct. 11.

PENNSYLVANIA

Dam Bridge Challenge

The Fourth Annual Dam Bridge Challenge Sept. 17 features three races along the Susquehanna River, on Lake Clarke, near Wrightsville. On-site check-in begins at 7:15 am. The first race begins at 8:50 am and is a 10-mile round-trip between Safe Harbor Dam and the PA Route 462 bridge. The second (9 am start) is a 3.5-mile loop around Grace Island back to Lock 2. The third, a 1-mile sprint (9:30 am) is from Fishing Creek to Lock 2. Kayaks, canoes and stand-up paddleboards welcome. This event supports the Lower Susquehanna Riverkeeper Association. Registration ($40–$75) includes a one-year membership to the association. Preregistration is recommended; walk-up spots not guaranteed. The post-race party at Shank's Mare Outfitters includes prizes for top 3 finishers in each category for each race, live music, food and beverages and family-friendly activities. Info/to purchase tickets: paddleguru.com/races/DamBridgeChallenge, lowsusriverkeeper.org

Fracking book discussion

The Middle Susquehanna Riverkeeper Association's next Nature Book Club meeting, 7 pm Sept. 26, will discuss the book *Up to Heaven and Down to Hell* by Colin Jerolmack, who will join the event. The book focuses on the fracking boom in the greater Williamsport area. Attend the free meeting in person at the association's office in Sunbury or via Zoom. Registration required. Info: web search "middle Susquehanna book club."

VIRGINIA

Second Sunday Hikes

The Greater Prince William Trails Coalition offers hikes that explore places in Prince William, Manassas and Manassas Park (weather permitting) 1–3 pm the second Sunday of every month through 2022. Info: info@gpwtrails.org.

MARYLAND

St. Mary's City RiverFest

Celebrate the St. Mary's River at the 17th annual RiverFest, 11 am–4 pm Sept. 24, rain/shine, at Historic St. Mary's City. Learn how to protect waterways; try kayaking, seining; boat rides; live birds of prey, snakes, oysters, seldom-seen creatures. Exhibits feature local flora, fauna. Get a free Bay-Friendly Backyard booklet. Wade-in set for 2 pm. Free. Info: SMRWA.org

Horn Point open house

The University of Maryland Center for Environmental Science's Horn Point Laboratory's free open house takes place 11 am–4 pm Oct. 15 at its Cambridge campus. This year's theme is "Explore the Shore through Science." Meet scientists, learn about their research through outdoor or open-air interactive exhibits. Exhibits & activities include healthy marshes; how oysters clean water, build resilience to sea level rise & climate change; the East Coast's largest oyster hatchery; DNA food chain game; digital sand box to create shorelines, model weather's impact with laser imaging; scientist dunk tank; and children's activities. Children get a free t-shirt if they complete a scavenger hunt. Masks are strongly encouraged. Info: umces.edu/hpl/openhouse or Carin Starr at cstarr@umces.edu, 410-221-8408.

Swim & Paddle the South River

Swim & Paddle the South River 9:30–11 am Oct. 2. The event benefits the Arundel Rivers Federation and its work to protect and restore the South, Rhode, and West rivers in Anne Arundel County. The non-competitive event includes a 5-mile continuous loop for swimmers and paddlers to complete solo or as a relay. A lifeguard-supported 800-meter course is available for those who wish to stay close to shore. Staggered check-ins and safety briefings begin at 6:30 am for the 5-mile entrants. Lifeguarded loop check-in begins at 7:45 am. Participants must wear masks when on land. All swimmers must wear a waist belt visibility buoy. These may be purchased onsite ($30) or borrowed. Paddlers must wear PFDs; if they are supporting swimmers, they must have whistles. Motorized boats with Red Cross Lifeguards and small craft safety/support crew will be present throughout the courses. Waters, electrolyte beverages, fruit, granola bars and other snacks will be available. Entry fees vary and depend on course, level of support needed. There is no rain date. If heavy rains fall within 48 hours of the event, it will be canceled and participants will be thanked for their donation. Register/info: swimthesouthriver.com.

Oceana Phenomena Exhibit

The Annapolis Maritime Museum & Park is presenting Oceana Phenomena, a temporary exhibit focusing on the power of art to bring awareness to the mounting threats of flooding and sea level rise, 10 am–3pm, Tuesdays–Sundays through Nov. 13. The goal is to unite communities to solve these issues. The exhibit includes paintings highlighting the natural resources of oceans, bays, and rivers; photographs by Jay Fleming showing the realities of sea level rise in the Annapolis community, and more. Tickets: amaritime.org or at the door.

Patuxent Pollinator Festival

The Patuxent Research Refuge's North Tract's Pollinator Festival returns 9 am-1 pm Sept. 24. Visitors of all ages will learn about pollinators' role in nature. Highlights include: monarch caterpillars, chrysalises, adults; tagging & releasing adult monarchs before they migrate to Mexico; children's games & educational activities; talks with scientists & biologists studying pollinators at the refuge; live beehive & talks with beekeepers. This is an outdoor event, dress accordingly. Bring a hat, water bottle, sunscreen, insect repellent. Info: friendsofpatuxent.org, click on the events tab.

Piney Point Lighthouse, Clement's Island

Clement's Island Museum in Coltons Point and Piney Point Lighthouse Museum in Piney Point invite the public to explore nature through hands-on activities on select Saturdays through December 2022. Registration encouraged. Call ahead to request specific session time. Included with museum admission. Rain or shine barring unsafe weather conditions. Info: 301-994-1471, Facebook.com/1836Light. Upcoming programs:

- *St. Clement's Island/Outdoor Autumn Play Skills & Forest Stories*: 12–3 pm Oct. 8. Babies to preteens.
- *Piney Point Lighthouse/Shore Combing - A Look at the Smaller Side of Life*: 12–1:30 pm Sept. 10. Families, children.
- *Piney Point Lighthouse/Shore Combing - A Look at the Smaller Side of Life*: 2–3:30 pm Sept. 10. Adults only.

Anita C. Leight Estuary Center

Take part in any of these programs at the Anita C. Leight Estuary Center in Abingdon. Ages 12 & younger w/adult. Meet at center. Registration required for all programs; payment due at registration. Info: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

- *Family Feed*: Participant chooses time, Sept. 15, 22, 29 and Oct. 6, 13, 20 & 27. Go behind the scenes, help a naturalist feed the animals. Free. Register at least 24 hours ahead.
- *Down by the Bay/National Estuaries Week*: 12:30–2 pm Sept. 18. Families, ages 2+. Explore Otter Creek's edge in search of plants, animals. Use seine net to catch fish. Register by Sept. 16.
- *National Estuaries Day Kayak*: 9:30 am-12 pm Sept. 24. Ages 8+ Explore Otter Point Creek. $15. Register by Sept. 23.
- *Nature Tots*: 9:30–10:30 am OR 11 am–12 pm Fridays, Sept. 30–Nov. 4. Stories, songs, simple crafts, discovery outings highlight week's topic: turkeys, leaves, fall, pumpkins, squirrels, geese. Fee for 6-week series is $42/child. Register by Sept. 14.
- *Nature Discovery Tots*: 10:30 am Oct. 1. Ages 0–6 w/adult. Explore the season in the Nature Discovery Area. Free. Register by Sept. 30.
- *Amazing Arachnids*: 2:30–3:30 pm Oct. 2. Ages 2+ Learn Maryland's native spiders, spider hike, craft. $10/family. Register by Sept. 28.
- *Shoreline Show Kayak*: 9–11:30 am Oct. 8. Ages 8+ to adult $15 Register by Oct. 7.
- *Autumn on the Creek Canoe*: 9:30 am–12 pm Oct. 9. Ages 8+ Paddle Otter Point Creek. $15 Registration required.
- *Meet a Critter*: 1:30 pm Oct. 9. All ages. See, learn about an animal up close. Free. Register by Oct. 7.
- *Homeschool Lab Science Class – Estuaries*: 1–3 pm Oct. 7, 14 & 21. Ages 12–16. Water quality tests, population studies, animal dissections. $75/child for 3-week series. Register by Sept. 16.

CHESAPEAKE CHALLENGE

— Kathleen A. Gaskell

Menhaden on the menu

What do striped bass, sharks, osprey, jellyfish and humpback whales have in common? They all prey on menhaden (*Brevoortia tyrannus*). Do they know that the oily fish is full of energy? What do you know about this small fish found on the East Coast that is vital as forage for other fish and as an important commercial fishery in the Bay? Answers are on page 35.

1. Most menhaden are harvested for the "reduction" industry, which grinds or "reduces" them into meal various products. Why?
   A. They're the main ingredient in diet pills.
   B. They're processed into powder or oil used to make pet food, lipstick, cookies, health supplements and other products.
   C. The Bay no longer supports the number of fish it once did, and fish populations must be reduced.

B

2. Why is the Bay an important nursery area for juvenile menhaden?
   A. Fewer predators
   B. Abundance of plankton
   C. Perfect temperature to promote growth

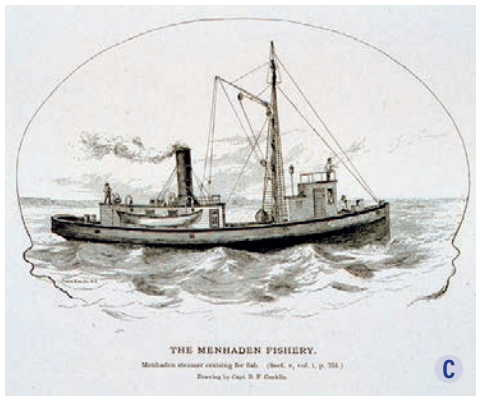
3. The Atlantic menhaden is a member of the Clupiedae family. Which of these are also clupieds? (More than one answer may apply)
   A. Herring
   B. Shad
   C. Sardines

4. A young female menhaden can produce roughly 38,000 eggs. How many can a mature female produce?
   A. About 146,000
   B. About 238,000
   C. About 362,000

5. How long can menhaden live?
   A. 6–8 years
   B. 8–10 years
   C. 10–12 years

6. How large can a menhaden grow?
   A. 1 pound, 15–18 inches
   B. 2 pounds, 18–21 inches
   C. 3 pounds, 21–24 inches

7. Menhaden have 30–35 abdominal scutes. What are these?
   A. Silvery scales that puff up during courtship
   B. Raised scales with sharp points that offer protection
   C. Raised scales that take in extra oxygen when swimming in low-oxygen water



C

8. Although adult menhaden, like oysters, filter water when feeding, they do little to clean the Chesapeake Bay. Why?
   A. They mainly eat zooplankton.
   B. They only feed in pristine water.
   C. Their gills are too large to process nitrogen.

9. What is a peanut bunker?
   A. Menhaden jerky
   B. A young menhaden
   C. An oyster reef crevice used by young menhaden for shelter

10. Menhaden larvae are pelagic. What does pelagic mean?
    A. Living in the upper layers of open waters
    B. Having transparent scales
    C. Large phytoplankton

D

Menhaden mentionables

A fish by any other name would still smell like … fertilizer. Two names for this oily fish are derived from indigenous languages. The word menhaden comes from the Narragansetts' *munnawhatteaug,* and pogy (another common name for menhaden) comes from the Abenakis' or Penobscots' *pauhagen.* Both terms roughly translate to "that which manures" or "fertilizer."

A-maizing fish: Indigenous people taught the Pilgrims to include fish as fertilizer when planting corn. Many believe this was menhaden.

Look ma, no teeth! There are no teeth in a menhaden's protruding jaw. It gathers food by filtering water through its gills.

Whale, what do you know? After disappearing from the waters off New York City for many years, menhaden started to return about 10 years ago. Hot on their tasty tails were hungry humpback whales, which were once rare visitors but are now frequently seen in the vicinity.

Talk about biting one's tongue: Other nicknames for menhaden — bug-fish and bug-head — are derived from the presence of the tongue-eating aquatic louse *Cymothoa pregustator*, a parasitic isopod that enters the fish's gills, bites its tongue till it falls off, then attaches to the remaining stump, becoming the fish's new tongue.

Icon: *The menhaden fleet deploys seine nets to capture the oily fish. (Dave Harp)*

A *Atlantic menhaden form large schools in the Atlantic Ocean and Chesapeake Bay. (Jerry Prezioso/NOAA Fisheries)*

B *A pound-netter stands amid his menhaden catch before offloading them at a buyer's dock on Hooper's Island, MD. (Dave Harp)*

C *A historical sketch depicts the menhaden steamer William Floyd. (NOAA National Marine Fisheries Service)*

D *The Atlantic menhaden is prized by predators and a commercial fishery that makes a variety of products out of the oily fish. (Brian.gratwicke/ CC by 2.5)*

Water recreation builds connections that benefit us all

By Sophie Stern

Rafters on the James River tackle a burst of whitewater. (Dave Harp)

The Alliance for the Chesapeake Bay's Virginia team enjoys an afternoon on the James River. (Sophie Stern/Alliance for the Chesapeake Bay)

I recently sat on the banks of the James River in Richmond watching whitewater rafters head through the Pipeline Rapids, shrieking with joy as they were splashed on the last rapid before reaching the takeout. All around them, I saw no less than seven herons perched on rocks. An osprey flew to its nest on an old railroad pillar nearby, and turtles sunbathed on exposed rocks from the low river levels.

Backdropped by the city skyline, I couldn't help but think what a privilege and joy it is to live near this section of the James.

I lived for seven years in New England, spending most of my time in the mountains and forests. When I moved to Richmond in 2017, I arrived in brutal heat and humidity in late September.

I was drawn to the James River, where I saw people swimming and fishing, dogs splashing in the water, and families and friends gathering. I watched kayakers and rafters run the Hollywood Rapids, having no idea at the time that the James River and this set of rapids would become such an important part of my life.

Even when temperatures started to cool, I found myself and my water-loving dog using our free time to explore the river's many public access spots within city limits, which the James River Park System works tirelessly to maintain.

Cooler temperatures meant fewer crowds, but the always-present paddlers at the put-ins above the rapids never waned. As I got to know the regulars, I learned more about the vast boating community in Richmond and the whitewater recreational opportunities here and throughout the Chesapeake Bay watershed.

And it's no secret that the more connected people are to their waterways, the more they want to protect them.

In Richmond, we have outfitters with trained guides to keep people safe on the river, whether it's a whitewater trip through the rapids or a leisurely flatwater float. There are summer and after-school educational programs that focus on getting students in canoes and kayaks, connecting them with local waterways. There are groups like James River Women, aimed at supporting more women and femme-identifying paddlers on their journey into whitewater paddling.

Especially in the summer, the James is heavily visited by rivergoers of all abilities. Safety must be a priority for everyone, and there are lots of resources to help paddlers and swimmers enjoy the river safely. We must remember that being safe on the river is often a privilege gained from exposure to guided trips, mentors, summer camps and more. Websites for the Westham Gauge, Riverside Outfitters and James River Park System, as well as the How's the James RVA Instagram page, help prepare people for a fun and safe visit.

Recreational boaters, a powerful stewarding resource in the Chesapeake community, also provide voices on and off the river with information about river health and safety.

I've witnessed paddlers share resources with other river users about how to get alerts on their phone when sewage-tainted stormwater enters the river and where to check bacteria levels at their favorite swimming locations. I've seen paddlers advocate for more education on river safety and access, including the recently constructed universal access ramp at Huguenot Flatwater. Paddlers promote these resources, follow local recommendations and set examples for others.

Not only am I fortunate to recreate on the river in my free time, but I'm also able to connect with the James in my everyday work life — as a water quality monitoring coordinator for the Alliance for the Chesapeake Bay. I help train community members to collect baseline water quality trends. RiverTrends, launched in 1985 and funded primarily by the Virginia Department of Environmental Quality, is an Alliance-managed project that provides training, equipment and technical support to volunteers who conduct chemical and physical water quality monitoring in their communities.

The Alliance also became involved recently with the Citizen Science Volunteer Water Quality Monitoring Program in the District of Columbia, funded by the city's Department of Energy and Environment. Alongside our partners at Anacostia Riverkeeper, the Rock Creek Conservancy and Audubon Naturalist Society, we provide weekly water quality data to residents and visitors during peak recreation months. This is the first effort to integrate citizen science water quality data into the District's water quality plan, an important tool for policy management and assessments.

Most of these volunteers find us because they're passionate about their local waterways. They become even more connected and informed by having a profound understanding of the waterways they call home. Collecting this data is crucial for informing the public of the safety and quality of our rivers.

Now more than ever, it's essential to see how recreation on the water is intertwined with water quality so that we can keep enjoying the river as an outdoor playground while staying safe and healthy.

My journey with whitewater recreation and water quality are deeply connected, and I look forward to continuing to promote Bay stewardship and river safety in my circles and beyond. ■

Sophie Stern is the water quality monitoring projects coordinator for the Alliance for the Chesapeake Bay.

Red-shouldered hawks rocket through life-and-death drama

By Mike Burke

Rocketing past me, the hawk was gone in a stunning moment. By the time I focused, it was crashing through the dense tree foliage on the other side of the creek. The bird came from behind me, at head height and just 10–15 feet to my right. My surprise and the bird's speed momentarily left me unable to identify it.

As my alarm subsided, I realized I had just had a close encounter with a red-shouldered hawk (*Buteo lineatus).*

The red-shouldered hawk is crow-size and deadly. It has lethal talons and a sharp, hooked bill. With shortish, broad wings, a slim profile and long tail, this hawk is wonderfully adapted for navigating forests. It can dodge limbs at full speed in hot pursuit of its prey. I had no need to watch *Top Gun: Maverick*; I had just witnessed an unparalleled aerial display in real time. The hawk's success or failure occurred out of my sight. Nature will have its way, with life and death in the balance.

Red-shoulders concentrate on small terrestrial animals to fill their dietary needs. But, as I had just witnessed, they also hunt for small songbirds.

Red-shouldered hawks are common throughout the eastern United States, including the entire Chesapeake Bay watershed. When winter approaches, they tend to migrate to our southeastern states. While some will stay on their territory year-round, others will go farther in their migration. These longer-distance migrants head to Mexico until the weather warms.

A separate subspecies (*Buteo lineatus elegans*) has established a permanent population in California. The eastern and western ranges do not overlap. The western population is especially vivid, with bright orange-red covering its undersides, reaching over the shoulders and down part of the back. In Florida, yet another subpopulation (*Buteo lineatus extrimus*) is just the opposite, with pale rusty feathering across the breast.

A red-shouldered hawk soars above state game lands in western Pennsylvania, white feathers translucent in the sunlight. (Dave Inman/ Creative Commons)

Red-shouldered hawks show strong nesting site fidelity. They often refurbish old nests with new sticks and soft linings. Both sexes build or rebuild the nest, which is placed in a notch between the trunk and a limb. They build their nests high, just below the canopy. A single brood is produced annually, yielding two to five chicks. Both parents take care of the nest, but the mother does nearly all of the incubation, which typically lasts 32–40 days. The male brings her voles and other small animals as she tends to her post.

Once hatched, the chicks remain in the nest another 42–49 days as they grow larger and stronger. They begin testing their wings during this phase as well. Both parents continue to support the youngsters with fresh kills until the young birds have improved their hunting skills to the point of independence.

Males and females look alike, although females are larger — a common occurrence among raptors. The average female weighs 25 ounces while most males top out at 19 ounces or so.

A solid russet covers the hawk's breast. The reddish coloring extends over its shoulders, giving the bird its name. The sides and belly are auburn with thin, horizontal white stripes. From below, the inner wing is a splotchy reddish brown. Just inside the bird's black wingtips, white feathers are translucent when the sun is directly overhead. The long tail has broad bands of black, separated by rows of white, including a terminal stripe. From the top, the hawk displays black, white and a bit of russet in a cryptic mix.

Red-shouldered hawks often survey the landscape from a perch, then drop off in swift pursuit of prey. (Dave Inman/Creative Commons)

Later in the day of my close encounter, I saw and heard the red-shoulder soaring over its territory, calling regularly in a staccato burst of high-pitched notes. Red-shoulders call often, their piercing voice heard over woodland tracts, water features near forests and even suburban locations with extensive trees.

That day I witnessed two of three typical behaviors for red-shoulders: soaring aloft and racing through woodlands. The missing activity was perching on a fencepost, tree limb or signpost. These perches provide an excellent view of adjacent clearings. The hawk trains its black eyes below, scanning for the least movement from mice, lizards, snakes or frogs. Once it sees its target, the raptor drops off the perch and darts toward the doomed prey. In a quick movement, talons swing down in a perfectly timed, lethal strike.

Most birds spend considerable energy and time looking for and consuming food. For hawks like the red-shoulders, that means another creature must die. When the hawk captures and eats a vole, most people don't mind. But when the same bird captures, kills and eats a colorful songbird such as an indigo bunting, disapproval often follows.

Death comes equally for vole and bunting. It is an inevitable outcome in a balanced ecosystem. Even as an apex predator, the red-shouldered hawk will meet its demise someday.

Oddly enough, I find a certain peace in the life-and-death drama of the natural world. It is in woods and marsh that I see more clearly that death is not a judgment on the beauty, age, intelligence or any other characteristic of the departed. All we really know is that it is inevitable and perfectly natural. In our built environment, we wonder "why?" or "how could it happen to one so young and beautiful?" In the natural world, it is easier to realize that these questions are simply unanswerable.

So, did the red-shouldered hawk catch and kill the songbird? I no longer root for predator or prey. Slowly, I'm replacing judgment with acceptance. It's a good trade. ■

Mike Burke, an amateur naturalist, lives in Mitchellville, MD.

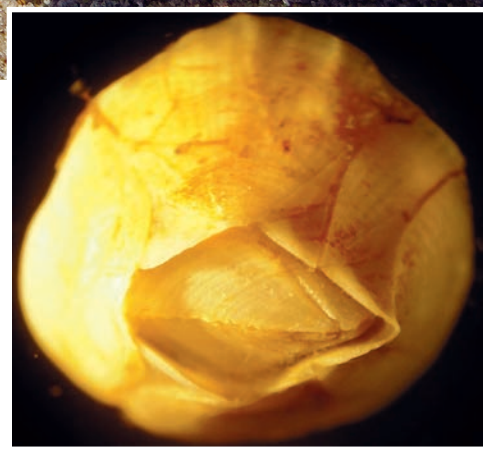
A closer look at barnacles, the original Super Glue

By Kathy Reshetiloff

Above: White barnacles, also a Bay species, cling to a mostly buried piece of driftwood at low tide. (Annika Lindqvist/CC BY 4.0)

Left: A top view of the ivory barnacle, one of four barnacle species found in the Chesapeake Bay. (Auguste Le Roux/CC BY-SA 4.0)

Right: This close view of a bay barnacle, a Chesapeake species, shows the animal's "mouth." just inside the shell. The mouth closes tightly when out of the water. (Austin Smith/CC BY 4.0)



Barnacles — these cone-shaped shelled animals attached to pilings, boats, bulkheads and driftwood — have fooled many of us into believing they are mollusks. They do indeed look like mollusks (oysters, clams, snails, etc.) because they are soft-bodied animals enclosed in a hard calcareous shell and *apparently* legless.

But barnacles, including four species found in the Bay, are a crustaceans — and are more closely related to the crab or shrimp. Crustaceans are characterized by a hard exoskeleton (not to be confused with a shell) and jointed legs. Hidden by its external shell, a barnacle has been described as a shrimp-like animal in a limestone house.

According to the Chesapeake Bay Program, the barnacle species found in the Bay are the bay barnacle (*Amphibalanus improvisus*), white barnacle (*A. subalbidus*), ivory barnacle (*A. eburneus*) and little gray barnacle (*Chthamalus fragilis*).

The animal's shell consists of six overlapping plates with an opening at the top covered by two hard flaps. When submerged in water, the two flaps, acting as doors, open up. The barnacle unfolds a fan of feathery, jointed "legs," which it uses to sweep tiny food particles into its shell.

Barnacles are hermaphroditic, each possessing both male and female organs. To reproduce, however, a barnacle's eggs must be fertilized by another barnacle. This is accomplished by a sperm tube that protrudes from one barnacle into a neighboring one.

Fertilized eggs are nurtured in the barnacle until they hatch into tiny larvae that are released into the water during May and June. The water is thick with thousands of larvae — a favorite food for many young fish. They are consumed in such large numbers that few of the larvae survive to adulthood.

The larvae pass through two stages. The first stage, the nauplii, is a triangular form that exists for a few days before molting into the cypris, which looks like a tiny transparent seed. The cypris larvae swim about for a few days searching for a suitable place to attach — often a surface occupied by barnacles of their own species, likely guided by a chemical attractant released by the established adults. The cypris attaches at its head using cement secreted by its antennal glands. After its attachment, the animal begins to produce the calcareous plates that will encase it.

As the barnacle grows, so too will its shell, composed of calcium carbonate. The shell is enlarged by adding calcium carbonate along the edges of each plate, increasing the space inside. Like other crustaceans, the animal itself has an exoskeleton, which it repeatedly sheds as it grows.

Barnacles adhere to piers, boats, plants, rocks and shells in the intertidal zone. This is an area that is submerged by tides and then exposed to air as the water recedes. When the animal is exposed to the air during low tide, its two flaps at the top of its shell will shut tightly. This keeps the animal inside moist until the tide rises again.

Barnacles, though well-protected by their shells, are nevertheless susceptible to dryness, extreme cold and harsh winds. Plus, many animals eat barnacles, including sponges, bryozoans and worms, especially the little oyster flatworm.

Of course, anyone who owns a boat curses these tiny creatures and the tedious and difficult task of removing them. But barnacles are an interesting and necessary part of the Chesapeake Bay food chain, removing particles from water and providing food to other animals.

Barnacles … yeah, we're stuck with them! ■

Kathy Reshetiloff is with the U.S. Fish and Wildlife Office's Chesapeake Bay Field Office in Annapolis.

Right: The little gray barnacle, photographed here on a blade of spartina grass in coastal Georgia, is yet another Chesapeake barnacle species. (Yihui Zhang/Public Domain)