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Independent environmental news for the Chesapeake region

Agriculture & the Chesapeake Bay: Sowing a conversation

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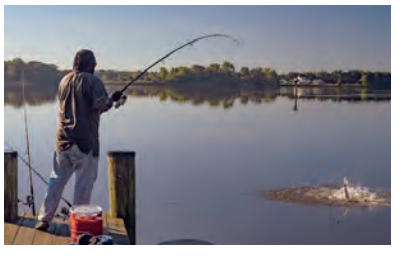
RECYCLING PLASTIC

A proposed riverside plant stirs debate in PA PAGE 13

INVASIVE BLUE CATFISH



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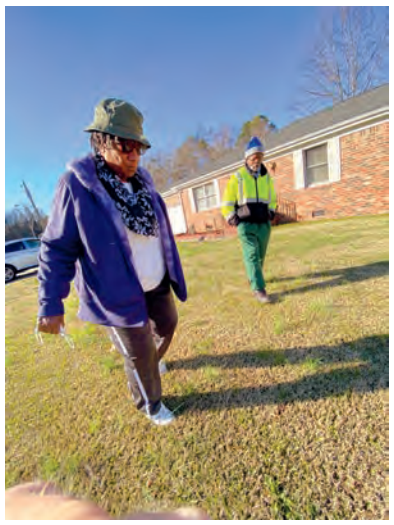


Carolyn and Wayne White are among residents of Pughsville in Suffolk, VA, eager to see effective solutions to increased flooding in their neighborhood. Read the article on page 19. (Jeremy Cox)

ON THE COVER

Farmland and marsh are nestled together along Tuckahoe Creek, a tributary of Maryland's Choptank River, which flows into the Chesapeake Bay. (Dave Harp)

Bottom images: Left is a rendering courtesy of Encina, center by Dave Harp, right by Whitney Pipkin.

EDITOR'S NOTE

Weighing wins and trade-offs

Inside this issue of the *Bay Journal*, you'll find the launch of a new series. It highlights a topic long considered the most critical for restoring water quality in the Chesapeake Bay: reducing nutrient pollution from agriculture.

People, agencies and organizations across the Bay region have put enormous amounts of energy and money into that effort. And their work has made a difference for local water quality and for the Bay. It has collectively held the line, more or less, on nutrient pollution even as the human population, development, livestock population and agricultural production have increased in recent decades.

But, according to computer model estimates, the amount of nitrogen reaching the Bay from farms has changed little since 2010, when the 2025 cleanup goals were set. Assessments by the Chesapeake Bay Program, a partnership led by the federal government and states in the Bay watershed, show that the region will not achieve its 2025 goal. Maryland, Pennsylvania and Virginia are each expected to each fall short in their share of the work.

Our series is called *Agriculture & the Chesapeake Bay: Sowing a Conversation*. And the title is in part a call to action — for all of us. The articles you will read in this and future issues of the *Bay Journa*l will offer insights into the complexities of the problem, missed opportunities and the choices that must be confronted as the Bay cleanup moves forward. We hope that *Bay Journal* readers will think through their own views on the topic and share them with regional leaders working to craft a plan for the Bay cleanup to 2025 and beyond.

Karl Blankenship, author of the series and founding editor of the *Bay Journal*, has been reporting on Bay policies for more than 30 years. There is arguably no one better suited to provide this important, in-depth analysis of how we got here — and where we might go next.

Dive in, and rest assured there is more to come!

— Lara Lutz

BY THE numbers

10
The average number of years that a blue catfish lives

102
The weight, in pounds, of the largest blue catfish caught in Virginia

83,000
The approximate number of farms in the Chesapeake Bay watershed

50%
The percentage of nutrient pollution in the Bay that comes from farmland

7–11
The length, in feet, of a typical bull shark

20,000–50,000
The number of teeth, depending on the species, that a shark can produce in its lifetime

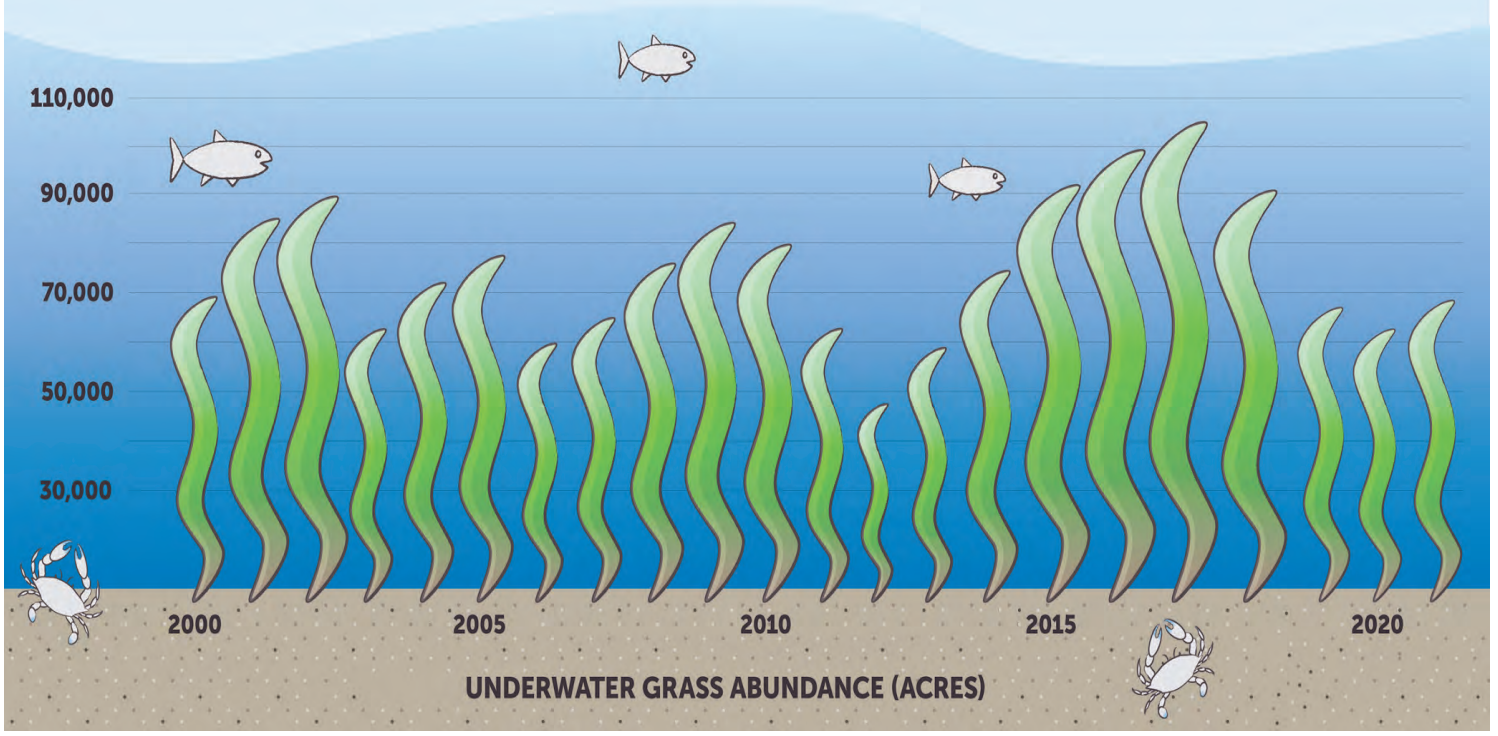
Underwater meadows in the Chesapeake Bay

Underwater grasses — also known as submerged aquatic vegetation or SAV — are a critical indicator of the Chesapeake Bay's vitality. They provide food for ducks and geese, as well as shelter for young fish and crabs. They also add oxygen to the water and help clarify it by absorbing nutrients and trapping sediment.

The grasses need clear water so they can get enough sunlight to survive and grow. If the water becomes clouded with nutrient-fed algae or sediment, the grasses die.

More than two dozen types of grasses grow on the bottom of the Bay and its rivers. The species vary depending on the salinity of the water. Freshwater plants like wild celery grow in the upper or northern region, with eel grass and widgeon grass in the saltier southern region, and sago pondweed and redhead grass in the middle.

Scientists think the Bay once supported 600,000 acres of underwater grasses, but aerial surveys in 2021 found less than 70,000 acres. The Baywide restoration goal is 185,000 acres.



(Graphic courtesy of the Chesapeake Bay Program)

bayjournal.com/podcast

LOOKING BACK

30 years ago
Freshet to test Bay's recovery

Scientists watch for ecosystem impacts from the region's wettest spring since Tropical Storm Agnes in 1972. ■

— Bay Journal
May 1993

20 years ago
Region sets goal to reduce sediment

The Chesapeake Bay Program sets its first goal aimed at reducing sediment pollution in rivers and the Bay. ■

— Bay Journal
May 2003

10 years ago
Bay grasses plummet

Warmer water temperatures and poor water quality drove Bay grass acreage down 44% over the last three years. ■

— Bay Journal
May 2013

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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STAFF

Lara Lutz, Editor / Executive Director (llutz@bayjournal.com)
Karl Blankenship, Editor-at-Large (kblankenship@bayjournal.com)
T. F. Sayles, Managing Editor / News Service Editor (tsayles@bayjournal.com)
Timothy B. Wheeler, Associate Editor / Senior Writer (twheeler@bayjournal.com)
Jacqui Caine, Marketing & Advertising Director (jcaine@bayjournal.com)
Jeremy Cox, Staff Writer (jcox@bayjournal.com)
Ad Crable, Staff Writer (acrable@bayjournal.com)
Kathleen A. Gaskell, Copy Editor (kgaskell@bayjournal.com)
Dave Harp, Photographer (dharp@chesapeakephotos.com)
Khristna Paysour, Administrative Assistant (kpaysour@bayjournal.com)
Whitney Pipkin, Staff Writer (wpipkin@bayjournal.com)

Editorial content and oversight is managed solely by Bay Journal staff.

Layout by Michele Danoff, Graphics By Design.

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editor:
llutz@bayjournal.com or 410-798-9925

BAY JOURNAL NOTEBOOK

Students from the Park School of Baltimore took time during their spring Immersion Days to ask Bay Journal writer Jeremy Cox and editor Lara Lutz questions about environmental journalism. (Sami Zooker)

Spring is a time for teaching, learning

School is in session – and, boy, don't we know it.

It seems like our staff has been here, there and everywhere this spring, talking about the environment in classrooms and elsewhere.

Editor-at-Large **Karl Blankenship** made a trip to Salisbury University on Maryland's Eastern Shore, where he spoke to an advanced environmental studies class taught by *Bay Journal* columnist **Tom Horton**. The topic was agriculture and the Chesapeake Bay. He explained how restoration efforts have been vexed for decades because of the competing societal goals of reducing water pollution while having productive and profitable farms (and cheap food).

Agriculture also was the main topic when *Bay Journal* staff writer **Jeremy Cox** took the lectern at another event at SU. He discussed how farm country on the Shore became overloaded with nutrients, for a class titled "The Future of Food."

Editor **Lara Lutz** talked to about 40 members of the Tartan Sailing Club at the Eastport Yacht Club in Annapolis, covering everything from the Bay cleanup to PFAS and from railbiking to eel weirs.

Lutz and Cox joined forces over Zoom to virtually meet with students from the Park School of Baltimore as part of the school's spring Immersion Days. They took questions from the students about reporting on climate change.

Senior writer **Tim Wheeler** took his educational messages to the airwaves. He talked about the future of green energy with Charles Robinson, host of WYPR's Future City program, which aired March 31. He also joined Delmarva Public Radio's Don Rush to talk about the annual winter survey of the Bay's blue crabs and a proposal to expand national wildlife refuge lands in Southern Maryland.

Sometimes, we're on the receiving end of education. Staff writer **Whitney Pipkin** learned about several green topics at the Environment Virginia Symposium at the end of March at the verdant campus of the Virginia Military Institute in Lexington. There, she received a briefing on the many environmental bills among the more than 800 overall bills that were passed by Virginia's General Assembly.

And if we're expanding the definition of "education": Staff writer **Ad Crable** has informally adopted a couple of streamside buffers planted by volunteers near his Pennsylvania neighborhood in the past two years. He is "teaching" the plastic tubes to stand up straight, so the saplings might yet grow into a mature forest.

— J. Cox

NEWS briefs

LOCAL
REGIONAL
NATIONAL

MD launches partnership to develop emissions plan

Maryland has set some of the most ambitious reduction targets for greenhouse gas emissions in the nation. Now, the state is moving to develop a plan for meeting those goals.

Democratic Gov. Wes Moore announced in April the creation of a partnership between the Department of the Environment and the University of Maryland's Center for Global Sustainability to develop those strategies.

Under the Climate Solutions Now Act of 2022, state lawmakers set emission reduction targets of 60% by 2031. The law also calls for the state to reach net-zero emissions by 2045, meaning that newly generated emissions must be balanced with removals from the atmosphere through actions such as carbon sequestration.

The partnership will explore a host of potential measures to determine which would be the most effective, said Nathan Hultman, the center's director. The effort is expansive, examining what can be done across all economic sectors. The Moore administration has emphasized that the solutions must promote equity and social justice. Officials especially want to help vulnerable communities make a transition to clean energy.

MDE is seeking public comment on the plan and expects to complete the document by the end of 2023. *—J. Cox*

Winter was warmer and saltier in the Chesapeake Bay

Chesapeake Bay water was warmer and saltier than normal throughout most of this winter, which may bode well for blue crabs and bay anchovies, two key species in the estuary.

The National Oceanic and Atmospheric Administration Chesapeake Bay Office reported above average water temperatures throughout the Bay this winter except during a brief cold snap at the end of December and early January. That could be good news for wintering blue crabs as it typically reduces mortality during hibernation, according to a seasonal summary prepared by the NOAA Bay office.

But it cautioned that extreme short-term temperature plunges like those at the end of December and early January have sometimes been associated with spikes in mortality. The picture may be cleared up when the results of the annual blue crab winter dredge survey are released this spring.

The Bay also had lower than average salinity throughout the winter, especially in the lower reaches. The high salinity was associated with lower than normal freshwater flows into the Bay from its tributaries during the winter, according to the summary. High salinity in surface water during the winter is an important factor in providing good habitat for bay anchovy, which is one of the most important forage species in the Chesapeake, the summary report said. *—K. Blankenship*

NRCS awards conservation grants to three VA projects

Three projects to promote agricultural conservation in the Bay region proposed by Virginia applicants were selected for partial funding by the USDA Natural Resources Conservation Service in April as part of its Conservation Innovation Grants program.

The approved projects included a $1.99 million application from Virginia Tech to train producers and technical advisers in the advantages of converting to silvopasture, which is the practice of integrating trees, grasslands and grazing animals. Silvopasture uses managed grazing and enables landowners to grow trees and forage on the same acreage used by livestock.

Virginia Tech was also approved for a $999,277 grant to promote "Climate-Smart Technology for Sustainable Crops," including the use of cover crops and precision tillage.

The Virginia Forest and Grassland Council was funded with $299,993 to promote grazing to both established and underserved audiences. It will include a winter forage conference series, a grazing school for inexperienced producers, an advanced grazing school for agricultural professionals, a Virginia Grasslands bus tour, establishment of a statewide mentor network and other services to state graziers. The grant will also enable the council to hire a state grassland specialist and a summer intern who will specialize in issues related to forage and grazing.

Conservation Innovation Grant projects are designed to be two years in length. All three approved projects are scheduled to begin in 2023 and conclude in 2025. Nationwide, 31 grants were awarded this year. *—K. Blankenship*

Navy vows to study expansion of Potomac River 'danger zone'

Public seeks more assurance that impacts of defense testing are considered

By Timothy B. Wheeler

Facing pushback from boaters, watermen and environmentalists, the U.S. Navy has pledged to conduct an environmental assessment of its proposal to expand the "danger zone" in the Potomac River that is off limits while it tests weapons and sensors for detecting attacks.

The Naval Surface Warfare Center, Dahlgren Division, in King George County, VA, had requested approval from the U.S. Army Corps of Engineers to expand the area of the river where it can prohibit civilian vessel traffic. The Navy said it needed to clear a bigger stretch of the river "for ongoing infrared sensor testing for detection of airborne chemical or biological agent simulants, directed energy testing, and for operating manned or unmanned watercraft."

Recreational boaters complained that the proposed danger zone expansion would force vessels into such shallow water along the Maryland shore that they would risk running aground. Oyster farmers and watermen wanted more details about the testing and the need for increasing the danger zone. Some wondered about potential impacts to shellfish beds and fish.

The Potomac Riverkeeper Network and Natural Resources Defense Council threatened to sue the Navy, accusing it of violating federal laws by not obtaining a discharge permit for its testing and by failing to evaluate the impact of its activities on critical habitat for an endangered fish, the Atlantic sturgeon.

A Navy official replied that it wasn't required to get a discharge permit and that it had earlier concluded its activities wouldn't harm sturgeon.

Boaters, oyster farmers, the Maryland and Virginia watermen's associations and the Potomac River Fisheries Commission all asked the Corps to hold a public hearing on the Navy's request. The Baltimore District of the Corps did not grant the hearing but extended the public comment period until April 7.

Jennifer Erickson, spokeswoman for the Dahlgren facility, said the Navy would analyze the potential effects on the environment and the community of its planned activities in the danger zone.

A sign along the Potomac River at the Naval Surface Warfare Center, Dahlgren Division, warns of unexploded ordnance. (Dave Harp)

The Navy also will consult with the National Marine Fisheries Service as it studies the potential impacts of its proposed activities on critical habitat for sturgeon, she said. That assessment should be done by December, she added.

A spokesperson for the Dahlgren facility did not respond to requests for comment.

At a March 29 public meeting on the issue in Colonial Beach, VA, Jeff Stonehill, who represents the Dahlgren area on the King George County Board of Supervisors, noted that the warfare center is the area's largest employer.

"I really wouldn't do anything to affect them," he said, describing himself as a "huge supporter of the military."

But Stonehill noted that he's personally affected because he owns a marina and restaurant on a creek next to the installation that can't be accessed without going through the danger zone. He said he's also a commercial fisherman and that some of the best fishing and crabbing in the river is in waters subject to periodic closure.

"There's a lot that the Navy needs to explain, I think," he said. ■

Settlement proposed for Bay cleanup lawsuit

States, environmentalists sued EPA for lax oversight in PA

By Karl Blankenship

The U.S. Environmental Protection Agency would further increase oversight over farms, stormwater systems and wastewater treatment plants in Pennsylvania under terms of a proposed settlement to a 2020 lawsuit against the agency.

The suit, brought by environmentalists and several states, contended that the EPA has not done enough to force Pennsylvania, which is far behind in its Chesapeake Bay cleanup goals, to accelerate its efforts.

Chesapeake Bay Foundation President Hilary Falk said that, under the settlement, the EPA had agreed to actions that would address "severe problems in Pennsylvania, providing accountability and reasonable assurance that restoration will succeed."

The Bay Foundation and the attorneys general of Maryland, Virginia, Delaware, the District of Columbia and others had brought suits after Pennsylvania failed in 2019 to submit a plan showing how it would fully achieve its 2025 cleanup goals. The suits were later combined.

In the settlement announced April 20, the EPA agreed among other things to:

- Increase oversight of operations with water discharge permits to make sure they comply with their permits, especially facilities where permits are "administratively extended" without a more thorough examination before being renewed.
- Identify smaller livestock operations not currently subject to EPA oversight that could come under regulatory programs. The EPA typically has authority to regulate only the largest animal feedlots but can extend its reach if it determines operations pose a threat to water quality.
- Increase oversight of stormwater programs in the state, potentially bringing some additional sources under regulatory programs.
- Target its actions and funding to parts of Pennsylvania that have the greatest impact on Bay water quality.

The EPA has already started some of the outlined activities, but the settlement establishes timetables for completing certain actions and reporting progress.

The agreement, though, says that the completion of some actions is "subject to resource availability."

It's also not clear that some of the actions would result in change. The EPA in the past has reviewed the possibility of regulating smaller Pennsylvania feedlots but deemed it unfeasible because there are so many of them and extending regulatory oversight over an individual operation is difficult and time-consuming.

Pennsylvania does not border the Bay but contributes more water-fouling nutrients to the Chesapeake than any other state. It has had a particularly difficult job reducing nutrient pollution in waterways because the vast majority of its nutrients come from farms and stormwater, sources that all of the Bay states have struggled to control. And Pennsylvania has more farms and stormwater systems than other states in the watershed.

Maryland and Virginia have made more progress, mainly because a larger source of their nutrients came from wastewater treatment plants where discharges are more easily controlled. Although Maryland, Virginia and Delaware are parties to the suit, none are on track to meet goals in their agricultural and stormwater sectors.

Critics, though, have long complained that Pennsylvania's programs and funding levels are far below that of most other states. Pennsylvania did recently ramp up funding for Bay-related activity, but that was done using federal money that will expire after next year.

The region as a whole is far behind in meeting its 2025 nutrient reduction goals, and officials have acknowledged that the self-imposed deadline will be missed.

The goals, set in 2010, are intended to reduce the amount of nitrogen and phosphorus that reach the Bay in order to clear its often-murky water and eliminate oxygen-starved "dead zones."

The proposed agreement is open to public comment for 30 days before it can be finalized. ■

Study detects airborne ammonia near Eastern Shore homes

Levels drop off at sites farther from chicken houses

By Jeremy Cox

A two-year study suggests that chicken houses on Maryland's Eastern Shore may be exposing residents who live near them to concerning levels of ammonia in the air.

The two environmental groups that conducted the study say that although more research should be conducted, there is enough evidence for environmental regulators to take actions, such as requiring certain poultry farms to begin monitoring air quality.

The research, sponsored by the Environmental Integrity Project and Assateague Coastal Trust, monitored the air at four residential properties, all lying within a few hundred feet of the nearest poultry operations. The sites were in Somerset and Worcester counties, two of the biggest producers of meat chickens in the state.

The results were in line with what previous research suggested would be the case, said Courtney Bernhardt, EIP's research director. The ammonia levels were higher at sites closest to chicken houses. Concentrations dropped proportionally to distance.

"They dissipate and react with other compounds in the air," Bernhardt said.

The highest levels were recorded by a sensor situated within a football field's distance from a chicken operation, the closest of the monitoring sites. There, the average of the readings, taken at two-week intervals, was 60 parts per billion. The highest reading recorded was 487 parts per billion.

The Maryland Department of the Environment has established a one-hour risk threshold of 350 parts per billion for ammonia — meaning an hour's worth of exposure to greater than 350 ppb is potentially harmful.

The two environmental groups have been leading voices in a years-long campaign to raise scrutiny on chicken house air emissions. They contend that the gaseous ammonia emitted by the chickens' droppings and blown outdoors by giant fans could pose far-reaching health and environmental hazards.

The organizations published their results online in March in a 15-page white paper. They contrasted their findings with a separate air monitoring effort on Maryland's Eastern Shore that turned up generally lower ammonia concentrations.

That research, led by MDE, found typical ammonia levels in the general vicinity of poultry farms similar to levels in downtown Baltimore, far from any chicken houses.

The Delmarva Chicken Association, the region's poultry trade group, funded some of the equipment used in that study, but none of its money went to the researchers at the University of Maryland Eastern Shore who conducted the sampling.

Representatives with the EIP and Assateague Coastal Trust criticized the MDE study when it was released. They said that the sensors were placed too far from chicken houses and often with obstructions, such as trees, standing in the way. Those associated with the MDE study countered that it was designed only to measure "ambient" air.

The sensor technology used in the latest study only allowed readings to be taken every two weeks. If they could have taken hourly samples, researchers said, they likely would have detected levels as high as 1,000–3,000 parts per billion, depending on the site. They based those assumptions on the MDE sampling results.

Deborah Sauder, the UMES scientist who led the state sampling effort, said both studies show that air concentrations of ammonia drop off quickly the greater the distance from chicken houses. That, she said, should be heartening to anyone worried about potential health impacts.

The higher levels recorded by the two environmental groups were captured along the property lines between the residential tracts and their agricultural neighbors, she pointed out.

"That's fine if you spend all your time at the fence line, but my guess is you don't spend your time there," Sauder said. Farther downwind at the home site, she added, "the ammonia concentration is going to be that much lower." ■

Ravaged by fungus, native bat species declared endangered

Estimated 90% of northern long-eared bats lost in two decades

By Jeremy Cox

The Biden administration has upgraded the northern long-eared bat's protection status from threatened to endangered as a fungal disease continues to devastate its population.

"This listing is an alarm bell and a call to action," said U.S. Fish and Wildlife Service Director Martha Williams last November when the administration announced it was going forward with the new classification. After officials delayed the action in January this year, it went into effect March 31.

The bat is about 3 inches long with a wingspan of up to 10 inches. It can be found in 37 U.S. states, mainly in the East and northern Midwest. That range includes virtually all of the 64,000-square-mile Chesapeake Bay watershed.

Since its discovery in New York in 2006, white-nose syndrome has spread through 80% of the species' range, according to the Fish and Wildlife Service. In some cases, it has wiped out entire local populations.

The disease causes what looks like white fuzz to blanket the bat's muzzle and wings. The fungus thrives in the cold, damp caves where bats hibernate in winter. It causes the bats to wake up early and expend energy they need to survive until spring. Dehydration and starvation often follow.

The reclassification is expected to lead to greater scrutiny of wind turbine installations, timber harvests, highway projects and other habitat-altering actions. Projects with the potential to cause unintentional bat deaths must now receive a "take" permit from the Fish and Wildlife Service, triggering a higher level of review compared with the process for threatened species.

The new status also will likely lead to more requirements to offset the impacts of forest-clearing. States, for example, may restrict how much forest canopy may be eliminated or which tree species must be spared. The shagbark hickory, one of the bat's favorite abodes, could be poised to escape the saw blades.

A researcher grasps a northern long-eared bat with white fuzz speckling its muzzle, a clear sign of white nose syndrome. (Steve Taylor/University of Illinois)

The long-eared bat's collapse has been swift. The species was listed as threatened in 2015, less than a decade after the fungal outbreak was first reported. Environmentalists and wildlife scientists fear that the species is on the brink of extinction.

A dozen bat species have been affected by white-nose syndrome. In 2021, a study led by the federal government estimated that the disease had killed 90% of northern long-eared, little brown and tri-colored bat populations in less than 10 years. The tri-colored species has been proposed to be added to the endangered list while little brown bats are under review to receive some level of federal protection.

The disease has no known cure.

After emerging from their caves or abandoned mines, long-eared bats spend the warmer months alone or in small colonies roosting in forests. They feed on insects, providing an estimated $3 billion worth of pest control and pollination services to U.S. agriculture, according to the Fish and Wildlife Service.

The agency has assembled a "national response team" of 150 government agencies, nonprofit organizations and others to study the problem and develop management strategies. Since 2008, the service has awarded more than $46 million to entities performing white-nose syndrome research, which includes the development of a vaccine.

Although disease is the greatest concern for the species, other threats loom, such as collisions with wind turbine blades, loss of forest habitat and climate change, experts say. ■

Dominion seeks permit for new coal ash landfill in VA

New law creates more drinking water protections for nearby residents

By Whitney Pipkin

Dominion Energy is moving forward with plans to build a new coal ash landfill near the Potomac River in Northern Virginia, entering the last chapter of a long debate over how to safely dispose of the lingering contaminant.

The Virginia utility company applied for a solid waste permit from the state Department of Environmental Quality in November for its $347 million plan to construct a 70-acre lined landfill next to the last remaining pit of coal ash left at its Possum Point Power Station in Dumfries. The power station sits on a peninsula bounded by Quantico Creek and the Potomac River, a tributary of the Chesapeake Bay.

Meanwhile, Dominion is also working with DEQ to develop a "corrective action plan" for remediating groundwater and surface water contamination detected at the site where coal ash had been stored for years in waterlogged clay-lined pits.

Concerns about groundwater contamination are among the reasons some have been advocating for Dominion to excavate and remove the remaining coal ash rather than create a new onsite landfill, not far from private residences. Opponents of Dominion's proposal have argued that the ash should be transported by truck, rail or barge to an existing industrial landfill. But Dominion officials contend that those options would cost two or more times as much as an onsite landfill and some are logistically infeasible.

A 2019 bill required Dominion to test drinking water wells near the coal ash storage pits and provide an alternate source of drinking water to residents if coal ash-related elements in their water exceeded limits. Four years later, nine households are still using bottled water supplied by Dominion, a company spokesperson confirmed.

"We're 30 miles from [Washington, DC] and people are living on bottled water because of contaminated drinking wells from coal ash," said Potomac Riverkeeper Dean Naujoks, who has advocated for moving the coal ash to an offsite landfill.

A new state law requires any successful applicant for a coal ash landfill to fund the connections of households within one mile of the landfill to municipal water service. State Sen. Jeremy McPike (D-Prince William County), whose district will soon include

Two former coal ash storage pits are marked by brown and gray patches at Dominion's Possum Point Power Station along the Potomac River in Virginia. The ash has been moved to a storage pond, visible in the center, while the company seeks approval for a new onsite landfill. (Dominion Energy)

Possum Point as the result of redistricting, said he sponsored the legislation to help the residents who live near the proposed landfill and still suffer from contaminated wells.

He pointed to growing evidence that coal ash elements have already leached into the surrounding groundwater and made their way into wells, triggering the need for corrective action. Drilling the wells deeper, as Dominion had offered to do for some households, would not necessarily be a long-term solution, he said.

"How can you ensure cap-in-place really works when existing monitoring wells have popped up with several hot spots?" McPike asked. Cap-in-place is the term for Dominion's original plan to drain, cover and store the ash in the large clay-lined pit where it is currently stored.

Dominion's monitoring wells have detected metals from coal ash, such as arsenic, boron and cobalt, at levels that exceed groundwater quality standards set by the state. A Dominion spokesperson said the company has submitted its plans for potential remediation actions to DEQ and is conducting additional studies. The primary step the company has proposed is to move the ash from the 72-acre pit where it is stored to a new, double-lined landfill nearby.

"The expected timeline for determining any other required actions is difficult to predict," Dominion spokesperson Peggy Fox wrote in an email, "but we are hopeful to have a plan developed in the next 12 months."

Spencer Adkins, director of the coal combustion residuals project for Dominion Energy, said the company has been working with a local taskforce to firm up potential plans for the site once it has been remediated. Among them is a concept to turn portions of the land owned by Dominion into public parks and trails, though it could be tricky to begin the work during construction.

"We're committed to doing something here," Adkins said.

Prince William County Supervisor Andrea Bailey created the taskforce in early 2022 after hearing about Dominion's plans to create a new onsite landfill. She said at the time that she was "very disappointed" in the plan. Her chief of staff said in April that Bailey continues to champion "the removal of the contamination at Possum Point."

During a town hall meeting Bailey hosted in late March, she invited Dominion's Adkins to present an update on the company's plans. Potomac Riverkeeper Naujoks had been invited but did not attend after learning that the focus of the meeting, he said, shifted away from Possum Point to a broad variety of economic topics. Naujoks, a member of Bailey's task force, said he has been disappointed with its progress.

Prince William County staff, meanwhile, gave local approval to the proposed coal ash landfill by certifying to DEQ that it was zoned correctly, based on its lawyer's interpretation of the relevant law.

Possum Point is one of four Dominion-owned power stations with longstanding coal ash piles and pits, located next to waterways, that the company has been charged with cleaning up — first by federal law and then by a stricter state law. The Possum Point plant burned coal for power until 2003, when it converted to oil and natural gas. Legislation passed in 2019 required the utility to recycle about 25% of the coal ash left at these sites and safely dispose of the rest by 2032.

Each of the power stations is in a different stage of the cleanup process. Dominion plans to build a new landfill at two of them and entirely remove the ash from the other two, some for recycling and some for disposal, Adkins said.

For reference, Adkins said, the company plans to landfill and recycle portions of an estimated 15 million pounds of ash from its Chesterfield Power Station located along the James River south of Richmond. At Possum Point, that number looks more like 4 million pounds of coal ash — still enough to fill the U.S. Capitol Rotunda 83 times. ■

Shark bite left its mark in Chesapeake history, researchers say

Attack in St. Mary's River may be earliest recorded shark-attack fatality in North America

By Jeremy Cox

Bull sharks are typically 7–11.5 feet long and weigh between 200 and 500 pounds. (Albert Kok, CC BY-SA 3.0, via Wikimedia Commons)

In August of 1640, an English-born laborer stepped off from the sandy shoreline of one of Maryland's tidal rivers — and into the maw of history. He had only just begun wading in when a "huge fish" sunk its jaws into his thigh and tore away a giant chunk of flesh.

The man died, but a written record of his gory demise survived. The only physical copies, though, were inscribed in Latin and shipped back to Europe, soon to be forgotten.

Flash forward nearly 400 years. A pair of unlikely collaborators — a former federal marine scientist and a physician who moonlights as a history book author — has rescued the account from obscurity to make a bold claim: This was the first documented fatal shark attack in North America.

The 1640 incident predates by two years an attack off what is now New York City, currently listed by the Shark Research Institute as the earliest recorded unprovoked shark attack on the continent. And there's strong reason to believe that it was a fiction sprung from the mind of Washington Irving, who wrote about it in an 1809 work.

Kent Mountford, the retired scientist, and Richard Fernicola, the physician, assert that the report of the deadly encounter in the Chesapeake appears credible. And they're reasonably sure what type of shark did him in: a bull shark.

"We're almost guaranteeing that this is the shark that killed this man," Mountford said.

As a senior estuarine researcher with the U.S. Environmental Protection Agency, Mountford was an early architect of the science behind the Chesapeake Bay Program, the multi-state and federal effort to restore the Bay. He retired in 2000. By then, he had already begun penning a column for the *Bay Journal*. Dubbed *Past as Prologue*, it often explored the region's environmental history.

One of those columns lead to the shark project.

In 2010, he dove into the history behind Maryland's then-recent purchase of more than 4,000 acres of land from the Society of Jesus, Maryland Province. Mountford devoted most of his related column to detailing the state's Catholic origins. The shark story only made a cameo in the 26th paragraph.

Years passed before Fernicola stumbled across the column online. "I was completely struck by it in passing because it converged with multiple interests of my own," Fernicola said.

The New Jersey-based physician had made a name for himself in the shark research community with the publication of a book, *Twelve Days of Terror*. It is one of the most complete accounts of the spate of deadly incidents off the Jersey Shore in 1916 that set into motion the nation's fascination with — and fear of — sharks.

"He just went bonkers when he saw this in the *Bay Journal*," Mountford recalled.

Today, shark attacks are typically reported by local authorities and recorded by news outlets. Historical accounts can be difficult to etch conclusively in the record because they are often based on hearsay and murky details. That is not the case here, both men said.

The witness, though second-hand, was a man of authority. Father Thomas Copley. He was a Jesuit priest garrisoned in the St. Mary's settlement on the shores of what is now called the St. Mary's River. His shark account appears in the 1640 version of his annual report to Rome. The story centers on a potential convert who, instead of using his rosary beads for prayer, would grind them into a powder and smoke them.

In Copley's telling, this sacrilegious act had divine consequences. One afternoon that summer — Mountford and Fernicola believe it was August — the overheated laborer decided to swim in the St. Mary's, a Potomac River tributary just a few miles upstream from the Chesapeake Bay.

Per the letter: "*Scarcely had he touched the water when a huge fish having suddenly seized the wicked man, before he could retreat to the bank, tore away at a bite, a large portion of his thigh, by the pain of which most merited laceration, the unhappy wretch was in a short time hurried away from the living.*"

Copley's description matches up neatly with a typical bull shark attack, according to Mountford and Fernicola. (Historical accounts often deploy terms such as "huge fish" when referring to sharks, they said.) The blunt-nosed, round-bodied species is known to venture into freshwater. And they often employ a "bump and bite" method with their prey, which appears to have been the case here, they said.

Charles Bangley, a marine biologist and shark expert at Canada's Dalhousie University, consulted with the two researchers over the years. He agrees that a bull shark was most likely to blame.

"In our work, we found that the lower Potomac River in the general St. Mary's area was a bit of a hot spot for sightings, and pound net fishermen continue to catch large ones on occasion," said Bangley, a former fellow at the Smithsonian Environmental Research Center in Edgewater, MD. "There are other large and potentially dangerous species that sometimes enter the lower Chesapeake, but to my knowledge there's never been a record of any of them as far up as the Potomac River."

The 1640 fatality may be the earliest of its kind recorded in this neck of the woods, but it is far from the first shark-related death documented in world history. That title is held by an incident that happened 3,000 years ago in waters off Japan; researchers surmised the cause of death from the hundreds of serrated marks on the skeletal remains.

Mountford and Fernicola weren't content to confine their research to a single event. They combed through historical writings, media accounts and scientific works to compile what is likely the most comprehensive accounting of shark interactions in the Chesapeake Bay region, counting 181 events between 1840 and 2021. As many as seven were fatal. ■

Read the researchers' paper through a link in the web version of this article at bayjournal.com.

Development along Rapidan River could have big impacts

Mixed-use project could transform more than 2,000 rural acres

By Whitney Pipkin

A 2,600-acre property with suspected gold mine contamination along the Rapidan River in Orange County, VA, could become the largest mixed-use development project in the rural county's history.

Such a rezoning would allow the heavily forested property — part of the Germanna-Wilderness Area — to become a mix of residential, commercial and light industrial development interspersed with parks and open spaces. Known as Wilderness Crossing, the development would happen in phases over the next 40 years.

A county planning commission has deliberated over the proposal for nearly 100 days before voting 3–2 in mid-April to recommend the project to the county's Board of Supervisors, who will make the ultimate decision. The developer, KEG III Associates LLC, made several changes to the original proposal at the planning commissioners' request.

One key change is that the developer has agreed to participate in the state's voluntary remediation program to address any gold mining contamination that's discovered during construction. But some groups who raised initial concerns about developing land that's likely contaminated with mercury from decades of pre-regulations mining say that "voluntary" doesn't go far enough.

"It will … be extremely important that all remediation actions be seen through to completion," representatives from the Southern Environmental Law Center and Piedmont Environmental Council wrote in a February letter to the Orange County Planning Commission. "The current proffer language reflects only a statement of the applicant's intent to begin [the programs] … not a commitment to remain in those programs through final remediation."

A December 2022 report found that Virginia's existing regulatory framework is ill-equipped to handle modern gold mining, which can impact the environment unless precautions are in place. The state's regulations also do not provide many options for property owners whose land may have been contaminated by a long legacy of unregulated mining in one of the nation's first gold-producing states.

A nearly 10-mile stretch of Virginia's Rapidan River is impaired by mercury, discovered in fish tissue. It runs along land that might be rezoned for a 2,600-acrea mixed-use development, including data centers. (Hugh Kenny/Piedmont Environmental Council)

Meanwhile, the complexity of the Orange County project — and potential concerns — have grown since the project was first proposed two years ago.

Most recently, revisions increased the amount of land within the project's footprint that could be rezoned for light industrial uses, from 150 acres to 732 acres. That zoning category could include data centers and distribution warehouses, a change strongly opposed by many of the 30 residents who spoke at a hearing in March.

The developer agreed to cap the amount of space potentially set aside for data centers to just less than 5 million square feet. But the planning commission does not know exactly what the developer intends to use that land for because some of its plans are protected by a nondisclosure agreement with a few members of the Board of Supervisors. At a work session in February, the developer confirmed that the revision is due to changes in the data center market, which has been growing rapidly across Northern Virginia in recent months.

"We've been tracking this for two years now as it has gone through the process and has changed … from something primarily residential and commercial to something that is, in our eyes, primarily about data centers and warehouses," said Max Hokit, state and local relations associate with American Battlefield Trust, at a March hearing. His nonprofit works to protect places like the Wilderness National Battlefield Park, which shares a border with the proposed project.

Chief among the concerns expressed about potential data centers is whether they will impact the sights and sounds of the historic, rural area. The proposed project would allow for light industrial buildings up to 80 feet in height, which Hokit said would impact the viewshed of the national park. Data centers and their generators are inherently noisy unless special accommodations are made, and additional truck traffic would likely accompany distribution warehouses of any kind. Orange County does not have a noise ordinance limiting such impacts.

Dan Holmes of the Piedmont Environmental Council talks to a local reporter in June 2021 about a proposal that would transform a large rural property along the Rapidan River. (Hugh Kenny/Piedmont Environmental Council)

One planning commissioner explicitly asked the developer to consider adding a proffer to the proposal that would not allow data centers or "Amazon-type" distribution warehouses on the property.

"It's clear from what the public said, we don't want data centers and truck traffic," Commissioner Bryan Nicol said.

Some of the commissioners also voiced concerns about the impact that adding potentially thousands of new residential units would have on drinking water supplies.

The Rapidan River supplies much of the drinking water to Orange County, which as of the 2020 census included just 36,254 residents. A severe drought in 2002 forced the county to enact water restrictions — and to begin discussing the need to create drinking water reservoirs, especially as the county grows.

In response to those concerns, the developer has set aside two areas of land to potentially create one or two reservoirs. But Nicol said such a reservoir would need to be in the works as soon as a development like this is approved to accommodate the additional residents in the event of a drought.

Commissioners also said a broader economic analysis is needed to determine whether a development of this scale and complexity would be a net benefit to the county's budget or a drain. Planning Commission Chair Donald Brooks said the commission asked the supervisors to hire an outside firm to do such an analysis and was told no. He said that he plans to ask again. ■

Plastics recycling plant proposed for Susquehanna shoreline

Some call the technology an innovative solution, others call it 'greenwashing'

By Ad Crable

A proposed $1.1 billion plastics recycling plant, shown here in an artist's rendering, would be located along the Susquehanna River in central Pennsylvania. (Encina)

Is a $1.1 billion plastics recycling plant proposed for Pennsylvania an innovative way to reuse plastics and keep them out of landfills, incinerators and waterways? Or will it help cement society's reliance on plastics and create pollution concerns for the Susquehanna River?

The answer depends on who you ask.

Pennsylvania outcompeted other states to land what Houston-based Encina says will be the flagship for a global network of "advanced recycling" facilities. Over the course of a year, up to 450,000 tons of hard-to-recycle plastics — enough to fill an NFL stadium — would arrive via 80 truckloads a day from materials recovery facilities around the region. The items would include plastic bags, packaging, straws, ice cream and yogurt containers, potato chip bags and more.

Then a process called pyrolysis — high heat without oxygen — combined with an unspecified proprietary catalyst, would liquify, separate and purify the plastic's molecules, the company says. It breaks them down into basic chemicals: benzene, toluene and mixed xylenes.

The compounds would be sold and shipped by train to customers who make new plastics that can be used in thousands of products. Potentially over and over. Unlike other advanced recycling plants in the U.S., Encina claims, none of the material would be sold as diesel fuel, synthetic oil or other forms of fossil fuel.

"Increasingly, customers are demanding sustainable practices across the product supply chain and life cycle," said Encina CEO David Roesser. "What we manufacture helps reduce waste, offsets the need to extract virgin resources and helps manufacturers achieve carbon reduction goals."

The company has operated a small-scale demonstration plant since 2016 in San Antonio, TX.

To build the Pennsylvania facility, the company has signed a long-term lease on 101 acres in a floodplain on an aggregate mining site along the Susquehanna River in Northumberland County, about 60 miles north of Harrisburg.

If it obtains all the necessary permits, Encina hopes to start operations in 2024. So far, one company, American Styrenics, has agreed to buy up to 250,000 tons of recycled resins a year.

In March, township officials denied the company's request for a variance to build its 80-foot-high processing building in a 50-foot maximum height zone. While surprised by the denial, Encina officials expressed confidence it would only be a temporary setback.

Former Democratic Gov. Tom Wolf celebrated the project when it was announced in 2022.

"Not only will they be creating new, good-paying jobs, but they're committed to doing it with an innovative approach that will lessen their impact on the climate and sustain a brighter future for all of us," he said at the time.

But not everyone sees it that way.

The Encina plant does nothing to address single-use plastics that are the heart of the plastics crisis, said Tamela Russell, founder of the Pennsylvania-based group Move Past Plastic. The $1.1 billion, she added, would be better spent creating biodegradable packaging and establishing a reuse model in which plastic products are designed to be collected by manufacturers, refurbished, cleansed and used again.

"It's just going to perpetuate using more plastics," she said. "And it's still just taking those environmental contaminants and just recycling them. It's the same false recycling narrative. It's not going to stop more production, which we must do."

Alexis Goldsmith, of Vermont-based Beyond Plastics, said the pyrolysis process will produce greenhouse gases and emit toxic volatile organic compounds, which she claimed would end up either in the air or water.

Goldsmith also called the Encina project "greenwashing."

"The petrochemical industry sees the writing on the wall," she said. "In order to divert political will from passing laws to reduce plastic use, they say chemical recycling is the solution. The real solution that we need is to reduce plastics production."

Danny Berard, the mayor of Northumberland, just downriver of the proposed plant, has said there are too many unanswered questions about how microplastics would be kept from entering the river, the extent and management of truck traffic and the financial stability of "a start-up company."

The Middle Susquehanna Riverkeeper Association has not taken a position on the project, but Riverkeeper John Zaktansky expressed concern. "There's just so many red flags in this situation," he said. "For one thing, we're concerned with the massive number of plastics sitting on a site within a floodplain."

He also is dubious about guarantees that PFAS, commonly known as "forever chemicals," would not escape into the river from bales of plastics as they are washed and processed.

Zaktansky said his research of other advanced recycling initiatives launched around the country has shown that many run into problems.

At a public call-in session with Encina officials in March, residents raised concerns about air pollution, building in the floodplain, microplastic pollution, wastewater pollution and the plant's water consumption — estimated at up to 2.5 million gallons daily.

Encina representatives said modifications would be made to protect buildings from flooding. Water withdrawn from the river would be treated and likely returned with better quality. A membrane bioreactor system would filter plastics from discharged water, and the water would be monitored before releases. None of the materials will contain PFAS, they said.

Air emissions would adhere to restrictions set by the Pennsylvania Department of Environmental Protection. "Anything we are producing will be captured," Roesser said.

Encina officials disagree that the plant enables more plastic production without addressing the heart of the excess plastics problem.

"We need a more refined approach where we reduce as much as we can, replace as much as we can and reuse as much as we can," said Sheida Sahandy, the company's chief sustainability officer. "But at the end of the day, at least in the short to middle term, there are some critical uses of plastics that none of these alternatives address." ■

Can Bay's blue catfish shift from disaster to dinner plates?

As MD seeks federal aid, questions remain about ability to stem invasion

By Timothy B. Wheeler

Mike Malczewski used to make his living fishing year-round for channel catfish on Maryland's Eastern Shore. But then one wintry day about a decade ago, he went out to retrieve his baited pots from the Choptank River and found them full of a different kind of catfish.

Since then, the waterman from Cordova, MD, said he's had to diversify. He now spends about five months a year also targeting blue catfish, an interloper from the Mississippi River that in recent years has turned the Chesapeake Bay into its domain.

"I've made my whole career selling just channel catfish," Malczewski said recently. "But it's getting harder and harder because blue catfish are just taking over everything."

Introduced for sportfishing into a few Virginia rivers in the 1970s, blue catfish were originally thought to be safely limited to freshwater. But in time, the newcomers showed they could not only tolerate but thrive in slightly salty water, enabling them to expand their population to more and more rivers throughout the Bay region.

Complaints like Malczewski's helped spur Maryland Gov. Wes Moore in March to ask U.S. Commerce Secretary Gina Raimondo to declare a fishery disaster in the state, authorizing it to receive federal funds to help burdened watermen and seafood businesses.

Moore said the state needs help responding to an "explosion" in the numbers of invasive nonnative fish in the Bay and its tributaries, including flathead catfish and northern snakeheads. But the chief culprit he cited was blue catfish, which many believe are responsible for declining abundance and catches in recent years of blue crabs, striped bass and other commercially valuable fish.

Blue catfish are voracious eaters, downing everything from underwater grasses to juvenile crabs and smaller finfish.

"We're [also] seeing this issue with American eels, with yellow perch, with white perch," said Josh Kurtz, Maryland's natural resources secretary. "The sheer number of important species that these fish are preying upon is a big concern of ours."

The invaders have grown so numerous and large — the record catch in Maryland weighed more than 100 pounds — that they are the dominant fish species in some rivers. Watermen and scientists alike fear they are not only consuming significant numbers of native fish but depriving them of food and habitat.

Rocky Rice, left, and his mate Brent Murphy empty a fyke net full of blue catfish caught in the Potomac River. (Dave Harp)

Federal help

Urged on by watermen and seafood businesses, Maryland officials say they want federal funds to help shift the state's fishing industry from chasing after declining numbers of native fish to catching more of the nonnative invasive species.

It's unclear, though, whether the governor's plea for federal help will succeed or, if it does, whether it will be enough to halt or reverse the surge of blue catfish.

In his March 15 letter to the commerce secretary, Moore invoked two federal laws authorizing disaster assistance to fishing communities suffering significant economic losses because of drastic declines in commercial harvests. The state's congressional delegation followed up with its own letter a few weeks later urging the administration to "prioritize" Maryland's request.

It's a well-worn appeal. In the past 30 years, there have been 127 other requests nationwide for federal fishery disaster declarations. Southeastern and Gulf coast states have asked for help dealing with disruptions from tropical storms and red tides. On the West Coast, states have blamed some recent harvest declines on climate change and ocean warming. Frequently, though, states asking for help say they don't know why their fish suddenly became scarce.

States receiving a disaster declaration have received anywhere from less than $100,000 to more than $200 million in federal assistance. Congress appropriated $300 million last year for that purpose, but there are about a dozen other bids for aid pending that were submitted years before Maryland's.

Maryland's request is the first to cite invasive species as the cause of a fishery failure, according to Jenni Wallace, deputy director of the sustainable fisheries office in the National Oceanic and Atmospheric Administration.

There's nothing in the law that would bar disaster aid in that case, Wallace said. But the governor's letter did not provide sufficient information for NOAA to decide whether it is warranted, she said. The state must more clearly spell out the fisheries impacted, she explained, and must document revenue losses of at least 35% for affected individuals and businesses.

If the state's request is granted, it would be only the second federal fishery disaster declared in the Chesapeake. In 2008, Maryland and Virginia received $10 million each in economic assistance from NOAA after crab harvests plummeted for unknown reasons in both states. The states used some of that money to pay watermen to collect hundreds of so-called "ghost" crab pots from the Bay, lost or abandoned gear that could continue to catch and kill crabs.

Virginia, though likewise swarmed by blue catfish, has not joined Maryland in asking for federal assistance. Michele Guilford, a spokesperson for the Virginia Marine Resources Commission, said officials are "reviewing the claims made by Maryland" and its rationale for declaring a fishery disaster. Meanwhile, she said VMRC has "already been taking action and [is] looking into all options" for controlling invasive species in Virginia waters.

It was the 2008 blue crab disaster declaration that inspired Bill Paulshock, a seafood business owner in the Baltimore suburbs, to team up with watermen and press the

Donathan Jennings hauls in a blue catfish at Kingston Landing on Maryland's Choptank River. He's hooked blue catfish as big as 12 pounds and sells them commercially. (Dave Harp)

Department of Natural Resources in January for similar federal help with blue catfish.

"The environment and the entire Maryland seafood industry is at risk," he said. "If we do not attack it immediately, in another four or five years it's going to be impossible to change the tide because they're eating everything up at an alarming rate."

In search of evidence

Scientists agree that blue catfish are likely preying on native species in the Bay, but the evidence of significant impacts is largely circumstantial. Maryland's commercial harvests of blue crabs, striped bass and several other economically important fish species in 2022 ranged from 27% to 91% below what they were in 2012, according to DNR. At the same time, annual DNR surveys have tracked a growing abundance of blue catfish in waters frequented by young fish.

Studies in Virginia and Maryland have found that blue catfish are omnivores, eating underwater vegetation and invertebrates when small, then adding fish to their diets as they grow.

Noah Bressman, a biologist at Salisbury University in Maryland, is analyzing the stomach contents of blue catfish caught in the Nanticoke River. In spring, when river herring migrate up the Bay's rivers to spawn, more of them show up in blue catfish guts. In the summer, their consumption includes more juvenile crabs.

"We've also [found] crazy things," Bressman said. "A wood duck, turtles, rocks, sticks, mud, muskrats. In a 30-inch catfish, we found the head of a striped bass we estimated [had been] 18–19 inches long."

There's only been one study so far, though, that took a stab at quantifying the impact of blue catfish on other Bay species. In 2021, researchers at the Virginia Institute of Marine Science estimated that blue catfish in one stretch of the lower James River were consuming 2.3 million juvenile crabs annually — and likely even more.

More research is urgently needed, said Tom O'Connell, director of the Eastern Ecological Science Center of the U.S. Geological Survey.

"One of the challenges with the current fishery declaration is that I think there's a lot of people who believe blue catfish are having a negative impact on fisheries like blue crabs and maybe striped bass. But … nobody has been willing to make the investment to make the scientific connection."

O'Connell's agency is partnering with DNR to study blue catfish diets in the Patuxent and Nanticoke rivers, including partially funding Bressman's work.

Kurtz, the DNR secretary, acknowledged the information gaps but said the state hopes to use some of the federal disaster aid to fund more research.

Making a market

Meanwhile, say state officials and watermen alike, it's clear the blue catfish population needs to be curbed. The best way to do that, they agree, is for more people to join Mike Malczewski and catch more of them.

Commercial harvests of blue catfish in Maryland have already grown threefold over the past decade, from 188,000 pounds in 2012 to 726,000 pounds in 2022, according to DNR. To begin making a dent in the blue catfish population, many think those landings need to at least double or triple.

It ought to be easy, advocates say. There are no limits on how many blue catfish can be caught, and they're tasty and nutritious, a worthy substitute for other fish in many recipes. But there are other curbs on how much or how fast the harvest can grow.

One is regulatory. A U.S. Department of Agriculture inspector must be present whenever fish wholesalers process blue catfish into filets. The regulation — imposed in 2017 to protect the farmed catfish industry in the South from Asian imports — adds to the cost and logistical challenges of processing blue catfish. Rep. Andy Harris (R-MD) has tried without success to get Congress to ease the rule.

The other hurdle is harder to overcome. Consumer demand for blue catfish is just not that great. Bill Paulshock said that's why he doesn't carry it in his market in the Baltimore suburbs.

Workers at Tilghman Island Seafood fillet blue catfish caught from the Potomac River for shipment to a food bank in Salisbury. (Dave Harp)

Stephanie Pazzaglia sees demand picking up, but acknowledges it's been a slog. She is the business development manager for J.J. McDonnell Co., a seafood wholesaler in Elkridge that's one of just four businesses processing blue catfish in Maryland.

In a region where striped bass is the favorite local finfish, she said it was "pretty tough" at first to get restaurants in Baltimore, Annapolis and the Washington, DC, area to put blue catfish on their menus.

But she's since changed some restaurateurs' minds, she said, by promoting it as an affordable alternative to pricier fish. And to expand the market, she said her company ships some blue catfish to California, the South and even overseas.

"Processors like us have to find homes for it in other places," she said. "I don't think we're going to solve it here in Maryland."

The Maryland Department of Agriculture's seafood marketing office spends $30,000 a year promoting sales of blue catfish, but more is needed, advocates say.

The newest entry into the blue catfish business may be Tighman Island Seafood on Maryland's Eastern Shore. Originally focused on oysters and crabs, the business got licensed several months ago to process blue catfish, which to meet USDA requirements meant renovating the inside of the old shucking house that formerly housed the Phillips Wharf Environmental Center.

"It's like an operating room in there," said owner Nick Hargrove.

As a startup, he's grappling with the dual challenges of finding enough customers for blue catfish filets to keep his staff busy and give watermen incentive to catch the fish that he needs. His first batch in early April was destined for a food bank in Salisbury.

"Because [blue] catfish is a very healthy fish to eat, we're hoping we can help people with food insecurities [while] also helping the environment," he said.

It's not realistic to think blue catfish can be eradicated from the Bay, experts agree. But if their population can at least be reduced, they think it may be possible to curb their impact on other species.

Malczewski sees a big drawback, though, to relying on the market to boost blue catfish harvests. Wholesalers only want fish that weigh between two and 20 pounds, he said, which means watermen like him will throw back the smaller ones, leaving the next generation of invasive fish to grow and multiply.

"Until they figure out what you do with the little ones, nothing's going to change," he said. Meanwhile, with a soft market, the prices wholesalers will pay for blue catfish are so low it doesn't encourage many watermen to go after them.

Paulshock, the Baltimore area seafood business owner, said he sees ways around those hurdles: Avoid the need for USDA inspectors by selling the fish whole to pet food companies, some of which already take fish scraps. Then, he said, use the federal funds to guarantee watermen a decent fixed price for their catch so more will get into the fishery. He sees it as a win-win for all concerned.

"We need this thing to happen now," he said. "The Chesapeake Bay cannot wait." ■

Hydro project on Susquehanna River draws controversy

Proposal to support renewable energy would flood 580 acres

By Ad Crable

Jake and Jen Horton, and their teen daughter, Keena, sat in the kitchen of their 19th-century homestead as newborn lambs frolicked outside and windows framed sloped farm fields starting to blush with spring green.

"Everything you see will be under water," Jake said. "We'll be under 30 feet of water right here where we are sitting."

The Hortons, along with 35 other landowners, could lose their homes and farms — including five preserved ones — in the forested hills that flank the Susquehanna River in York County, PA, under a proposal to build a 1,000-acre, $2.1 billion hydroelectric project.

On the ridgetop above one of the last roadless sections of the river, the pumped-storage project would create a 580-acre storage reservoir with a 225-foot-high dam nearly 2 miles long and two dikes. River water would be pumped into the reservoir to a maximum depth of 200 feet.

To generate power, the reservoir would be drawn down by about 160 million gallons, the water rushing downhill in buried, 29-foot-wide tunnels to drive turbines. Even though it would use more electricity than it produces, 858 megawatts of power could be generated in a burst — enough to power about 141,000 homes and almost as much electricity as produced at a nuclear plant.

But the facility would only run when needed. It would act like a storage battery, providing power when the 13-state regional power grid needs it. That could happen during heat waves or frigid weather. It also could be triggered by the projected increase in the use of electric vehicles and electric heat pumps, or the growing momentum to produce energy from sources other than fossil fuels.

A similar proposal for a hydro facility was floated 12 years ago for the same location, a hilly area straddling the river, known locally as the River Hills. But it was withdrawn amid much pushback, to the relief of residents and conservationists.

In fact, this is the fourth proposal since the 1970s for a hydro project at this location. All were eventually scrapped. The current proposal is a dusted-off version of one floated by the same partners in 1990.

This view of the Susquehanna River is from a rugged section of the River Hills area in York County, PA, which could become the site of a 1,000-acre hydroelectric pumped-storage project. Approximately 580 acres would be flooded for a reservoir. (Kelly Snavely/Lancaster Conservancy)

"It becomes basic harassment after a while," said Jen Horton, whose family has rented the house and surrounding farmland for 22 years. They could also lose a river bungalow that they bought a year ago and have been working to restore. "Literally, you lose sleep at night."

Pushback

Land trusts, farmland preservation groups, hiking groups and conservation groups are joining local residents to oppose the latest incarnation of the hydro project.

They feel they have an even stronger case this time. The state, federal government, two counties, nonprofit groups and river towns in the last 10 years have invested approximately $60 million to preserve the lower Susquehanna River gorge and develop a tourism-based economy tied to natural and historic features.

"A lot has changed since the last time this pumped-storage project was proposed. The beautiful lower Susquehanna River is no longer only a local treasure, but a landscape so special that it has received designations as both a state conservation landscape and a national heritage area," said Phil Wenger, CEO of the Lancaster Conservancy, which has helped protect thousands of acres in the River Hills.

"The adverse effects of this project are in direct opposition to our organization's efforts and those of many fellow partners — [with potential] effects that cause irreparable damage and erase an important part of the natural, cultural and historic landscape we have long fought to protect."

Lower Susquehanna Riverkeeper Ted Evgeniadis expressed concerns, too. "Farmland, archaeological sites and one of the most ecologically satisfying areas of the Mason-Dixon Trail would be flooded and underwater forever. The lower Susquehanna has been monopolized for power generation and profits at the expense of water quality and aquatic life for generations," he said. He was referring to the four hydro-electric dams, two nuclear plants and another pumped-storage hydro facility already on a 20-mile stretch of the river.

The board of the Susquehanna National Heritage Area said in a statement that it is "deeply concerned about the adverse impacts of the proposed pumped-storage facility on the natural, cultural and recreational resources of our national heritage area and will work in collaboration with our partners and local communities to oppose its development at this location."

A disbanded citizen's group has hastily re-formed, printing up yard signs to signal their opposition. David Imhoff, spokesman for the Cuffs Run Alliance, will be trying to save his family's circa-1870 farmette for the third time.

"But there's a lot more at stake than my own property," he said, questioning the hydro project for touting itself as "green."

"The project is just a bad idea economically and environmentally," he said.

A 'clean energy' option

The pair of local energy-industry businessmen who are proposing the hydro project — for the second time — say it makes more sense than ever as the country increasingly seeks renewable energy to help combat climate change.

The transition from a fossil fuel-based power sector will strain the region's capacity to produce enough power at times of peak energy use. That's because the sun doesn't

Jen, Keena and Jake Horton (left to right) stand on their farm in the River Hills of York County, PA. The house, buildings and land could be submerged for a reservoir as part of a proposed $2.1 billion hydroelectric storage project. (Ad Crable)

A hand-scrawled message is tacked to a road sign in York County PA, where private developers have proposed a 1,000-acre hydroelectric project. (Ad Crable)

always shine for solar arrays and there isn't always a breeze to drive wind turbines, said William M. McMahon Jr., one of two partners in York Energy Storage.

"We think our timing is perfect and use of this project a good match," he said.

Eighty-year-old McMahon is a veteran of the energy industry, and his partner, Jan Sockel, is a retired engineer. McMahon said they are working closely with a single investor who is interested in funding the project.

The $1.2 trillion Bipartisan Infrastructure Law passed by Congress in 2021 is providing $10 million to support studies of potential pumped-storage facilities for hydropower. "Hydropower is key to building a 100% clean energy future," according to a U.S. Department of Energy notice of the initiative.

There are currently 43 such hydro projects in the U.S., including one along the opposite shore of the Susquehanna in Lancaster County, several miles downriver from the proposed site in York County.

McMahon said that when they proposed the York County project 30 years ago the site was considered by one global water resources development company as one of the best spots in the country for a pumped-storage energy plant. "There's not too many places where you have two bodies of water as close to each other but yet a difference in height," he said.

He said the venture "would create a green footprint in the area with no emissions, noise, visual impact, traffic concerns, crime or [public safety issues]. When it's done it will be greener than it is right now. It's going to be a large lake with a forest around it. It's going to be wild and open to wildlife. It will be pretty green, benign and quiet."

Debating green

Opponents challenge the notion that this is a "green" project, noting that trees will be cleared and that the pumped-storage process would use more electricity than it generates. They also point out that the pumps will be powered by electricity from the regional grid, with sources that include natural gas and coal-fired power plants.

"We believe that better alternatives exist that don't destroy life and forests, produce methane and erase our rich historic and cultural history," said the Lancaster Conservancy's Wenger.

Several studies have found that, depending on conditions, decaying plant life in stagnant reservoirs emit methane, a potent greenhouse gas. McMahon said that would not be the case with this project.

The 200-mile Mason-Dixon Trail System, a National Recreational Trail, passes through the proposed project site at what is currently one of the pathway's most secluded and scenic sections. "We are not the 'not-in-my-backyard' type of people, but I can't imagine a way to make the trail scenic [with the project]," said Ruthie Franczek, president of the trail system.

But McMahon said he thought the trail could be rerouted and that other public trails will be created. He said it wouldn't be safe to allow the public to fish in the reservoir but hoped a separate body of water could be provided. Picnicking would be permitted.

As for the concerted efforts to preserve the landscape and promote outdoors tourism over the last decade, McMahon said, "I think we're on their side. We're trying to preserve it as much as anyone else."

He said he understands the emotions of residents who would lose their properties. "None of them appreciate what we're doing, but going forth, someone has to be part of the solution. The benefit is for the population of a big region around us here. There will be benefits to the electric grid and 65 million people.

"That's what the Federal Energy Regulatory Commission is all about. They are the ones that will judge whether the disadvantages to the people living there outweigh the benefits to society in the future."

McMahon referred to the project area as "sparsely used land" and rejects complaints that it would indelibly mar the existing landscape. He said only the 2-mile-long dam on top of the ridge and a column of rocks in the river, where water would be withdrawn, would be visible.

The forested slopes facing the river would be mostly untouched, he said. The access road to the project would be built on top of the ridge and not visible from the river,

The Muddy Run Pumped-Storage Facility along the Susquehanna River is several miles downriver from a similar facility proposed on the York County side of the river. (Constellation Energy)

and 3 miles of needed transmission lines would march inland from the reservoir, not fronting the river.

Governor's stance unclear

McMahon gave a presentation about the project on March 9 in Harrisburg, attended by Gov. Josh Shapiro's deputy chief of staff for consumers and the environment, and representatives of other state agencies.

According to Shapiro spokesman Manuel Bonder, the administration "is still evaluating all the pieces of the puzzle on this." He said the project could be impactful for Pennsylvania but that the governor was aware of local objections.

Pennsylvania ranks near the bottom of states in the amount of electricity it derives from the wind, sun and water. But Shapiro pledged during his recent campaign to generate 30% of the state's power from renewable sources by 2030.

The project was recently interjected into hearings of the state's proposed budget when Republican state Sen. Kristin Phillips-Hill of York County asked state Agriculture Department Secretary Russell Redding what could be done to prevent farms preserved with state taxpayers' money from being targeted by energy infrastructure projects.

Unfortunately, Redding replied, the state should, but does not, have much sway in putting state-preserved farms off-limits when the projects involve agencies such as the Federal Energy Regulatory Commission.

FERC has received the project's preliminary application. On March 24, the agency said that York Energy Storage must first work with Brookfield Renewable Partners, which operates the Safe Harbor hydroelectric dam downriver, to obtain assurances that the proposed project would not affect Safe Harbor Dam or alter the plant's operation.

McMahon said he was in the process of contacting Brookfield and expressed confidence in securing its signoff. "I would expect that we're going to be friends and we will be working well together," he said.

Before FERC rules on the preliminary permit, there will be a comment period. If FERC approves the permit, the developer can conduct a detailed feasibility study, which could take up to four years.

Details of the project may be viewed at the Federal Energy Regulatory Commission website at elibrary.ferc.gov. Then click on "Docket Search." Enter P-15303-000 in the "Enter Docket Number" box.

Meanwhile, the Horton family and their neighbors vow to fight the project. "I just can't see why anyone's personal profit could take something like this when it's basically our livelihood," Josh Horton said.

"We've got a lot of time, tears, blood, sweat and love invested. It's just disheartening." ■

MD lawmakers boost offshore wind, forest conservation

Flurry of bills also includes community solar, electric trucks, open space equity

By Timothy B. Wheeler

There were a lot of new faces in Annapolis at the start of this year's General Assembly in January. But newcomers and veterans together managed to produce a flurry of climate and environmental legislation by the conclusion of the annual 90-day session at midnight on April 10.

Following up on their decision in 2022 to set one of the nation's most ambitious greenhouse gas reduction goals, Maryland lawmakers doubled down on the state's commitment to develop offshore wind and solar energy while joining a coalition of other states to continue boosting sales of electric trucks, buses and delivery vans.

They also broke a years-long stalemate over how or even whether to reform the state's 1991 forest conservation law, set a goal of protecting a growing share of Maryland's landscape from development, and acted to increase green space in underserved and overburdened communities.

"It wasn't a perfect session by any means, but we got a lot done," said Kristen Harbeson, political director of the Maryland League of Conservation Voters.

Advocates said their job was made much easier by the January inauguration of Gov. Wes Moore, a Democrat who had campaigned on a pledge to fight climate change, protect the Chesapeake Bay and push for environmental justice. While his Republican predecessor Larry Hogan had voiced similar support, he had criticized and even vetoed key bills addressing those issues.

Offshore wind

On the heels of last year's Climate Solutions Now Act, which called for a 60% reduction in carbon emissions by 2031, lawmakers passed the POWER Act, which stands for Promoting Offshore Wind Energy Resources. It sets a goal of producing 8.5 gigawatts of electricity by 2031 off Maryland's Atlantic coast. That's more than four times the roughly 2 gigawatts of offshore wind power now planned by a pair of companies.

The bill also orders state agencies to work with PJM Interconnection, the regional electric grid manager, to build one or more transmission lines to carry the power to be generated by the offshore wind turbines to homes and businesses across the state.

Maryland lawmakers set a goal of producing 8.5 gigawatts of electricity from offshore wind by 2031 during the General Assembly session that ended in April. (Dave Harp)

Community solar

Lawmakers made permanent the state's community solar program, which allows people who can't put solar panels on their roof to buy their power from solar projects built elsewhere. The program, begun as a limited pilot in 2017, was set to expire at the end of 2024. The legislation lifts the cap on how much community solar can be developed. The measure requires that at least 40% of the community solar developed be reserved for low– and moderate-income households to purchase.

Electric trucks

Legislators directed Maryland to join a California-led coalition of states in requiring vehicle manufacturers to sell an increasing percentage of zero-emission medium– and heavy-duty trucks, delivery vans and school buses starting in 2027. The General Assembly has already committed the state to adopt California's "clean car" requirements aimed at boosting sales of electric cars and SUVs.

Environmental justice

Lawmakers passed a couple of bills requiring equity in planning transportation projects and in conserving open space in urban communities. One directs state officials to conduct cost-benefit and transit equity analyses as well consult with communities before announcing or proposing any major projects or service changes.

The other bill calls for funds to be provided annually to land trusts, local governments and other community groups to create and maintain green space in underserved neighborhoods that have been bypassed for such amenities.

Forest and land conservation

Ending years of debate, lawmakers agreed to revise the state's Forest Conservation Act for the first time in more than 30 years. It strengthened the law's overarching goal of ensuring no net loss of forest to one of increasing it. Key to the breakthrough was a study last year by the Hughes Center for Agro-Ecology, which found that the state is still losing forestland, though at a slower rate in recent years. The bill tightened some reforestation requirements and urged localities to do more to prevent forest fragmentation, which the Hughes study cited as a concern.

But the measure also gave limited new life to the practice of letting developers avoid replanting trees on site by paying into a forest "mitigation bank" elsewhere.

"The bill is not a wish list of everything that the advocates would have wanted," said Matt Stegman, a lawyer with the Chesapeake Bay Foundation. But he called it "much stronger" than previous bills that didn't pass.

The Maryland the Beautiful Act, which failed to pass last year, succeeded this year. It sets a new goal of conserving 30% of the state's lands by 2030 and 40% by 2040. About 23% is conserved now. The bill calls for loans and grants to land trusts and community nonprofits to help meet the goal.

Plastics

The burden for recycling and disposing of plastics could shift to manufacturers under a bill instituting "extended producer responsibility." As a start, lawmakers called for a study and an advisory council to recommend specific legislation in 2024.

Blue catfish

A pair of bills help address blue catfish, an invasive species that eat blue crabs, striped bass and other fish. One expands the types of fishing gear that can be used, while the other specifies that blue catfish be considered for inclusion when state food procurement contracts are drawn up.

Baltimore utility study

Lawmakers approved a Baltimore city and county task force to explore joint management of the region's troubled water and wastewater utilities.

Failed bills

Bills that would have revised the state's energy efficiency program to focus more on reducing greenhouse gases faltered amid what advocates said was confusion fed by industry misinformation.

Legislation also failed to pass that would have required state agencies to assess and prioritize the health and environmental impacts on marginalized communities of projects needing pollution permits.

Another measure that died would have strengthened state rules preventing waterfront property owners from protecting their eroding shorelines with bulkheads or riprap, which harm shallow-water habitat for fish and wildlife. ■

Bay Journal staff writer Whitney Pipkin contributed to this story.

Black neighborhood wary of long-awaited VA flood project

Lots of water with few drainage options creates ongoing problems in Pughsville

By Jeremy Cox

About an inch of rain had fallen the previous day. Carolyn White knew what to expect.

But a demonstration was in order, so she stepped gingerly onto her front lawn, showing how the ground audibly squished under foot.

"When you stand in the yard, it feels like mush even if it hasn't been raining," said White, 69, who was born and raised in this rapidly developing corner of Suffolk, VA. "It just sits there."

After more than a decade of planning, city officials expect to begin work by the end of this year on the core elements of a flood relief project in White's neighborhood. Known as Pughsville, the community founded by formerly enslaved people has struggled for years to get help for its worsening issues with standing water.

Now they're on the verge of getting it, but some residents are skeptical that the new infrastructure will do much good. They contend that officials have largely disregarded their input on how the project should unfold, and they disagree with assumptions about the way water drains from the mostly African American neighborhood.

"A lot of people are so fearful that [the city] is going to take their house [through eminent domain] if they go down there to speak up," said White, who is Black.

Still, some voiced their concerns at a community meeting in November 2021 and at a City Council meeting in January 2022. Several residents said the city was at least partly to blame for the flooding woes by repeatedly permitting new homes to replace forested lots.

"Before you all allowed the development so rapidly, water flowed through all of the ditches in and out of Pughsville, and it didn't affect anybody's homes," Pamela Brandy, vice president of the Pughsville Civic League, told the council. "Once you started allowing the people to develop crazily, that is what has altered the direction of the natural path of the water."

White and her husband, Wayne, who is president of the civic league, say that flooding got noticeably worse with the construction of Interstate 664 in the 1990s. The highway now forms the eastern boundary of the neighborhood.

"The water is dumping in on us from the interstate," Carolyn White said.

Carolyn and Wayne White stand in the often soggy front yard of their home in the Pughsville section of Suffolk, VA. They are among residents who say the city's plan to fix the area's drainage problems is based on faulty assumptions. (Jeremy Cox)

Citing a 2012 drainage study, city engineers say that isn't the case. The 400-acre community generally slopes from northwest to southeast, putting the interstate on the receiving end of the community's stormwater, not vice versa.

The main problem, according to the study, is that all that land is almost exclusively drained by just two natural channels. Both merge into a single waterway before emptying through a single outfall beneath I-664.

"You have a massive amount of water going through this small area that's just not being accommodated," said Luke Drylie, a project manager for the Suffolk Public Works Department.

Pughsville itself grew haphazardly over many decades. If stormwater was ever considered, it was shunted into roadside open ditches. When Suffolk took control of its road system from the Virginia Department of Transportation in 2006, Pughsville quickly stood out as the most flood-prone area, said Darryll Lewis, assistant director of Public Works.

"It's probably the worst we have in the city of Suffolk," Lewis said of the sprawling municipality, which absorbed Nansemond County in the 1970s. "We have areas with localized flooding but nothing like this."

Hurricane Matthew in 2016 raised the stakes further. The storm dumped about a foot of rain, bringing floodwaters in some parts of the Pughsville over the tops of cars.

In 2018, the city began moving forward with a drainage overhaul for Pughsville. That year saw the installation of four culverts to relieve water backups. But that was only a "temporary fix," Lewis said.

The second phase, which is set to begin in November, will collect stormwater in a large underground pipe and direct it toward a new retention pond. While the main goal of the $7 million project is to prevent a Matthew-level flood, it will also provide environmental benefits by slowing down the stormwater, allowing much of the pollutants to settle out, Lewis said.

The water exiting Pughsville eventually finds its way to the Western Branch of the Elizabeth River, a tributary of the James River.

One of the reasons the work has taken so much time, officials say, is that Suffolk can't go it alone. Part of the project's footprint crosses into the adjacent city of Chesapeake. That city is undertaking a $2 million project to upgrade culverts, timing it to coincide with the Suffolk work.

"This is a good opportunity for us to work with our neighbors on stormwater issues," said Earl Sorey, Chesapeake's public works director.

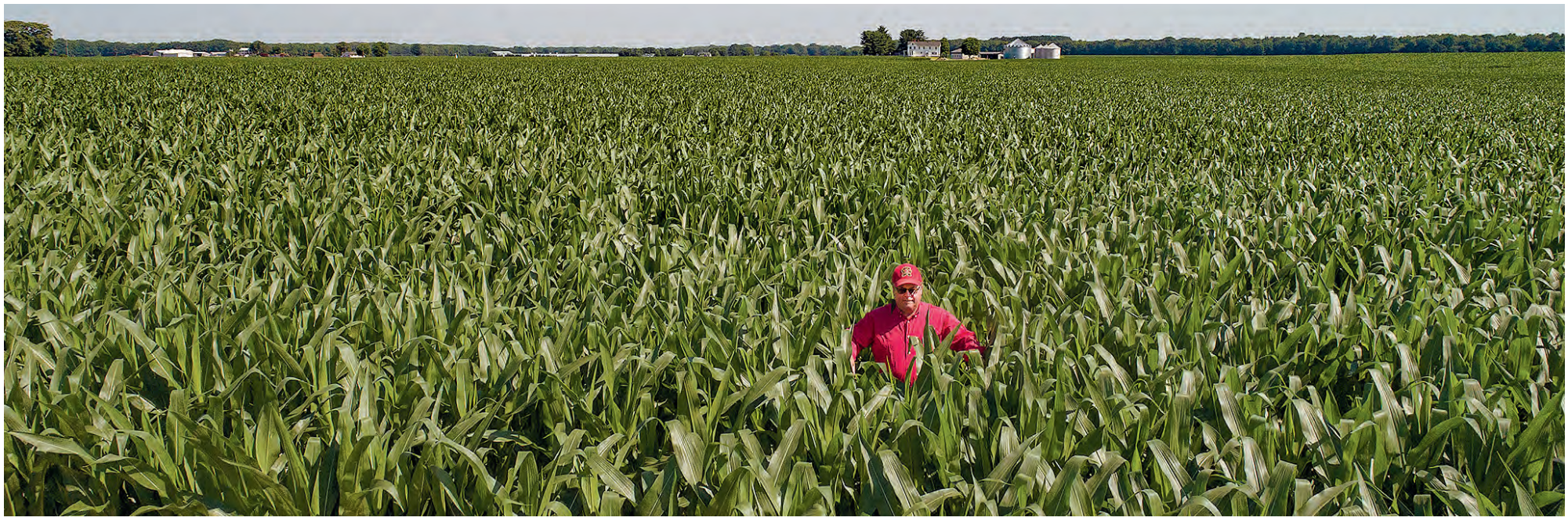
But Carolyn White and other residents say that Suffolk could have been more neighborly to its own people. When the city was designing the proposed retention pond, it chose a site where two owner-occupied homes would need to be bought and razed.

Lewis said that planners did everything they could to minimize the impact to the neighborhood while still providing adequate flood resilience. He rejected a location farther west that some residents had suggested, arguing that it wouldn't be able to trap stormwater to the east.

"They seem to think we can get water to go back uphill," he said.

Even when the project is finished — its scheduled completion date is June 2025 — it likely won't be the last time the city needs to spend money fixing Pughsville's flooding problems, Drylie said. There will probably need to be a phase III and a phase IV.

"What we're doing will be a big improvement," he added, "but it won't be the ultimate solution. I don't know how much it will really cost to solve this problem — maybe $10 million to $12 million more. But we will provide benefit to them." ■



Bay cleanup faces difficult trade-offs with agriculture

Ag & the Bay
Sowing a Conversation

Editor's Note: Last fall, state and federal leaders admitted that the Chesapeake Bay region will not meet its most fundamental 2025 cleanup goal, aimed at reducing nutrient pollution in the Bay and the rivers that feed it. Now, many people are asking, "How did we get here?" and "What's next?" This article is the first in a series that will tackle that question.

For 40 years, the region has struggled to meet its goal largely because of an inability to sufficiently reduce nutrient pollution from farms in Maryland, Pennsylvania and Virginia. The reasons are complex. But it's important to explore those challenges as the region begins a tough conversation about the future of the Bay restoration effort beyond 2025.

This first article in our series looks at water quality goals for the Bay and the economic drivers that conflict with them. Karl Blankenship, founding editor of the *Bay Journal* and author of this series, has been reporting on Bay cleanup policies for more than 30 years.

By Karl Blankenship

Rarely has the future been so clear.

At midnight on Dec. 31, 2025, the Chesapeake Bay region will miss its goal for reducing nutrient pollution in the Bay. It will be the third miss, after work toward deadlines in 2000 and 2010 also came up short.

While progress has been made, trends since the most recent Bay cleanup goals were set in 2010 suggest the region might not hit its nutrient reduction target for many decades.

The primary reason for the shortfall is the region's inability to grapple with the 25% of the Bay watershed that is covered by farms.

It's been known since 1983, when state and federal governments agreed to work together to restore the Bay, that agriculture was a leading source of nutrients — nitrogen and phosphorus — that turn the water murky with algae and rob it of oxygen.

Despite that, those leading the restoration effort have repeatedly underestimated the magnitude of the challenge they face and the amount of economic pain its solutions would impose on farmers.

Bay cleanup leaders, environmental advocates and others have often touted solutions as being "win-win" or "common sense" or simply a matter of raising enough money to induce far more farmers to adopt runoff control measures.

Missing in such assessments are the potentially dire consequences for the region's agricultural sector. Far from being win-win, the U.S. Geological Survey recently estimated that meeting nutrient goals for the Bay could require taking approximately 44% of the region's roughly 8.2 million acres of farmland out of production or instituting dramatic actions that would almost certainly affect farm income.

Further complicating the issue are state and federal policies and, most importantly, market forces that drive farmers to intensify production for a growing national and global population. That can't be done without placing large amounts of nutrients on the land, some of which inevitably escape into waterways.

"Agriculture is a nutrient-use-intensive industry because that's how growing food works," said Ken Staver, a farmer and a scientist with the University of Maryland Wye Research and Education Center. "People act like agriculture is like any other industry. But it's the most fundamental thing human beings do. Growing food is not like making hula hoops. It is not optional."

The result is this: Nearly half of the nitrogen reaching the Bay today, at least according to computer model estimates from the Chesapeake Bay Program partnership, comes from the roughly 83,000 farms in the Chesapeake's watershed.

Bay Program data shows that actions to control runoff from farms accelerated during the last decade, as has spending: Nearly $2 billion was spent by state and federal agencies from 2014 through 2022 to reduce farm runoff. Farmers contributed money on top of that to install and maintain those conservation practices.

But the amount of nitrogen reaching the Bay from farms has changed little since new cleanup goals were set in 2010, according to computer model estimates.

It's not that their efforts accomplished nothing. Rather, they staved off substantial headwinds as farmers faced market demands to produce more crops and livestock.

Since the latest cleanup goals were set, the animal population in the watershed — chickens, turkeys, cows, hogs and other livestock — increased by about 13%, measured in pounds. There are more than 600 pounds of farm animals for every person in the watershed. And yields of corn per acre, the most widely grown crop and a substantial source of nitrogen, have also grown steadily during that time, requiring more nutrients.

The headwinds posed by increased demand are unlikely to abate anytime soon, and those working in the field say that even under the most optimistic scenarios, it would likely take decades to reach nutrient reduction goals for the Bay. And it would still likely require new programs, policies and technologies, some of which may be beyond the region's control.

Perhaps most of all, the path forward would also require something the Bay effort has long avoided: An honest

Top: Mark Dubin, who works through the University of Maryland as the agriculture technical coordinator for the Chesapeake Bay Program, stands on his family farm in Maryland. (Dave Harp)

conversation about how competing societal goals regarding farms and the Bay can be woven together.

A fateful cruise

Farming was not on the list of the Bay's ills when U.S. Sen. Charles "Mac" Mathias set out on a five-day, 450-mile boat tour of the Bay in 1973. Along the way, he talked to more than 150 people who were convinced the Chesapeake was in decline. Even Mathias, who was from Western Maryland, was struck by the changes since he was a boy.

"I remember when I was a small child, the Chesapeake Bay was pretty clear," he recalled in a 2003 interview with the *Bay Journal*. "Now it looked just muddy."

Eventually, Mathias secured $25 million for a multi-year study by the newly established U.S. Environmental Protection Agency to examine the health of the nation's largest and most productive estuary — a place where salty and fresh water meet.

At that time, most people thought the Bay's woes stemmed from wastewater treatment plants and industries discharging directly into the water. If so, the federal government had tools to fix the problem. In 1972, one year before Mathias' trip, Congress had enacted the Clean Water Act, giving the EPA greater power to crack down on such "point sources" of pollution.

Those were, indeed, contributing to the Bay's poor condition. But as scientists delved into the murky water, they began to see evidence of another problem. Critical underwater grass beds were disappearing in rural areas, far from any discharge location. Algae were clouding the water, keeping the plants from getting the sunlight needed to survive.

The algae were fed by nitrogen and phosphorus flowing into the water, but the nutrients didn't stem from sewage in the region's growing cities. They came from surrounding farmland that had co-existed with a thriving Bay for centuries.

Why did agriculture become such a problem for the Bay? The answer dates to the late 1800s. Nitrogen was known to be essential for crop growth, but the supply was limited. It is the most common element in the Earth's atmosphere, but scientists did not know how to unleash that source and make it available to plants.

A British chemist in 1898 said finding a way to tap that supply was the "great challenge" for scientists. If they didn't, he warned, "all civilized nations stand in peril of not having enough to eat."

The solution came little more than a decade later. German scientist Fritz Haber developed a technique to synthesize atmospheric nitrogen into a form that could be used as fertilizer. Carl Bosch, with the German company BASF, developed the means to scale up production. By 1914, the Haber-Bosch process was producing 20 tons of ammonia, a form of nitrogen, daily.

The importance of the Haber-Bosch process cannot be overstated. Today, it produces about 230 million tons of ammonia annually, mostly for fertilizer. Without it, about half of the world's current population could not be fed.

A changed Bay

Those developments fundamentally changed agriculture, including in the Bay region.

Once, farmers used manure produced on their farm or nearby farms to fertilize their fields. They supplemented that by planting legumes, such as alfalfa or clover, which "fix" nitrogen from the atmosphere into the ground, or by importing fertilizers like bat guano to replace nutrients exported from the farm in the products they sold.

Because the supply was limited, farmers sought to use nutrients as efficiently as possible. That helped keep nitrogen and phosphorus levels in balance — and mostly out of the Bay. But it also limited production.

After World War II, cheap fertilizers became widely available. Farmers in the Midwest with rich, deep soils could use fertilizer to produce larger crops at less cost than farmers in the Mid-Atlantic.

But Mid-Atlantic farmers were close to many Eastern cities and could more economically get meat, milk and other livestock products to urban markets.

Those changes, coupled with improvements in the genetics of crops and animals, greatly increased production. Since 1950, milk production per cow has increased fourfold, as has the average size of a broiler chicken. Improved plant hybrids have increased corn yields per acre by about 400% since the 1930s.

The new dynamics, though, brought negative environmental consequences. Crops in the Bay region shifted toward those tied to animal production, such as corn, soybeans and hay. That had significant impact for the Bay, as both corn and soybeans "leak" large amounts of nitrogen.

As the animal population grew, it often became economical to supplement grain grown locally for animal feed with grain grown with cheap fertilizers from the Midwest. But it was never economical to send manure from those animals back to the Midwest. That meant areas with large numbers of chickens, cows, turkeys and other livestock began accumulating more nutrients than needed by local crops.

Between 1950 and 1982, the amount of nitrogen from manure and fertilizer applied to crop land in the Bay region nearly doubled, reaching 960 million pounds annually, even as the amount of farmland decreased by nearly half.

The result was a steady increase in the amount of nutrients reaching the Bay, where it fueled algae blooms — and, in turn, concern about the Bay's health. The cycle continues today. Algae tint the water green, blocking sunlight for underwater plants that provide critical habitat for juvenile fish and crabs, causing massive diebacks.

When the algae die, they sink to the bottom where they are decomposed by bacteria in a process that draws oxygen from the water, creating oxygen-starved "dead zones."

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Nutrient pollution creates algae blooms that block sunlight from underwater grasses and rob the water of oxygen as they decompose, creating "dead zones." (Dave Harp)

Some of the nutrient pollution in the Bay and its rivers comes from cows that have access to streams and deposit their waste directly into the water. (Dave Harp)

AG & THE BAY *continued from page 21*

A lack of trust

The Chesapeake Bay Program, a partnership between the federal government and states in the Bay watershed, was created in 1983 to address the Bay's problems.

After the EPA completed its study, the Bay was recognized as the best-researched estuary in the nation and perhaps the world. That strong foundation in estuarine science allowed the Bay Program to identify ideal water quality conditions for underwater grasses and fish and to establish the amount of nutrient reductions that would be needed to reach those goals.

The Clean Water Act provided tools to address only some of the nutrient sources. "Point sources" — wastewater treatment plants and industries that discharge directly into waterways through easily identified pipes — could be required to install state-of-the-art technologies to reduce their pollution. Nearly all of the wastewater treatment plants in the watershed have been upgraded, accounting for most of the nutrient reductions to the Bay so far.

The story was different when it came to agriculture, the largest source of nutrients in most Bay states. The Clean Water Act exempted the EPA from regulating "nonpoint" pollution, including farm activities, except for large feedlot operations.

The Bay Program was not well-suited to deal with it either. The primary solution available was a suite of best management practices, or BMPs, that can help reduce runoff. These include things such as installing terraces on hills to slow erosive runoff, following nutrient management plans designed to reduce overapplication of manure or fertilizer, installing streamside buffers or planting nutrient-absorbing cover crops in the fall. Today, the Bay Program recognizes more than 100 different types of BMPs for their ability to improve water quality.

But the Bay Program has historically been dominated by people with backgrounds in estuarine science and government regulations. They had little knowledge of the magnitude of effort it would take to reach their agricultural goals.

And there was a fundamental disconnect: Those working on Bay issues tend to see farming through a water quality lens. Those working closer to the agricultural sector view it through an economic and productivity lens.

"The communication wasn't very good," said Rich Batiuk, the former associate director for science with the EPA Bay Program Office. "There was a lot of finger-pointing."

New houses stand next to a farm field in Pennsylvania. A recent report from the U.S. Geological Survey says that meeting pollution reduction goals for the Bay could require taking 44% of the region's farmland out of production. (Dave Harp)

Efforts were also hampered almost from the start by those who worked closely with farmers. Many people in agricultural agencies and land grant universities — those with large programs devoted to farming — felt that nutrient runoff was not a major issue and the Bay was not their concern.

"It was something that was a really treacherous thing to talk about here at the University of Maryland," Staver said, a sentiment echoed by ag researchers at other universities. "They were wanting to say there wasn't a problem."

That tension grew as the Bay Program began requiring river-specific cleanup plans in the 1990s. To many in the farm community, voluntary BMP programs started looking more like regulatory expectations.

The problem was illustrated in a 2006 report written jointly by the Inspectors General of the EPA and U.S. Department of Agriculture — the largest funder for farm conservation measures in the watershed. They found that collaboration by the two agencies was poor even though it was essential to meeting Bay cleanup goals.

The EPA lacked the trust of the agricultural community, the report said, and even though various BMP programs operated by state and federal agencies were voluntary, "the agricultural community is concerned that the EPA as a regulatory agency may use this information to take enforcement actions."

As a result, the report said, the USDA was reluctant to jeopardize the trust it had built with farmers over the decades by aligning more closely with the EPA.

Ken Staver, a farmer and a scientist with the University of Maryland Wye Research and Education Center, plants a rye cover crop on his Maryland farm. (Dave Harp)

Cooperation between the agencies has waxed and waned over time. More recently, the EPA and USDA Natural Resource Conservation Service have made more efforts to work together on assessing and funding agricultural nutrient controls.

Still, even today many members of the Bay Program's Agriculture Workgroup say farmers' concerns are not well-integrated into decisions. "I just feel like ag is getting discounted," said Gary Felton, a retired agricultural scientist with the University of Maryland and former chair of the workgroup.

Mark Dubin, who is a farmer and a former official with the Pennsylvania Department of Environmental Protection, in 2006 became the Bay Program's first full-time person assigned to agricultural issues. He works with agricultural agencies and colleges, trade groups and others to improve relationships.

"The Bay Program has had some significant shifts on this, which is good," he said. "Are we at the level where we should be? No."

A 'charitable donation'

The communication problems contributed, many say, to a poor appreciation of how difficult it would be to slather enough BMPs across the landscape to make a significant impact on water quality.

That blind spot led to a general perception that solutions would be a "win-win" for farmers and the environment, and that the biggest obstacle was securing enough funding for the voluntary state and federal cost-share programs that help farmers install buffers, write nutrient management plans or take other runoff control measures.

"The assumption they clearly have is money equals progress," said Jim Shortle, a professor emeritus of agricultural and environmental economics at Pennsylvania State University. "That has not been demonstrated in this case."

Shortle recently co-authored a book, *Water Quality and Agriculture*, about the daunting challenge facing the Bay region and elsewhere. It argued that although the Bay Program used "high quality environmental science" to set water quality goals, its approach has largely failed because it did not consider social, economic and behavioral factors critical to achieving those goals.

Relying on voluntary BMP implementation is unlikely to succeed, he wrote, because it does not address "underlying systemic economic and institutional causes of the problem."

Corn is the most widely grown crop in the Bay watershed and a substantial source of nutrient pollution. Yields of corn per acre have grown steadily in the region since 2010. (Dave Harp)

He and others say that while some BMPs can provide benefits for farmers and the environment, many do little to help farmers or the economic viability of their operations.

They require time to install and maintain, they may take land out of production, and some incur expenses without improving productivity.

"Basically, it's a charitable donation," said Kurt Stephenson, an agricultural economist with Virginia Tech.

Farmers have widely adopted some practices, such as no-till farming that saves money on fuel. But they have been reluctant to adopt streamside buffers, which take land out of production. Planting cover crops at times when they are most effective can be difficult because it competes with harvest schedules. Fences that keep cows out of streams require maintenance and the construction of alternate watering locations.

"These types of practices can be exceedingly difficult to get people to adopt," Stephenson said. "Because what you're asking people to do is basically incur a bunch of upfront costs in which they have no direct benefit."

Farm ownership increases the challenge: More than two-fifths of farmland in the Bay watershed is not owned by the farmer working the land but is rented. There is little incentive to incur costs that reduce runoff on land they don't own.

In Pennsylvania, constructing manure storage facilities — structures that help farmers hold manure until the appropriate time to apply it to fields — is a priority for the NRCS. But the average cost, said Denise Coleman, the agency's state conservationist, is $120,000. NRCS covers 75% of the price tag, but the farmer's share is still significant.

"Farmers are outlaying, on average, $35,000 to $40,000 of their own money to make this happen," she said. "So, if you have kids you're putting through college or you're doing this on a shoestring income, it can be very expensive."

The production treadmill

Achieving the Bay's water quality goals through current BMP programs is also challenged by the pressure on farmers to continually increase production.

It's what some call the "production treadmill." Farmers grow more crops and livestock to help offset higher costs, such as those for fuel and fertilizer, but market competition keeps sale prices low. So, the profit margin for farmers gets thinner.

Indeed, despite increased production, farm income in the region stayed largely the same from 2007 to 2017, according to USDA Agricultural Census data.

"We ask why we're surprised that Bay water quality isn't pristine," said Zach Easton, a Virginia Tech agriculture professor who researches runoff and BMPs. "We can't have cheap food and a pristine Bay. I just think that they're incompatible desires."

The production intensification creates a strong headwind for Bay cleanup goals.

On one hand, the use of BMPs and improved production efficiencies have helped. In general, changes in animal diets have decreased the amount of nutrients required for each pound of animal produced. And corn varieties grown today do a better job of using nitrogen than those grown just a couple of decades ago. In other words, it takes less nitrogen to produce a bushel of corn, a gallon of milk or a pound of meat.

On the other hand, those improvements are offset to some extent by the overall increase in production, which requires more nitrogen. And some of that nitrogen will inevitably escape to local waterways.

"That's sort of the question," Dubin said. "Does the improved efficiency outweigh the loss? Because you're always going to have loss. Every pound is going to lose a certain percentage to the environment. It will never be 100%."

A recent analysis published in *Environmental Research Communications* found that from 1985 through 2019, despite growth in productivity, the amount of "surplus" nitrogen left on fields in the Bay watershed was decreasing. That's good news because less surplus means less runoff from the fields.

But the study also found that in the most recent 10 years — from 2009 to 2019 — that trend had halted. A 2022 USDA report also found that trends toward reduced nutrient leakage from farmland slowed over the past decade.

Bay Program computer models tell a similar story.

They estimate that about 123 million pounds of nitrogen reached the Chesapeake annually from farms in 2009, the year the Bay Program uses as a baseline for measuring progress toward its 2025 goal. Through 2021, that load had been reduced to about 117 million pounds a year — a 6-million-pound reduction over 12 years.

To meet Bay restoration goals, Delaware, Maryland, New York, Pennsylvania and Virginia each count on achieving most of their future nutrient reductions by slashing runoff from agriculture. At the pace of the last decade, the region would not reach those goals for another half century.

And it might take even longer: The computer models rely on old fertilizer data. If they used more recent figures that show an increase in use, the current pace would not reach pollution reduction goals until after 2100.

Contradictory policies

The problem is exacerbated as state and federal agencies pursue policies that incentivize increased production, even as they seek to reduce pollution.

On April 18, 2022, EPA Regional Administrator Adam Ortiz announced that his agency was ramping up compliance and enforcement measures in Pennsylvania because the state's latest Bay cleanup plan didn't measure up.

While all the states in the Bay watershed have struggled to reduce nutrient pollution from agriculture, Pennsylvania — which has the most farmland by far — is farthest behind.

Pennsylvania, Ortiz said, lacked a "statewide commitment" to meeting nutrient reduction goals. It was, he said, a "systemic issue" in which the state lacked both sufficient policies and resources to meet its goals, especially for agriculture.

The following week, his boss, EPA Administrator Michael Regan, made Pennsylvania's nutrient control job even more difficult. Regan issued an emergency waiver to allow E15 gasoline, a fuel that uses a 15% ethanol blend, to be sold during the summer driving season.

That action would increase demand for corn, the primary feedstock for ethanol, which leaks large amounts of nitrogen into the environment.

The EPA's own Science Advisory Board, in a 2011 report calling for a national policy to manage nitrogen, said promoting corn-based ethanol would "make it extremely difficult" to reduce the amount of nitrogen running off the land. Since then, ethanol demand has only increased, consuming about two-fifths of the nation's corn harvest. Subsequent studies have found that ethanol policies contribute to the chronic "dead zone" in the Gulf of Mexico by boosting corn production — and related nutrient pollution — in the Mississippi River basin.

A recent analysis by agricultural economists at Virginia Tech showed the Bay region is second only to the Midwest Corn Belt in the relationship between ethanol policy and increased corn production.

In effect, even as Ortiz was blaming Pennsylvania for not doing enough to reduce nitrogen runoff from farms, his own agency was incentivizing farmers to grow more of a crop certain to increase polluted runoff.

It's hardly an isolated example. Federal and state policies are typically designed to increase farm production, and therefore profitability, while the marketplace works to

AG & THE BAY *continued on page 24*

AG & THE BAY *continued from page 23*

keep food costs low. Federal crop insurance programs, which protect farmers against droughts and floods, can also promote increased production on marginal lands.

Changes to those policies in the 1990s made it easier for farmers to choose the crops they grow in response to market demands without risking financial penalties under federal farm programs. That tended to further boost production of corn and soybeans.

"We've got to quit this contradictory approach that we have to boosting ag on one hand and worrying about pollution on the other," Shortle said. "Policy coherence is an accountability issue, and it's at the federal level and it's at the state level. They're both encouraging ag production on one hand, but then fighting pollution on the other."

Tough trade-offs

Even the Bay Program has conflicting goals. While reaching its water quality objectives would likely require less agriculture, or certainly less intense agriculture, its 2014 Chesapeake Bay Watershed Agreement also seeks to protect farms and conserve landscapes that "sustain working forests, farms and maritime communities."

"We believe that we can farm and have nutrient-intensive farms in this region and not have environmental consequences," Shortle said. "With the structure of ag now, I just don't think that's true."

A 2021 USGS report estimated that reaching Bay cleanup goals would require taking 44% of farmland out of production or taking a smaller amount of land out of production in combination with other sweeping actions, such as reducing farm animal populations and dramatically ramping up the use of BMPs. The same report showed that past rates of BMP implementation were struggling to hold the line.

All of those actions would impact the bottom line for farmers who are under pressure for increased production.

"They don't have a lot of choice, especially when the economics are squeezing them more every day," said Kathryn Brasier, a professor of rural sociology with Penn State and vice chair of the Bay Program's Agriculture Workgroup. "It just becomes a survival story.

"And the question is, do we want to pay the price as a society to take those farms out of production, with all the follow-up consequences for families and households and rural communities, or not?"

The path ahead will require tough choices and a recognition that competing societal objectives require trade-offs. "There are no win-wins," said Virginia Tech's Kurt Stephenson.

A forested streamside buffer along this Maryland farm helps protect water quality in Miles Creek. (Dave Harp)

The same market pressures that drive production also encourage the move to larger farms. Their scale makes them more efficient, so they can operate on thinner margins per unit of production. But it also makes it hard for younger farmers to get into the business.

Lindsay Thompson, executive director of the Maryland Grain Producers Association, recently started a small farm with her husband but acknowledged that it's been a struggle. "The big guys just keep getting bigger because they can spread their cost and their risk across more acres," she said. "They can pay much higher land rents on specific farms.

"They get better deals on seed and nitrogen because they're buying in bulk. That's not what the consumers want. But really, in order to efficiently produce food, which is something that we want, you've got to have economies of scale, right? So it's conflicting desires there."

Jeremy Daubert, a dairy farmer in Virginia's Shenandoah Valley and chair of the Bay Program Agriculture Workgroup, said it used to be that a milk truck would visit several small farms before taking milk to the processing plant. Now, to avoid the added time and labor of multiple stops, a single operation typically has to fill a truck.

"Twenty years ago, if somebody wanted to start dairy farming, they could go out and buy 50 or 70 cows and go to one of the milk co-ops and say, 'Hey, I'm going to start milking next week,'" Daubert said. "That's not even an option today."

While many factors affect the environmental impact of a particular farm, larger operations often result in less pollution. They are more likely to afford high-tech equipment that places fertilizer more effectively and nutritionists who can optimize livestock diets to produce less waste.

"It's this trade-off thing," Shortle said. "People like small farm agriculture, but for the purposes of efficient protection of the environment and food production, it may be better to have larger farms. And we're probably happier regulating larger farms than we are smaller farms."

A long slog

Shortle believes that some targeted regulation could help but, like many others, he doubts that significantly increased regulation is likely. Agriculture is so diverse it makes crafting regulations difficult. It would also face significant opposition from agricultural trade groups, as well as lawmakers who historically have been reluctant to impose regulations that would be onerous on farmers.

Further, many people — including environmentalists working on the ground with farmers — say regulations could be counterproductive if they hike farm costs. The primary way for a farmer to cover increased expenses is to grow more chickens, more cows or more acres of corn and soybeans, further fueling the production treadmill.

Targeting specific areas and farms might accelerate water quality results but would bring its own challenges. "Who wants to go say to the Plain Sect community, 'Maybe you need to give up milking cows and maybe you need to give up having livestock because you don't have the financial capital to handle more advanced management systems and practices'?" Dubin asked.

Changes in ethanol policy or a shift in diet away from meat — corn and soybeans are largely grown for animal feed or biofuels — could reduce demand. But that could also hurt farm income and the survival of farms.

Even if that happened, more of those products may simply be exported to meet growing global demand. In fact, the growing world population requires increased production on existing farmland to meet global food needs, according to a recent World Resource Institute report.

"If today's levels of production efficiency were to remain constant through 2050," the report said, "then feeding the planet would entail clearing most of the world's remaining forests, wiping out thousands more species, and releasing enough [greenhouse gases] to exceed the 1.5 degree [Celsius] and 2 degree C warming targets enshrined in the Paris Agreement — even if emissions from all other human activities were eliminated."

In effect, the report illustrates that reducing pollution in the Bay watershed by exporting production somewhere else only exports the problem to other places.

"This is like regional nimbyism," Stephenson said. "I don't want the power plant in my back yard, and I don't want the cows in my watershed. Go pollute the Gulf of Mexico."

Given these complicated dynamics, it's clear that Bay cleanup goals will not be achieved anytime soon, and success will depend in part on new technologies and continued improvements in plant and animal efficiencies that enhance farm productivity and profitability.

The reality is that reducing water pollution from agricultural runoff is a "long slog," said Staver, who has been working on the issue for nearly 40 years and is optimistic that slow improvements will continue even if the current Bay cleanup goal may not be fully achievable.

It's not a message that is appealing to politicians or a public impatient for results, he acknowledged, but better runoff controls must be developed, refined and implemented on a farm-by-farm basis — a long process for a watershed with approximately 83,000 farms.

"We're kind of stuck with mostly working on incrementalism," he said.

As the Bay Program marks its 40th anniversary this year and approaches its third missed deadline, state and federal partners will need to revisit their goals and timeframes.

Will they seek a "clean" Bay despite its large impacts on agriculture or a "better" Bay with manageable impacts? It's a difficult question, and one that the Bay Program, in many ways, has avoided asking. But when it comes to farming and the Chesapeake Bay, there is no free lunch. ■

Up next: *In June, this series will begin to explore factors that contribute to unrealistic cleanup deadlines.*

Rare fish in upper James River could get federal protection

Endangered species listing for roughhead shiners could generate funds to revive them

By Whitney Pipkin

A tiny fish with a bumpy head, found only in a rural stretch of the upper James River watershed in Virginia, could soon find protection under the U.S. Endangered Species Act.

The roughhead shiner (*Notropis semperasper*) is a shiny, 3-inch olive minnow that lives in the Cowpasture River and its tributaries in western Virginia's Alleghany, Bath and Craig counties.

In late March, the U.S. Fish and Wildlife Service announced that the fish was among four species, in the U.S. and abroad, being considered for federal protection. (The others were the common hippopotamus, a scarab beetle and Inyo rock daisy.)

The shiner will undergo a yearlong status review to determine whether it receives the protection, which could unlock additional federal funds for habitat restoration and other measures.

The Center for Biological Diversity first petitioned the federal government to consider protecting the roughhead shiner in March 2022 after scientists said it was becoming increasingly rare. One of the main threats to the fish is an intruder — the telescope shiner. Native to rivers in the South, the telescope shiner looks like the roughhead shiner but has been driving the native fish out of its habitat.

Roughhead shiners, like most minnows, thrive in rocky creek bottoms filled with insects, but the fish were cut off from part of their historic habitat by a dam. And excess sediment that flows into the river can impact habitat of shiners and other small fish.

"It's on the verge of extinction, as are a lot of little species that nobody is paying attention to," said Tierra Curry, a senior scientist at the Center for Biological Diversity. "It's a story that is happening everywhere and largely being ignored."

The Maryland darter, for example, the only animal known to be found solely in Maryland, was recently declared extinct by the International Union for Conservation of Nature after scientists recently tried but failed to find them in rivers they once inhabited. The tan-and-brown-blotched fish was declared federally endangered in 1967, and its population continued to rapidly decline. The last sighting was in 1988.

Globally, nearly one-third of freshwater species are facing extinction, according to the IUCN. The Appalachian region that encompasses the shiner's range is known for a high number of fish species only found in its waters.

The roughhead shiner is a shiny, 3-inch, olive-colored minnow that lives in Virginia's Cowpasture River and its tributaries. (Derek Wheaton)

"Around one-third of the region's fishes are restricted to a single drainage unit … which makes them highly vulnerable to extinction when faced with habitat degradation, invasion of non-native species or other threats from which they cannot [escape]," says the Center for Conservation Biology's petition for the roughhead shiner, citing a federal study of the Southern Appalachian ecosystem.

The roughhead shiner was first identified as threatened a half-century ago and was put on a waiting list for Endangered Species Act protection in 1994. Scientists from Conservation Fisheries, Inc., a Tennessee-based nonprofit that snorkels to seek rare and endangered species, recently flagged the roughhead shiner as even harder to find.

Virginia also has identified the shiner as a species of critical concern. But, Curry said, the state hasn't allotted the funding necessary for monitoring or restoration.

"Endangered Species Act protection would make funding available to recover the fish," she said.

Endangered species protection has made a difference for several freshwater fish species that have since recovered, Curry said, including the snail darter in East Tennessee and the Oregon chub. Scientists have known for decades about the roughhead shiner's predicament. But even with a status change the solutions would not be simple.

At this point, Curry said part of the effort of preventing extinction for the roughhead shiner would likely include bringing some of the species into captivity. That effort could preserve its genetic diversity while allowing the fish to be reared and potentially released to invader-free waters.

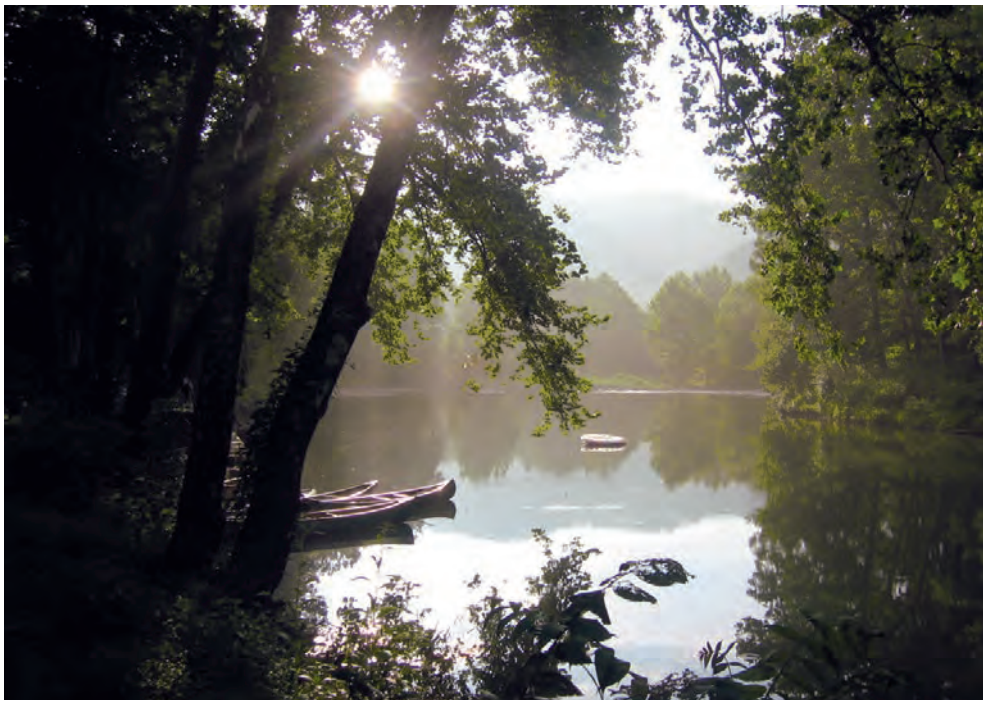
But protecting and improving the Cowpasture River and its tributaries would be a key component. As the river's name implies, the Cowpasture is surrounded primarily by agricultural fields with no large urban area in the watershed.

The river has an active preservation association and falls under the purview of the James River Association — though neither group has focused efforts specifically on the shiner.

Still, "small fishes like the roughhead shiner, are an important part of the ecosystem," said Erin Reilly, senior staff scientist at the James River Association. "Protection of critical habitat and restoration practices that support improving water quality and decreasing sedimentation will not only help the roughhead shiner but also many other species of small fish and invertebrates."

For Curry, who directs her center's "saving life on Earth" campaign, every species in danger of extinction matters, even the small, dully colored ones. The roughhead shiner is not particularly colorful or charismatic, though it is, like most minnows, shiny.

"It's just the ethical principle that it should have a right to exist," Curry said. ■



The Cowpasture River, home to the rare roughhead shiners, is part of the upper James River watershed in Virginia. (Thombo2/CC BY 2.0)

Shedding light on the antler craze in Pennsylvania's elk country

By Ad Crable

Why do forest leaves that smell like a stable, wet nuggets of poop and chewed tree bark 6 feet off the ground excite Russ Gleixner in the spring?

Because they tell the machinist from north-central Pennsylvania that he is among bull elk in the woods and possibly hot on the trail of an elk antler — possibly even a matched set —recently dropped from the head of the largest member of the deer family.

Finding antlers shed by elk in the second-largest herd in the Eastern U.S. has become a competitive treasure hunt in Pennsylvania, rivaling other traditional outdoors prizes like trout and spring turkey gobblers.

"It's the ultimate Easter egg hunt for adults," said Tom Benjamin of Lititz, PA, who caught the bug six years ago and has found two antlers — called "sheds" — so far.

In fact, more people might be found browsing through the woods in the 10 northcentral counties where the elk herd lives than head afield there during deer season.

Elk antlers, some weighing more than 17 pounds and stretching to more than 4 feet, are one of nature's most beautiful expressions. Each of the sculpted pieces of bone fall to the ground every spring and are free for the taking.

The shed takes place as the longer days of spring signal bull elk brains to decrease blood levels and reduce testosterone, a male hormone. The antlers fall off as a result, almost immediately followed by the growth of a new, larger set. It begins as cartilage, then turns to bone. Antlers are the fastest-growing living tissue in the world and can grow an inch per day.

While antlers aren't directly needed for survival, they do clue females into the presence of a healthy male. And the antler's "velvet" covering does carry nutrients. Robust males, needed in the gene pool, rise up the pecking order by virtue of their larger antlers and superior fighting ability.

Antler hunting was once only the pastime of locals who found them while hunting, fishing or hiking. But in recent years there has been a stampede to scoop up the sheds. The COVID years, when people were desperate to get outdoors, as well as postings of antler finds on Facebook pages and other social media have whipped up interest.

The Elk Country Visitor Center in Benezette, which opened in 2010, had 55,000 visitors in its first year. In 2019, the first year of COVID, attendance shot up to 520,000.

Fall is the most popular time for elk viewing, when people flock to see bulls bugling and jostling with each other over a harem of females. But springtime shed hunting is quickly escalating, said Ben Porkolab, conservation education coordinator for the Keystone Elk Country Alliance.

"More and more people are coming into the center asking about shed hunting. People are coming from long distances," said Porkolab, who has found nearly 50 elk antlers through the years and leads two popular seminars each spring with tips for collecting them.

"Shed hunting is a pastime you can do at any age. It's great family fun activity. You don't need a license and you can go any time of year," he said.

More people are training their dogs to recognize the smell of antlers and assist in the search.

It's also a plus that 80% of Pennsylvania's elk range is on public land, including state forests,

Top photo: The search for antlers shed by Pennsylvania elk bulls, like these in Clearfield County, has become a springtime craze. (Ad Crable)

Inset photo: The fallen antlers of elk are sculpted gems. Each one is different. (Ad Crable)

Russ Gleixner of Pennsylvania holds a set of massive elk antlers he found that were shed from the same bull. (Courtesy of Russ Gleixner)

Russ Gleixner displays his elk antler treasures throughout his home in St. Marys, PA. (Ad Crable)

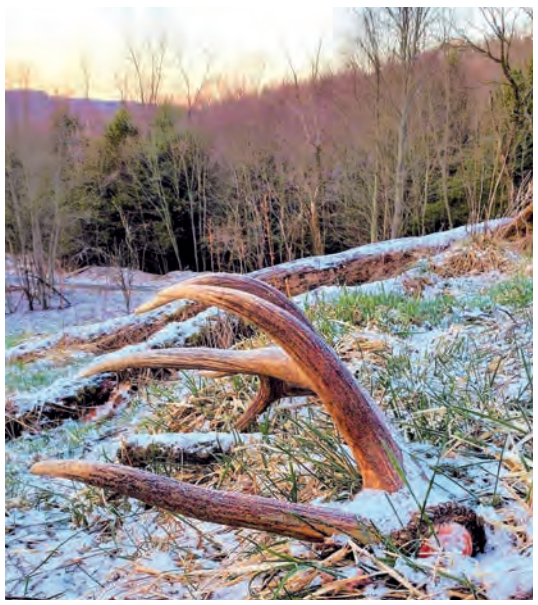
state parks, state game lands and Allegheny National Forest.

Bulls drop their antlers from late February well into April and that is the most competitive time for the search. Gleixner, though, estimates that 30% to 40% of his finds were not dropped in the same year that he collected them.

How may sheds are out there?

"They're never going to find them all," Porkolab said.

A recent aerial survey by the Pennsylvania Game Commission found more than 400 bulls in the elk range. Because bulls drop each side of their antlers separately, that's 800 sheds lying about each spring. And that's not counting the ones discarded in previous years, although rodents and porcupines can make short work of them by nibbling the bone for calcium.



When a collector finds antlers shed by elk, they often take an "as they lay" photo like the one shown here. (Russ Gleixner)

Elk drop their antlers later than white-tailed deer. Most white-tails lose their antlers in January and February. So shed hunters may find both deer and elk castoffs in the spring.

When one side of the antlers drops, the other usually follows closely, sometimes within sight of each other. This spring, Gleixner found one matched set 10 feet apart and another separated by more than a mile.

So, if you decide to try your luck at shed hunting, rest assured there are antlers lying around somewhere. "I would be willing to say a majority of antlers that are shed in the woods are never found," Porkolab said.

There may be plenty of antlers lying in woods and fields on public lands accessible to everyone. But be forewarned that bringing home what some call "Pennsylvania gold" is not an easy task. It takes time, stamina and patience.

Troy Lawrence is a shed hunter who owns, along with his wife, Sarah, the Morning Mist Bed & Breakfast that caters to elk groupies in Benezette. He estimates that it takes, on average, 400 hours of walking to find a shed. "I know many people that have never found one," he said. "It's not an easy sport."

This spring, Gleixner found four sheds in five days. Yet he has hiked 250 miles without finding one. He looks for sheds at least six days a week from late February into mid-April. He has missed weddings and family outings for his obsession.

Heightened interest has also delivered some extreme competition.

The biggest bulls in the spring are sometimes followed by roadies with binoculars day in and day out. If one drops an antler in the open, it can lead to a foot race to retrieve the prize.

"There have been quite a few altercations in the middle of the woods over antlers," said Eric McCarthy, owner of Big Bull Outfitters, which offers guided elk shed searches. "I know guys that use night vision goggles to keep tabs on bulls. That's how competitive and serious it gets."

"You have no friends during shed season. It's a pretty tight-lipped and secretive thing," added Bryan Hales, owner of Elk Country Outfitters. "There's definitely some braggadocio with it."

Gleixner has used his wife's car to keep other shed hunters from following him. He's had competitors track him in the snow.

Jeremy Banfield, the Pennsylvania Game Commission's elk biologist, said citations for illegal feeding of elk go up each spring as people put out piles of corn to keep bulls around until they drop their antlers.

Banfield urges shed hunters to avoid getting so close to elk that they are compelled to use energy running away — their fat reserves are at low ebb coming out of winter.

Gleixner avoids the masses glued to bulls in fields by hitting the woods. There, he looks for signs that bulls are in the area by smelling leaves in elk beds. He'll find a distinct barn-like scent if a bull has stayed there recently. He also looks for the telltale piles of fresh elk scat, which resemble oval nuggets. The wetter and darker the droppings, the fresher they are.

He also searches for "chewing," where elk have used their incisors to peel off the bark on trees. The chewing marks of a male will be noticeably higher up the tree than those of a female. ■

IF YOU GO

The Elk Country Visitor Center is located at 134 Homestead Dr., Benezette, PA. It's open year-round and has some of the best viewing fields. Contact the center at 814-787-5167 or visit elkcountryvisitorcenter.com.

For lodging choices and an elk viewing guide, go to visitpago.com/elk or call 814-849-5197.

To see photos of elk and whitetail deer "sheds," visit the Shed Hunting Pennsylvania Facebook page.

Here are some shed hunting tips:

- Search from late February through April and go where the bulls are. They are often still in the woods, rather than open fields.
- Walk slowly and scrutinize the forest floor. Many things can look like an antler. Binoculars can help.
- Be in good shape and be prepared to put in the miles.
- Respect private property. No trespassing means no trespassing.

Top photo: Russ Gleixner of St. Marys, PA, displays five elk antlers that he found this spring. (Ad Crable)

The long-abandoned artillery batteries of Fort Washington stand on the Maryland shore of the Potomac River at the mouth of Piscataway Creek. (Michele Danoff)

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Mother Nature is going to win — she always does

By Brad Johnson

My little village on Maryland's Eastern Shore is going to drown. What is going to be done to save it? Probably nothing. I am OK with that.

The European settlement of Tyaskin — derived from the Nanticoke Indian word for "bridge" — was established on the banks of the lower Nanticoke River in the 1800s. Natural resources were abundant, and the village grew and prospered as a waterman community.

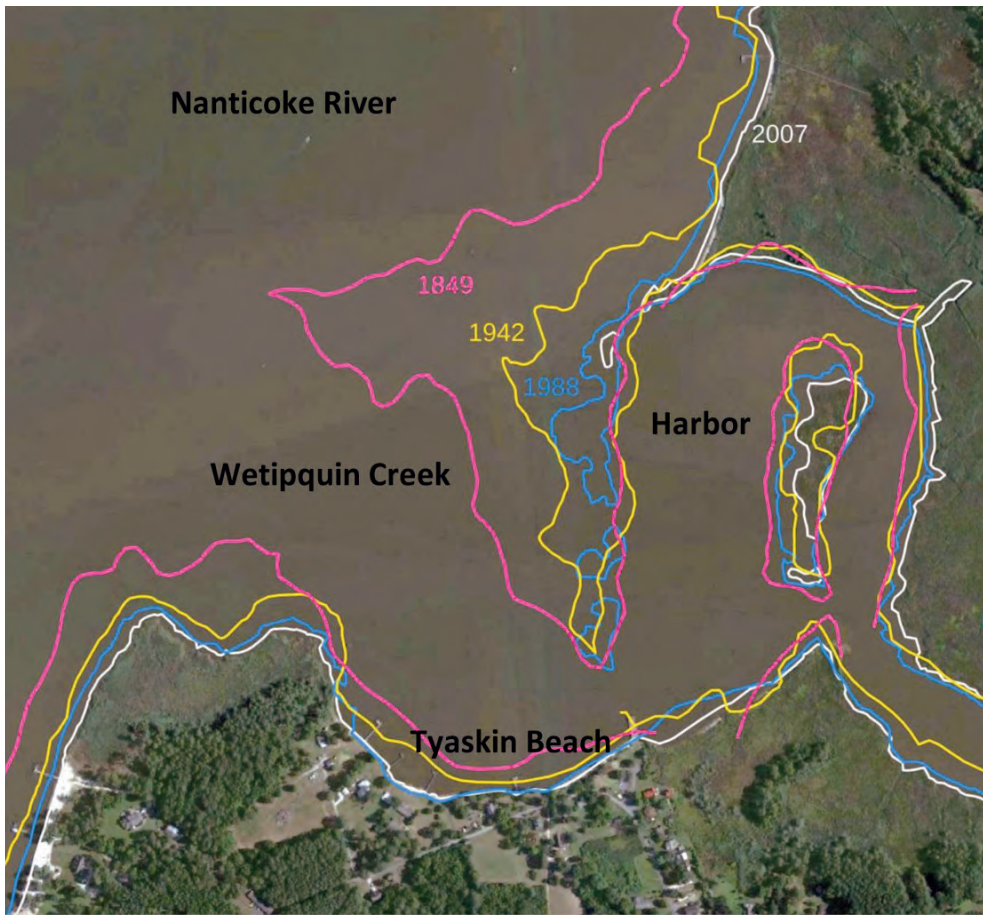
Tyaskin was blessed with a fine natural harbor in Wetipquin Creek. A nearly half-mile-long peninsula stretched south across the mouth of the creek — making it safe for steamboats and workboats to dock — sheltered from strong northwest winds and almost two miles of fetch. Over time, though, the entire peninsula washed away. From 1850 to 1950, its land mass shrank by half. It was reduced by half again between 1950 and the turn of the century.

I vividly recall teaching my young daughters in the 1990s to handle a Sunfish sailboat out there. Instead of being blocked from the river by the peninsula, they could shoot through the gaps of what had become a string of small islands.

Today, all that remains of the peninsula is a small tuft of marsh. Now, the south shore of the creek, Tyaskin Beach and the homes near the water lie naked before the elements. Eventually, all of it — the beach, Tyaskin Park, the old steamboat wharf and probably my house — will wash into the Nanticoke River. A small, precious piece of Chesapeake Bay history will disappear, quite literally.

Should we ask for help in saving Tyaskin?

Recently, the *New York Times* ran a front page story about Venice — the profoundly historic medieval city that knows the scourge of regular flooding as well as anywhere else. In 1984 the Italian government, looking for a way to stop the Adriatic Sea's relentless incursions, approved a plan for an innovative system of sea walls at the three inlets to the Venice lagoon — an estuary about one-sixth the size of the Chesapeake Bay. They were designed to be raised when necessary to stop flooding, then lowered when the waters receded.



Composite aerial map by Cannon Cloud. Source material: Google Earth satellite imagery, July 2022; Maryland Geological Survey (1849, 1988); National Geodetic Survey (1942, 2007).

The original plan called for the seawall to be operational by 1995. It was not until 2020, 36 years after construction contracts were signed, that the Venice seawalls were finally deployed. The project was plagued by corruption, bureaucratic infighting and strong economic headwinds, according to the *Times*, and the total cost has been estimated at well over $5 billion.

By all accounts the seawall system has been a technical success, the article said. It has, in fact, prevented flooding in much of the city. But maybe it has been too successful. Predictions were that the seawalls would need to be raised five times a year. But sea level rise appears to have changed the equation: Since they were first deployed two years ago, the walls have been raised 49 times. Today there is a very real concern that the seawalls, while protecting much of Venice from devastating floods, will starve the estuarine lagoon of flowing water and turn it into a cesspool.

And there is the issue of who benefits from this work. Today, Venice has been "largely abandoned" by locals, the *Times* wrote, and has become a "floating and brocaded theme park" with once-banned ground-floor apartments becoming bed-and-breakfasts for tourists.

Closer to home, and on a much smaller scale, I found myself pondering those same questions at recent town hall meeting hosted by Wicomico County officials at a nearby community center: If we spend millions of dollars to keep the Bay at bay here and elsewhere, what exactly are we saving, and for whom? And just as important, will it work as planned?

At the meeting, locals expressed concerns about a breakwater the county had recently installed at Cove Beach, a few miles downriver from Tyaskin. A similar breakwater installation by the county several years ago, at what's known as Cedar Hill Park nearby, succeeded in slowing erosion and protecting the park as a whole — but it turned the beach there into a "mudpit," to borrow one resident's word for it, making it unusable for recreation or for the Red Cross swimming lessons that once took place there.

Would there be, the residents asked, a similar misfire at Cove Beach? By preventing flooding in a parking lot, would the breakwater ruin the beach that the parking lot is there to serve? A Salisbury university professor in attendance made a compelling case that such a thing might indeed happen, with the breakwater depriving the beach of replenishing sand.

The county representatives at the meeting had nothing particularly encouraging to say in response. The only solution in each case, they said, would be to tear out the break water and truck in sand where needed — solutions for which the county had no budget in any case.

And that brings me to the core question. To save Tyaskin from drowning, should we expect taxpayers on the other side of the county to help foot the bill? Or if it were a state or federal project — as so many coastal resilience projects promise to be — should we ask a schoolteacher from Frederick County or a bus driver from Omaha to help pay for it?

And who is to say that a new breakwater, while effective in some fashion, won't deprive our little Tyaskin beach of the replenishing sand that is created by winter storms.

Mother Nature is going to win. In the long run, she always does.

I for one am OK if Tyaskin eventually washes into the Bay. I only get to use what Mother Nature created for a brief time. I have no expectation that it will survive forever. ■

Brad Johnson is the former president of ACN Energy Ventures, where he managed equity investments in alternative and renewable electricity. Today he spends much of his time exploring the marshes of the lower Nanticoke River.

Chesapeake Bay dreaming and the meaning of life

By Tom Horton

Recently, dozing on a fast-eroding forested bluff overlooking the Chesapeake Bay, I dreamed that I overheard God talking to Earth goddess Gaia, so named by the Greeks.

I sure hope it was just a dream.

God spoke first, as usual.

God: Hey G, haven't talked to you in ice ages! Nice Bay you've assembled here in the last few thousand years. I hope your humans treasure it, because estuaries like this are brief in the geologic scheme of things. There's a very perspicacious human, oceanographer Jerry Schubel, who wrote: "Estuaries come and go with the ebb and flow of the Ice Ages." He's right. For nearly 90% of the time, the globe's water is tied up in glaciers. The oceans recede to their basins, unable to flood the continental edges with bays like the Chesapeake.

Gaia: These humans don't know how to treat a lady! More than half a century since the first Earth Day, and a pandemic's been their only way to really shut down air and water pollution.

Their scientists have begun to call this most lovely interglacial period the Anthropocene instead of its more proper name, the Holocene. That's because they've mucked up the Chesapeake and the planet with what they call "progress."

God: But isn't this polluting proliferation of hairless apes what you planned all along? You know, getting humans to help with that "carbon thing"?

Gaia: Well, carbon in all its forms has always been the way to sweep this girl off her feet, and I'm not talking diamonds. I have embraced that sixth element of the periodic table for 3 billion years. Every cell in the human body — indeed, every living cell on Earth — relies on carbon. Carbon is everywhere: in the paper of the *Bay Journal* and the blood of our bodies. It's with us from beginning to end, present in our baby clothes and our coffins alike.

The sun sets over a marsh at Blackwater National Wildlife Refuge on the Eastern Shore of the Chesapeake Bay. (Dave Harp)

And, truth be told, greening and sustaining and evolving this planet eon after eon was beginning to wear me out. Too much of my carbon was ending up underground, billions of years of organic matter from growing forests and algae and swamps all decaying, turning to coal and oil and methane, buried deep, out of my grasp.

I wanted to feel young and vital again, to get my essential building materials back into circulation.

God: I coulda just hit the reset button, if you'd asked.

Gaia: God, no! That giant asteroid last time was harsh. Poor dinosaurs. They never had a chance to adapt. I decided I would invent a new animal, one clever enough to dig up all my buried carbon, to get my life stuff back into circulation even if it wasn't good for them in the long run.

God: So you mean all those earnest folk who fill the pews on Sundays, seeking the meaning of life, don't know their true purpose is to mine, to pump, to frack and burn, to drive their SUVs like there's no tomorrow? And what happens next, Momma G? Because your plan has enabled the population growth of way more carbon recirculaters than this planet can sustain — 8 billion, headed for 10 and more.

And I'm all out of spare Earths. Sure you wanna nix that asteroid?

Gaia (having the last word, as usual): I've got a plan. Before you head off to tend your other worlds, Lord, look out there across that long and lovely Chesapeake edge of land and water, woods and marsh, blue herons wading and rockfish jumping — some 11,000 miles in all. It's where people want to live — waterfront real estate! Worldwide, close to half of them, billions and billions, have settled near coastlines.

I've been luring them there for 3,000 years, ever since sea level stopped rising after the last ice age and the Chesapeake was fully formed. That's long enough that they all figured it was safe to build their civilizations right on the coasts.

And now that they've done such a fine job of unearthing my buried carbon, the climate's warming, the Antarctic's melting and the seas are rising. They'll cope, but not before many of their communities are under water. And there will be some mass migrations, wars, plagues … you know the drill. Bottom line is I'll have more carbon to regreen this place and fewer humans to mess with my handiwork.

And just maybe, a few million Earth Days from now, after several Chesapeakes have come and gone with the advance and retreat of the ice, they'll learn to worship the sun again, to leave the carbon to their Mother, not evaporate it into the atmosphere.

God only knows I'm out of patience; but I'm not out of hope. ■

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.

Dredged sediment is key for restoring Chesapeake islands

By Paula E. Whitfield

It's August 2019 and heat radiates from the expanse of sunbaked "mud" that covers two-thirds of Swan Island, a once half-drowned 25-acre island at the southern edge of Martin National Wildlife Refuge in the Chesapeake Bay.

The western third of the island, which is part of the archipelago that includes Maryland's Smith Island, is a forested hummock known as the "rookery." The newly placed mud (sediment, strictly speaking, which is a mixture of mud and sand) is about a foot deep and slopes gradually from high to low elevation, west to east. Marsh plants, some 200,000 of them, small and struggling in the summer heat, reach across the otherwise barren landscape in parallel rows.

Months earlier, this sediment was at the bottom of a nearby shipping channel — then dredged by the U.S. Army Corps of Engineers and spread on the island in an effort to restore it. It was enough dredge material to fill 18 Olympic size swimming pools.

In the past, sediment was considered an unwanted byproduct of routine dredging — scraped from the bottom of channels to keep them deep enough for ships. Until fairly recently, the common practice was to dispose of the dredge material upland and offshore, effectively removing sediment from the system. Now sediment is a prized resource in efforts to restore drowning Bay islands.

Given what we are up against, with climate change multiplying threats, we need to think beyond concrete and rebar, beyond even single-habitat restoration. We need to adopt a "multiple lines of defense" strategy to take advantage of the resilience potential of nature. Multiple habitats like islands, wetlands and reefs provide more protective benefits from storm and non-storm conditions than a single habitat type.

Sediment is the key to sustainability for these low-lying ecosystems. Plants have a natural "baffling" effect — slowing the flow of water — which allows sediment to drop out of suspension and settle on the bottom, where the plants trap and stabilize it. This is how natural systems like islands, mangroves, and marshes build elevation. But this can't happen without enough sediment to outpace sea level rise. Plants drown when water rises and there is not enough sediment for them to build elevation.

Swan Island, MD, part of the Martin National Wildlife Refuge in the Chesapeake Bay, has thriving grasses on its eastern acreage where once there was only bare sand. The Smith Island town of Ewell is visible in the background. (Ryan Giannelli/NOAA)

Islands are the mainland's first line of defense from the Bay's waves, reducing erosion and flood risks to communities and shorelines. But those defenses are wearing thin, quite literally. Erosion and land subsidence (sinking land) have done their work for millennia, and rising seas have sped up the process.

Poplar (before restoration), Barren, James, Tangier and other islands have dissolved to slivers of their former selves. In a 15-year period alone (early 1990s to mid-2000s), islands in Tangier Sound lost 21% of their land to erosion from repeated dune and vegetation washovers. This has caused precipitous declines in waterbird nesting.

Islands are a lifeline for struggling bird populations. "Loss of habitat is driving waterbird declines throughout the Bay," said Matt Whitbeck, a wildlife biologist with Chesapeake Marshlands National Wildlife Refuge Complex. "Islands are especially important for birds because they can provide predator-free nesting habitat."

By August 2022, the once mud-caked eastern third of Swan Island had become a lush waist-high meadow of high marsh sloping toward lower elevations, where patches of 6-foot-high marsh grass push outward into a mosaic of intertidal pools and mud flats — now home to skulking egrets and grandstanding fiddler crabs brandishing claws. Sediment trapped by robust low-marsh thickets forms elevated micro-dunes where dune grasses begin to take root. Semipalmated plovers and sanderlings scurry, heads low, across the pockmarked mud flat and through shallow pools in search of their next meal.

While the "elevation capital" has increased and bought the island more time, the erosional trend is clear. Without action — i.e., some kind of intervention to slow erosion, facilitate accretion or add sediment — Swan Island's days are numbered.

This story is playing out all over the Chesapeake. Starting in 1984 with Hart-Miller Island near Baltimore, the Corps of Engineers has used dredged sediment for the restoration of Battery Island, near Havre de Grace in the upper Bay; Poplar Island, near Tilghman; and parts of Barren Island, off upper Hooper Island in the middle Bay. After Poplar's completion, Barren and nearby James Island will receive sediment from the Port of Baltimore.

Danielle Szimanski, a project manager with the Corps' Baltimore District, has been helping to build islands for the last seven years. "The beneficial use of sediment from routine channel maintenance can slow island loss, keep sediment in the system and provide multipurpose benefits," she said. "And, given all the remnants out there, I hope to continue restoring islands."

Fortunately, momentum is building for beneficial-use and island restoration. With this strategy we can capitalize on the resilience power of nature and go beyond the single-minded use of conventional reinforced concrete. With its Engineering With Nature initiative, the Corps of Engineers has embraced natural approaches and a multiple-lines-of-defense strategy. We need to embrace those ideas, too, and develop a new vision of what coastal resilience looks like. ■

Paula Whitfield is a research ecologist, recently retired from the National Oceanic and Atmospheric Administration.

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.

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For a brighter Bay, invest in students, outdoor experiences

By Tom Ackerman

There is a crisis of joy in today's classrooms, more acute than ever after the trials and stresses of remote learning during the COVID-19 pandemic. There is also no doubt that tomorrow's environmental challenges will be more serious and require more creative and cross-disciplinary solutions.

High-quality, hands-on environmental education for today's students can be an answer to both.

I have experienced the impact of this type of education firsthand. I was 16 when my high school biology class visited Smith Island on a field program with the Chesapeake Bay Foundation. The experience forever changed the way I thought about the environment and human impact. The Bay was no longer just a place I was fortunate to visit on vacation with my family. It was a rich community of living things inextricably connected with the people who depend on it, all deeply reliant on clean water for their existence. The lesson shaped the course of my life.

Fifty years ago, school administrators were skeptical about the idea that students and teachers could find instructional value in a day spent on the water. The place to learn was in a classroom, they believed, not in a canoe. Outdoor education, though, has never been just a field trip. There is pure joy but also deep value in learning outside.

Nothing sparks natural curiosity like pulling up a seine net and wondering what strange and exciting creatures might be revealed. Nothing requires teamwork quite like navigating a canoe down a river for the first time.

Students gain the tools for creative thinking and problem solving, discover how they fit into an intricate natural and social system, and explore how they can change it for the better. Studies have shown that environmental education improves academic performance, increases civic engagement and instills a belief that individuals can make a difference.

This is critical for our ability to restore the Bay watershed and solve other complex, generational challenges like climate change. These tasks require a shift in the way we relate to our world and to each other, a change in paradigms entrenched over four centuries of development and industrialization. It takes a deep understanding of how we are all connected — an understanding rooted in experience, not just textbooks.

Students from the Gunston School in Centreville, MD, take part in a seining workshop that was part of the school's Earth Day celebration. (Will Parson/Chesapeake Bay Program).

Fortunately, more schools are seeing the value of learning outside, and more students are getting opportunities for experiential environmental education. This is the result of decades of ground-truthing and advocacy by an incredible cast of educators, administrators and community partners working throughout our watershed.

At the Bay Foundation alone, more than 1.5 million people to date have taken part in our education program, which celebrates its 50th anniversary this year.

The Chesapeake Bay Watershed Agreement includes a target for achieving environmental literacy. State education standards in Maryland, Pennsylvania, Virginia and the District of Columbia now include learning about the Bay and the local environment. In 2011, Maryland became the first state in the nation to make environmental literacy a graduation requirement for all high school students.

Dominique Skinner from Groundwork Anacostia leads a group of Green Team high schoolers during a free paddle night organized by the Anacostia Watershed Society in Washington, DC. (Will Parson/Chesapeake Bay Program)

These are huge wins. Still, with more than 2.8 million students in the Bay watershed, there is a long way to go to ensure that all have access to a high-quality environmental education. Many barriers remain, ranging from logistical challenges like transportation, to concerns about meeting curriculum requirements or a teacher's personal level of comfort teaching outdoors. These barriers are highest for students and teachers in communities challenged by lower economic opportunity.

Overcoming these challenges requires working with teachers and schools from the ground up while also pursuing state and federal education policies that help them achieve success. This can mean training teachers (in any subject area) to use the environment for teaching and learning, or connecting them with peer mentors or resources for getting their students outside.

It can also mean working with school administrators to design curricula that incorporate outdoor learning across disciplines and help achieve the standards to which they are accountable.

In a nutshell, it means putting in place the policies and resources to ensure that every student has an opportunity to learn outside and to become environmentally literate by the time they graduate.

Many educators will tell you that just giving students a moment of happiness and peace in nature is itself a valuable lesson. Educators themselves also need the respite and inspiration nature provides.

These simple moments of connection are what it takes to improve student engagement, create a lasting culture of environmental stewardship and build a brighter future for the Bay, our planet and our society. ■

Tom Ackerman is vice president for Environmental Education and the Henry L. and Grace Doherty Chair at the Chesapeake Bay Foundation. Teachers interested in learning more about the foundation's professional development programs can visit cbf.org/ccsummer.

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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 River watershed. Info: fergusonfoundation.org. Click on "Cleanups."

Become a water quality monitor
The Izaak Walton League invites people of all ages to join one of its monitoring programs. Info: SOS@iwla.org, 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 materials, downloadable instructions.
- *Stream Critters:* Use app to identify stream inhabitants.
- *Monitor Macros:* Become a certified *Save Our Streams* monitor. Learn to identify aquatic macroinvertebrates, collect stream data.

Citizen science: butterfly census
Friend of the Earth's Global Butterflies Census raises awareness about butterflies & moths, their biodiversity. Collect butterfly data 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, file the information on the census' interactive map, database. Info: friendoftheearth.org. Click on "Projects."

Citizen Science: Creek Critters
Use Audubon Naturalist's *Creek Critters* app to check a stream's health by identifying small organisms living in it, then creating a report based on what you find. It's free at App Store or Google Play. Info: anshome.org/creek-critters. Learn about partnerships/host a Creek Critters event: cleanstreams@anshome.org.

PENNSYLVANIA

State park, forest projects
Help the Department of Conservation and Natural Resources maintain natural resources through conservation projects at state parks and forests: clear & create trails/habitat; repair & install plants, bridges, signs; campground hosts; interpretation programs & hikes; technical engineering, computer database assistance; forest fire prevention programs; research projects. Web search: "PA DCNR conservation volunteers."

PA Parks & Forests Foundation
The Pennsylvania Parks and Forests Foundation, a Department of Conservation and Natural Resources partner, helps citizens become, involved in parks and forests. Volunteers learn about park or forest needs, then join or start a friends group. Info: paparksandforests.org.

Middle Susquehanna steward
The Penn State Extension's *Master Watershed Steward* program is expanding across the northern counties of the Middle Susquehanna watershed to include Elk, Potter, Cameron, McKean, Bradford, Susquehanna, Sullivan, Wyoming, Jefferson, Forest, Clearfield, Clarion, Centre, Clinton, Tioga and Lycoming counties. Help preserve clean water resources. Web search: "middle Susquehanna watershed steward."

York County Parks
Volunteer at Nixon Park in Jacobus. Contact: 717-428-1961, NixonCountyPark@YorkCountyPA.gov.
- *Front Desk Greeter:* Ages 18+ can work alone. Families can work as a team.
- *Summer Camp Leader-in-Training & Volunteer Orientations:* 6–8 pm June 1 & 1–3 pm June 3. Teens & adults. Learn, practice how to be leader, mentor for students at nature day camps.

VIRGINIA

Prince William Bandalong
Help to empty trash out of *Bandalong*, Prince William County's trash trap on Neabsco Creek, every Friday. Participants also collect data. Info: Tim Hughes at thughes@pwcgov.org.

John B. Cary Elementary School
Help the Alliance for the Chesapeake Bay maintain the conservation garden at John B. Cary Elementary School in Richmond, 8–11 am May 20. Install native plants; weed, prune, water, spread mulch. Supplies, tools provided. Wear closed-toe shoes, clothes that can get dirty. Bring water bottle. Info: Neal Friedman at 804-775-0951.

Citizen Science: Ghosts of the coast
The Gedan Lab at George Washington University and the Virginia Coast Reserve Long-Term Ecological Research project are documenting the formation of ghost forests — dead forests created by rising sea level. See a ghost forest? Submit observations to storymaps.arcgis.com/stories.

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.

Pond cleanup programs
Join a Prince William Soil & Water Conservation District's *One-Time Pond Cleanup* in the fall or spring. The district needs kayaks to support this effort. Volunteers are also needed to take on longer-term commitments. Info: waterquality@pwswcd.org.

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

Virginia Master Naturalists
Virginia Master Naturalists is a corps of volunteers who help manage and protect natural areas through plant & animal surveys, monitor streams, rehabilitate trails, teach in nature centers. Training covers ecology, geology, soils, native flora & fauna, habitat management. Info: virginiamasternaturalist.org.

Clean Swell App
Use the Ocean Conservancy's free *Clean Swell* app to instantly upload cleanup results from anywhere in the world to a database that provides a global snapshot of trash and supplies researchers and policy makers with insight to inform solutions. The app also keeps track of your results and lets you share them on social media. Earn badges based on the type, quantity of trash and cleanups recorded. Web search: "Ocean Conservancy Clean Swell app."

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 for details.

Virginia Living Museum
Virginia Living Museum in Newport News needs volunteers ages 11+ (11–14 w/adult) to work alongside staff. Educate guests, propagate native plants, install exhibits. Some positions have age requirements. Adults must complete background check ($12.50). Financial aid applications available. Info: volunteer@thevlm.org.

Chemical water monitoring teams
Help the Prince William Soil and Water Conservation District and Department of Environmental Quality by joining a Chemical Water Quality Monitoring Team. Training provided. Monitoring sites are accessible. Info: Veronica Tangiri at waterquality@pwswcd.org or waterquality@pwswcd.org, pwswcd.org.

MARYLAND

Oyster growers sought
The Marylanders Grow Oysters program is looking for a waterfront communities or property owners to grow oysters. Participants must own an existing pier or wharf with at least 4 feet of water at low tide with enough salinity to support oyster survival in one of the selected creeks, coves, inlets. They will provide maintenance for up to four cages of oysters for up to 12 months. Once oysters are about an inch in size, they will be planted on local sanctuaries to filter water; enrich tributaries' ecosystems; provide habitat for fish, crabs. There is no cost to participate. Web search "Marylanders Grow Oysters."

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.
June issue: May 11
July-August issue: June 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 Wood ear
2. C Turkey tail
3. E Chicken of the woods
4. A Jack-o-lantern mushrooms
5. D Coral-pink merulius

BULLETIN BOARD

Anita C. Leight Estuary Center
Meet 9–11 am May 21 at the Anita C. Leight Estuary Center in Abingdon for an *Invasinators* workday. Ages 14+ (12 & younger w/adult). Remove invasive plants, install native species, learn about problem plants, removal & restoration strategies. Wear sturdy shoes, long sleeves, work gloves. Weather permitting. Preregistration recommended. Info: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

Lower Shore Land Trust
The Lower Shore Land Trust needs volunteer land stewards. Info: Frank Deuter at fdeuter@lowershorelandtrust.org.

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

Grow, plant, maintain trees
Stream Link Education seeks volunteers to help grow, plant and maintain young forests in Frederick County. Register: www.streamlinkeducation.org/volunteer. Info: Lisa Baird at lisa.streamlink@gmail.com, 443-538-6201. All events take place 9–11 am.
Please note: Bulletin Board inadvertently mixed up the dates for each team in the April issue. The following is the correct schedule.
- *Tree Planting:* May 6, 13. Ages 10+ Help grow native trees in outdoor nurseries.
- *Nursery Teams:* May 20, 27 & June 3. All ages.
- *Tree Teams:* May 20 & June 3, 10, 17. Ages 10+ Maintain young forests.

Delmarva Woodland Stewards
Maryland property owners on the Delmarva Peninsula who are interested in changing their forest management practices to increase species diversity, eliminate invasives, improve forest health are encouraged to sign up for the *Delmarva Woodland Stewards* program. Web search: "Delmarva Woodland Stewards."

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

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 Tuesdays–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 May and June 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.

Invasive Species Tool Kit
The Lower Shore Land Trust is offering a free, online Invasive Species Tool Kit to identify, remove weeds on your land. Residents can also report invasive clusters in their neighborhood, parks, public lands. Info: lowershorelandtrust.org/resources.

Citizen science: angler surveys
The Volunteer Angler Survey app helps the Department of Natural Resources collect species, location, size data used in developing management strategies. Surveys: artificial reef initiative, blue crab, freshwater fisheries, muskie, shad, striped bass. Win quarterly prizes. Info: dnr.maryland.gov/ Fisheries/Pages/survey/ index.aspx.

Chesapeake Bay Environmental Center
Volunteer at the Chesapeake Bay Environmental Center in Grasonville a few times a month or more often. Help with educational programs; guide kayak trips & hikes; staff the front desk; maintain trails, landscapes, pollinator garden; feed or handle captive birds of prey; maintain birds' living quarters; monitor wood duck boxes; join wildlife initiatives. Or participate in fundraising, website development, writing for newsletters, events, developing photo archives, supporting office staff. Volunteering more than 100 hours of service per year earns a free one-year family membership. Info: volunteercoordinator@bayrestoration.org.

Maryland State Parks
Search for volunteer opportunities in state parks at ec.samaritan.com/custom/1528. Click on "Opportunity Search" in volunteer menu on left side of page.

EVENTS/PROGRAMS

PENNSYLVANIA

Solar siting seminar
Join the Choose Clean Water Coalition and the Alliance for the Chesapeake Bay 1:30 –4:30 pm May 22 at the Hilton Hotel in Harrisburg, for *ForumPlus/Siting Solar: An Understanding of Solar Fields in the Bay Watershed.* The seminar will examine where solar fields are placed based on implications of zoning policies in various jurisdictions. It will also discuss solar siting case studies from throughout the watershed; identify best practices, pitfalls to avoid, opportunities for collaboration; designate next steps for communities to support regions making land use decisions that have benefits for local water quality. Registration for this ForumPlus event is free. Registration is a part of the Choose Clean Water Conference, but it does not require attending the conference. To register: web search "Choose Clean Water conference," click on "register for the conference," then "register now," then select "Monday Forum-Plus Only registration."

York County Parks
Events at York County Parks are free and require preregistration unless noted otherwise. Info: NixonCountyPark@YorkCountyPA.gov or 717-428-1961. When registering, include number of participants, names, children's ages, phone number.
- *Nature Walks:* 2–3 pm Nixon Park, (near Jacobus). May 7 (*Wildflowers*). May 14 (*Mothers in Nature*). May 21 (*Pond & Wetlands*). May 28 (*Birds & Blooms*). June 4 (*Creek Walk* - water shoes required). June 11 (*Treemendous Trees*). No registration.
- *Statewide Free Fishing Day:* May 28. Kain Park (near Jacobus) & Spring Valley Park (near Springfield Township). No license needed. All other fishing regulations apply.
- *York County Master Gardener's Native Plant Sale:* 8:30 am–2 pm May 13. Rudy Park (near Emigsville). Master Gardeners will be available to answer questions. Educational programs. Food, garden tools, books, stepping stones will also be for sale. Full listing: Penn state Extension Office at717-840-7408. No registration.

Middle Susquehanna
The Middle Suquehanna Riverkeeper Association's *Nature Book Club* meets 7 pm May 22 at Shikellamy State Park Marina (Zoom option available). Participants will discuss *The Beast in the Garden: A Modern Parable of Man and Nature* by David Baron. Registration required. Web search "Middle Suquehanna Riverkeeper," click on "More" in menu, scroll down to Nature Book Club.

MARYLAND

Farm Alliance of Baltimore
The Farm Alliance of Baltimore, a membership organization of urban farms, neighborhood growers and friends, invites the public to field days. Preregistration required. Info: programs@farmalliancebaltimore.org or web search "Farm Alliance of Baltimore" and click on "Events."
- *Urban Flower Farming:* 6–8 pm May 24. Hillen Homestead. Overview of small-scale flower farming techniques; business tips for small-scale producers; tour of farm, which uses no-till production, no synthetic fertilizers/ pesticides, locally sourced compost for fertility. Flower harvesting, bouquet arranging tips include opportunity to make a mini bouquet to take home. $15+
- *Save Fruit Trees & Berries:* 6–8 p.m. May 31. Druid Hill Park. Overview of best practices for orchard planting, care, management. Learn about wild harvesting; taste wild mulberries. $15.
- *Pest & Weed Management on the Farm:* 6–8 pm June 7. 3901 W Bay Ave., Baltimore. Learn integrated pest management fundamentals: recognizing & monitoring key pests; decision-making guidelines; intervention tactics; how to assess as a whole. $15.

Drayden school open houses
The St. Mary's County Museum Division, in partnership with the Unified Committee for Afro-American Contributions, are offering free open houses at the Drayden African American Schoolhouse in Drayden, 11 a.m. to 2 p.m. May 6, June 3 and Juneteenth weekend, 17–19. The restored school is one of the nation's best-preserved one-room African American schoolhouses. Volunteers at the open houses will share stories about schoolhouse's history & importance to education in St. Mary's County, how African American students learned in this school up until the mid-20th century. Special programs for school, bus, tour groups can be arranged as well as individuals who would like to visit outside open house hours. Info: 301-994-1471, facebook.com/DraydenSchool.

MD Leopold Conservation Award
The Sand County Foundation and national sponsor American Farmland Trust are accepting nominations for the *2023 Maryland Leopold Conservation Award*, which recognizes landowners in 25 states who inspire others with their dedication to land, water, wildlife habitat management on private, working land. It is given in honor of renowned conservationist Aldo Leopold, author of *A Sand County Almanac*, which calls for an ethical relationship between people and their land. The awardee receives $10,000 and the conservation success found

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BULLETIN BOARD

continued from page 35

on their farm or forest will be featured in a professional video. Winner will be announced at the Maryland Farm Bureau Federation's Annual Convention & Meeting of Delegates in December. Owners of farms or forests in Maryland may nominate themselves or be nominated.
The deadline for the application, found at cognitoforms.com/MarylandFarmBureau/MarylandLeopoldConservationAward, is Aug. 1. Info: www.leopoldconservationaward.org.
Maryland state partners include Keith Campbell Foundation for the Environment, Maryland Association of Soil Conservation Districts and Maryland Farm Bureau Inc.

MD Youth Fishing Rodeos

The Maryland Department of Natural Resources is working with dozens of organizations in 14 counties to offer nearly 50 free fishing opportunities for thousands of youth through its *2023 Maryland Youth Fishing Rodeo*. Many take place at state parks and other public lands. While all are free and open to the public, registration is required because of space limitations.

Allegany County

- *Patch:* 8 am May 6. Info: Christopher Toey at 240-580-4442.
- *Laurel Run:* 7 am May 13. Info: Donna Thomas at 301-876-8614.
- *Patch:* 2 pm May 13. Info: Sharon Merrbach at 301-463-2498.
- *Lions Pond (Glendenning):* 9 am May 20. Info: Nick Green at 240-362-3918.
- *Midland Sportsmans Club:* 2 pm June 4. Info: Sharon Merrbach at 301-463-2498.
- *Battie Mixon:* 10 am June 10. Info: John Dawson at 240-727-0785.

Baltimore City

- *Patterson Park:* 10 am May 13. Info: Bob Wall at 443-955-0484.
- *Hillcrest Park Lake:* 7 am June 10. Info: Joan Mitchell at 410-887-6994.

Calvert County

- *Calvert Cliffs State Park:* 8 am June 10. Info: Sandy Abell at 410-586-1101.

Carroll County

- *Roberts Mill Pond:* 8 am May 6. Info: Lorena Vaccare at 410-751-1100.
- *Prospect Park:* 8 am May 6. Info: Ben Henniges at 240-401-5512.
- *Krimgold Park:* 8 am May 21. Info: Megan Erpenstein at 410-386-2103.

Frederick County

- *Klines Pond:* 9 am June 3. Info: Mike Hartdagen at 240-446-4231.

Garrett County

- *Grantsville Stormwater Pond:* 7 am May 6. Info: Robin Jones at 301-895-3144.
- *Herrington Lake:* 8 am May 6. Info: Jim Riley at 301-334-9180.
- *Bear Creek:* 8 am May 13. Info: James Tallentire at 724-208-2972.
- *Muddy Creek:* 9 am May 27. Info: Jim Smith at 310-616-4754.
- *Bynum Run:* 10 am June 10. Info: Bob Wall at 443-955-0484.

Montgomery County

- *Stevens Pond:* 8 am May 13. Info: Preston King at 301-370-9706.
- *Kings Pond:* 8 am May 21. Info: Jennifer Scully at 301-528-3463.
- *DeSimon Pond:* 9 am June 10. Info: Lauren Tuori at 240-243-2336.

Washington County

- *Lions Club Park:* 8 am May 20. Info: Melissa Hargreaves at 240-527-5801.
- *Cushwa Basin:* 9 am June 3. Info: Johnathon Harrell at 301-988-0919.

Wicomico County

- *Tributary of the Wicomico:* 8 am June 3. Info: Lillie Olson at 410-548-4900.

Worchester County

- *Newton Pond:* 9 am May 27. Info: Trudy Gebhardt at 410-632-2144.

Patuxent Research Refuge

Patuxent Research Refuge's National Wildlife Visitor Center on South Tract [S], and the refuge's North Tract [N], both in Laurel, offer free public programs. Preregistration required except where noted. Note special accommodation needs when registering. Info: 301-497-5887; 301-497-5772; fws.gov/refuge/patuxent-research/events.

- *Kids' Discovery Center:* 9 am–12 pm (35-minute time slots, on hour), Tuesday–Saturday. [S] Ages 3–8 w/adult. Ant-themed crafts, puzzles, games, nature exploration. Call 301-497-5760 to register.
- *Monarch Magic Center:* 9 am–4:30 pm Tuesday–Saturday in May. [S] All ages. Observe all stages of monarch butterfly development: eggs, caterpillars, chrysalises, adults. Video loop available. No registration. Volunteers needed; call Barrie at 301-497-5772.
- *Night Hike:* 8:30–10:30 pm May 12. [N] All ages. Stroll on Merganser Pond Trail. Look/listen for bats, beavers, frogs, crickets.
- *Family Fun/Reduce, Reuse, Recycle:* 10 am–1 pm, May 12 & 13 [S]. All ages. Activities, crafts, games. Learn to reduce, reuse, recycle, generate less trash. No registration.
- *Easy Pollinator Habitat Gardens:* 2–3 pm May 13. [S] All ages. Plant native species; learn how to make a backyard mini wildlife refuge for native pollinators.
- *Bugs & Slugs:* 2–3 pm May 13. [S] Ages 4–7. Interactive nature walk reveals how bugs are nature's recyclers.
- *Pollinators in a Pot:* 2–3 pm May 20. [S] All ages. Create a wildlife home in limited patio, deck space. Adopt a native plant grown at the USGS Bee Lab that attracts monarchs.
- *Photo Adventure Scavenger Hunt:* 9:30 am–1 pm May 27. [N] All ages. Use clues; hunt for sculptured stones, mystery objects, plants, animals; learn about refuge's history, features. Requires driving 1–2 miles, walking short distances. Bring camera/cell phone to record observations. No registration.
- *Riding Bicycles to Experience North Tract:* 10–12:30 pm, May 20. [N] Ages 10+ Experience local wildlife, plants, historical sites on 12-mile guided ride. Weather-dependent. Rough asphalt road may be unsuitable for narrow road tires. Bring bike, snack, water bottle, helmet.

Anita C. Leight Estuary Center

Meet at Anita C. Leight Estuary Center in Abingdon. Ages 12 & younger w/adult. Register for all programs, except where noted; payment due at registration. Info: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

- *Family Feed:* Participants choose time, May 11, 18, 25 & June 1, 8, 15, 22. All ages. Behind-the-scenes opportunity to help feed animals. Free. Register at least 24 hours prior.
- *Mother's Day Bouquet:* 1–2 pm May 13. All ages. Bring the mother figure in your life to take in spring's beauty, create a bouquet for her. Register by May 10. $10/family
- *Wild Mother's Paddle:* 3:30–6 pm May 13. Ages 8+ Search for wildlife moms, newborns. $15.
- *Meet a Critter:* 1:30 pm May 14 & 28. All ages. Learn about a live animal up close. Free. Register at least 48 hours prior.
- *Flowers, Bees & Pollinators Please!* 10:30–1:30 am May 20. Ages 5+ Bring the mother figure in your life to take in spring's beauty, create a bouquet for her. $10/family. Register by May 17.
- *Ponds & Polliwogs:* 1–2 pm May 21. Ages 5+ Dip a net into ponds, puddles to see what is swimming in them. $10/family Register by May 19.
- *Springtime on the Creek:* 1:30–4 pm May 27. Ages 8+ Explore Otter Point Creek's channels by canoe. $15.
- *Memorial Day Weekend Paddle:* 1–3:30 pm May 28. Ages 8+ Look for migratory birds & marsh's wildflowers, animals. $15.
- *Wade In Festival:* 1–4 pm June 4. All ages. Wade into Otter Point Creek. Canoeing, fish seining, live animals, DPW's Seymour Clearwater, water chemistry activities, fish printing, decoy carving demos. $5/car. No registration.
- *Summertime Seining:* 1:30–2:30 pm June 4. All ages. Get hands, feet wet using a 100-foot seine net to capture the creatures swimming along the shore. Fish activities. $10/family. Register 48 hours prior.
- *Homeschool Marsh Canoe:* 9:30 am–12 pm June 6. Ages 12–16. Learn canoeing basics, explore marsh's ecosystem. $15. Register by June 5.
- *Homeschool Marsh Kayak:* 9:30 am–12 pm June 8. Ages 12–16. Learn kayaking basics, explore marsh's ecosystem. $15. Register by June 7.
- *Preschool Bay Day:* 10:30 am–2 pm June 10. Ages 5 and younger w/adult. Games, shore exploration, crafts. Be ready to get wet! $10/child. Register by June 7.
- *Critter Dinner Time:* 1:30–2:30 am June 10. All ages. Learn about turtles, fish, snakes while watching them eat. Free. Register by June 9.

RESOURCES

Fishing & crabbing guide

The 2023 edition of Maryland's *Guide to Fishing and Crabbing* is available at eregulations.com/maryland/fishing. Its information includes state records, licensing, limits, fish identification for the Chesapeake Bay, Coastal Bays and Atlantic Ocean, as well as nontidal waters across Maryland.

NOAA interpretive buoys

The National Oceanic and Atmospheric Administration's Chesapeake Bay Interpretive Buoy System offers real-time weather and environmental conditions as well as information about Capt. John Smith's voyages in the 1600s. The buoys are located at Annapolis, Gooses Reef, Potomac, Stingray Point, York Spit, Jamestown and First Landing. Go to buoybay.noaa.gov/about/about-system to download the app for an Android or iPhone.

African-American driving tour guide

Beach to Bay Heritage Area's African-American Driving Tour brochure: *StoryWays, A Journey of Faith & Freedom on Maryland's Eastern Shore*, is available. The self-guided tour of 29 sites highlights places and people that have made a significant impact to the region.Email info@beachesbayswaterways.org to receive a free copy.

Chesapeake Network

Join the Alliance for the Chesapeake Bay's Chesapeake Network (chesapeakenetwork.org) to learn about events and opportunities that protect or restore the Bay, including webinars, job postings and networking.

MARYLAND

Conservation Careers Guide

The Maryland Department of Natural Resources' new online *Guide To Conservation Careers in Maryland* presents career options for young adults and career changers who want to make a difference, enjoy being outdoors, are passionate about the environment. The guide reminds readers that conservation careers are not limited to life science and geosciences but include a wide range of disciplines that support action to protect, preserve, restore, conserve natural resources. To read the guide, web search "guide to conservation careers in Maryland DNR."

Fishing report

The Department of Natural Resources' weekly *Fishing Report* includes fishing conditions across the state, species data, weather, techniques. Read it online or web search "MD DNR fishing report" to sign up for a weekly (Wednesday) email report.

CHESAPEAKE CHALLENGE

— Kathleen A. Gaskell

Tree-mundus fungus among us


A

(Keith Miklas/CC BY-SA 4.0)


B

(Vegan Feast Catering/CC BY 2.0)


C

(Public domain)


D

(Wearethechampignons/CC BY 4.0)

If while hiking in the woods, your friend shouts, "Look at that fantastic fungus!" chances are you'll start scanning the ground. You might be looking in the wrong place. Here are fungi that grow on trees. Match them up with their photos and descriptions. Answers are on page 34.

Chicken of the woods (*Laetiporus sulphureus*)
Coral-pink Merulius (*Phlebia incarnata)*
Jack-o-lantern mushrooms (*Omphalotus illudens*)
Jelly ear (*Auricularia auricula-judae*)
Turkey tail (*Trametes versicolor*)

Title image: *Jack-o-lantern (PublicDomainImages.net)*

1. One look at me and you know how I got my name. I survive droughts by totally drying out but can rehydrate when it rains. I grow on conifers. I am a jelly fungus and appear during rain or wet conditions.

2. My colorful fanlike shape looks just like my name. My outer stripe/zone is always the brightest. As I age, algae may grow on some of these zones, giving them a green tint. I am a polypore mushroom. Instead of gills, I have pores on my underside.

3. I grow in large pale yellow and orange shelves, or brackets, often on the wounds of oaks. Sometimes, my brackets weigh more than 100 pounds. I am a parasitic species and produce brown rot on my host tree, much to its detriment.

4. See that faint green glow in the woods at night? That's us trying to attract insects to our gills so they can help spread our spores. During the day, we are a clump of orange mushrooms on a decaying stump or base of a hardwood tree. I may look like edible chanterelles, but don't confuse us: I am poisonous!

5. I get my name from my bright salmon branched folds, which fade as I age. Look for me growing in clusters on hardwoods. I am almost never found without the false turkey tail mushroom somewhere nearby.


E

(Lee Collins/public domain)

There's a 'fun guy' in your family tree

Fungi were once considered part of the plant kingdom. Not only are they now a kingdom of their own, but research shows they are more closely related to animals: They take in nutrients from organic matter, while plants create food through photosynthesis. Fungi cell walls contain fibrous material called chitin, as do arthropods; plants do not.

Monumental mushrooms: One of Earth's largest living organisms is a single honey mushroom (*Armillaria ostoyae*) discovered in the Malheur National Forest in Oregon in 1998. It covers 2,384 acres and is estimated to be 2,400–8,650 years old. The fossil of a 20-foot-tall fungus that went extinct more than 350 million years ago was found in Saudi Arabia.

Capped crusader: Oyster mushrooms are used to clean oil spills. Researchers have discovered that this species also can decompose plastic while still creating an edible mushroom.

5% fruit: The "mushroom" or fruit is only a small part of the organism. The other 95% of the fungus is beneath the surface.

Heard it through the root-vine: A vast, symbiotic relationship between trees and fungi roots exists below the forest floor. These fungi, called mycorrhizal mushrooms, share the nitrogen and phosphorus they absorb from the soil with the tree roots, which in turn share simple sugars with the fungi. It was discovered in the 1990s that trees use the shared fungal network to warn each other about pests, drought and disease. It is now known as the "wood wide web."

Picky picking: About 50% of all known mushrooms are inedible but harmless; 20% can cause illness; 1% percent are lethal.

Zap adds zip: Inspired by observations in the wild, scientists blasted different mushrooms with artificial lightning. It spurred growth in several species and doubled the growth rate of shiitake mushrooms.

When you're feeling blue, think native plants

By Jamie Alberti

To me, "feeling blue" does not mean feeling sad. I've always been drawn to and soothed by the color blue, which I suppose is not unrelated to my affinity for water.

But it goes beyond that. My wardrobe is predominantly blue and several rooms in my home are painted blue or blue-gray. I couldn't even be persuaded into fall color schemes for my mid-October wedding — it was blue with pops of yellow!

My preference for blue includes my outdoor space. If you enjoy a dash of blue in your yard or garden — and want to improve water quality and help pollinators while you're at it — consider my five favorite native plants. These are all perennials, except for the blueberries, which of course are fruit-bearing shrubs.

Dwarf crested iris: My hands-down favorite native plant is the dwarf crested iris (*Iris cristata*). It's easy to grow, low maintenance and deer resistant. It's also low growing (around 6 inches high) and spreads quickly, making it an excellent groundcover. This iris is a great choice for my shady backyard, although it can also tolerate sun. It has a short but spectacular blooming period in the spring, and its sword-like leaves provide a bluish green color all summer. The irises attract hummingbirds but are also visited by other birds, as well as bees and butterflies. They prefer acidic, medium-moist soil, which makes them a good rain garden plant.

Eastern blue star 'blue ice': For my front yard, I selected the 'blue ice' cultivar of eastern blue star (*Amsonia tabernaemontana*), a shorter, more compact version of the typical blue star in a deeper blue. Its starry blue flowers bloom from late spring to early summer after its second year. It grows easily and does best in full sun and moist, fertile soil. It is drought tolerant and can tolerate wet soil for short periods.

Highbush or lowbush blueberry: While blueberry bushes don't have blue flowers, they do produce a mighty tasty blue fruit! The highbush blueberry (*Vaccinium corymbosum*), the fruit usually found in grocery stores, is a common choice for home gardens. It prefers well-drained, acidic soil and full sun, typically producing ripe fruit from mid or late July until mid-August. Be sure to get them before the birds do! We harvest a small amount for ourselves and leave the rest for our feathered friends.

Lowbush blueberries (*Vaccinium angustifolium*) are often marketed as wild blueberries. They are smaller, sweeter and darker than those of the highbush. They prefer growing conditions similar to the highbush but are shorter (up to about 2 feet) and produce less fruit.

Which native blueberry should you choose? Plant both! It's the best of both worlds, and the birds will thank you.

Creeping sedge 'bunny blue': I chose the 'bunny blue' cultivar of the creeping sedge (*Carex laxiculmis*) because it grows very nicely in a heavily shaded area of my yard. This cultivar, also known as 'hobb,' typically grows in a dense rounded clump up to 12 inches tall with grassy blue-green leaves. Creeping sedge is easy to grow and cultivate. It's a wonderful groundcover, and I have successfully transplanted offshoots to other areas. Creeping sedge prefers medium to wet soil in part to full shade and is deer tolerant.

Specific sedge species are difficult to identify; there are more than 1,500 species! The genus name from Latin means "cutter" and refers to the sharp leaves and stem edges found on most species. "Sedges have edges, rushes are round; grasses have nodes right down to the ground" is a helpful saying to remember when attempting to identify grasslike plants.

Great blue lobelia or blue cardinal flower: This spiky blue flower is stunning in partial shade or full sun and moist soil, making it another great choice for rain gardens. Once it finds a moist spot that it likes, it will reseed each year and spread. Great blue lobelia (*Lobelia siphilitica*) starts out as a low-lying cluster of leaves. Later in the season, stems appear. Usually at the end of July into August and September, it produces tubular flowers similar to the native cardinal flower. It's a favorite of native pollinators, including bees, butterflies and hummingbirds.

Honorable mention: Virginia bluebells. This ephemeral plant (*Mertensia virginica*) emerges with thick green leaves and blue/purple buds to announce the arrival of spring, blooming for two to three weeks in April. The flowers hang in clusters and are pollinated by bumblebees, other long-tongued bees, butterflies, skippers, hummingbird moths, flower flies, bee flies and hummingbirds. They spread using rhizomes, or underground stems, and reseed freely, making them one of the easiest wildflowers to grow. Bluebells prefer moist but well-drained soil in part to full shade. Once established, they typically do not like to be disturbed. Any transplant attempts should be made while the bluebells are dormant.

A *Dwarf crested iris. (Eric Hunt/CC BY-SA 4.0)*

B *Eastern blue star 'blue ice.' (Public domain)*

C *Highbush blueberry. (R.A. Nonenmacher/CC BY-SA 4.0)*

D *Creeping sedge 'bunny blue.' (Piotrus/CC BY-SA 2.5)*

E *Great blue lobelia, also known as blue cardinal flower. (HLWolfe/CC BY-SA 4.0)*

F *Virginia bluebell. (Public domain)*

The benefits of native plants are almost endless! Conservation landscaping using native plants supports clean air and water, wildlife, and a more beautiful, healthy human environment. They stabilize soil, prevent erosion, control runoff and reduce pollutants entering groundwater. Once native plants are established, they require less resources and maintenance, like mowing, water and fertilizers. And, of course, they support diverse wildlife, including our favorite pollinators.

So many choices, and those are just the blue ones! To learn about native plants, look up your nearest native plant society — every state in the watershed has one, and in some cases, several. Check out the Chesapeake Bay Native Plant Center (nativeplantcenter.net), a collaboration between the Alliance for the Chesapeake Bay and the U.S. Fish and Wildlife Service. ■

Jamie Alberti is director of the Alliance for the Chesapeake Bay's Green Infrastructure Program.

Meet the Carolina chickadee, resourceful 'bringer of news'

By Alonso Abugattas

Carolina chickadees are common visitors at birdfeeders in most of the Bay watershed, able to survive year-round by expanding its diet from insects in warmer weather to seeds in winter. (Wildreturn/CC BY 2.0)

One of my favorite birds is the chickadee. The Carolina chickadee (*Poecile carolinensis*) is the one we usually see around the Washington, DC, area.

The nearly identical black-capped chickadee (*Poecile atricapillus*) usually lives farther north, though the species overlap a bit in central and south Pennsylvania. The black caps are known to venture farther south during irruption years, when there is severe cold weather or food shortages.

The energy and resourcefulness of chickadees, along with biological adaptations, allow them to live in our yards year-round. In winter, when most other insect-eating birds migrate, they augment their diet with seeds. People who feed birds are likely to find chickadees, which are particularly fond of black oil sunflower seeds, to be among their best customers.

Feeders are a benefit when temperatures dip below 10 F. Chickadees need 20 times more food in winter than summer to maintain their metabolisms, so extra seed or suet can be a lifesaver. Finding 60% (the equivalent of 250 sunflower seeds) of their body weight each day is not easy. As if planning ahead, they cache food away under loose bark or other nooks and crannies.

Chickadees have several ways of conserving energy. They fluff their feathers and grow up to 30% more feathers in winter to trap body-warmed air. They can also enter torpor, reducing their body temperatures by as much as 20 degrees on winter nights to conserve fat reserves.

Chickadees are curious and often take risks. Birders know that a chickadee is often the first to respond to the "pishing" call birders use to lure birds into the open. They often lead mixed flocks of birds in mobbing screech owls and other predators as well.

Their calls can be used to warn each other or even other animals of danger. Tom Starr, a notable figure in Cherokee history, claimed to have had his life saved when he heard a *tsikilili* (chickadee) give its warning call. He realized he was being followed and escaped to safety. To the Cherokee, a *tsikilili* is considered a "bringer of news." I'm inclined to believe Starr's story. I've often heard chickadees raising a ruckus and investigated. Usually it was just a cat, but sometimes it was a snake, screech owl or something even more interesting.

Once when I was testing my skills calling turkeys at a park where I worked, the gobblers I was "talking" to suddenly went quiet. I thought I had hit a sour note but then heard something approaching. It was a red fox, apparently looking for a turkey dinner.

Several chickadees had heralded his arrival, and their calls may have saved a turkey's life. The chickadees got within a foot or so of the fox (and the fox got within 5 feet of me before I stood up and gave it a good scare), relying on their quickness to escape. With that much commotion and pestering, it would have been hard to sneak up on anything.

It's easy to get chickadees to nest in your yard. They will use a bird box (or existing cavity), with an entrance hole of about 1.125 inches. If possible, put the box up in February — they may roost in it on winter nights — preferably in an evergreen tree 6–12 feet high.

To increase the odds of getting them to accept your housing gift, place some leaves inside. Chickadees often use "house cleaning" as a pair bonding ritual.

If they do nest, don't disturb them. If you do, prepare for a surprise: Females can produce a snakelike hiss. More important, though, you can cause harm by stressing them. Plus, it's illegal to bother nesting wildlife.

Chickadees lay five to eight white eggs with reddish spots in a cavity nest lined with moss. It often includes grass, feathers and hair. I've heard stories of these birds plucking hair from live animals, such as dogs, but have only witnessed one pulling hair off a dead fox. It takes 11–12 days for the eggs to hatch, then another 13–17 days for the nestlings to fledge. Two broods per season is rare but not unheard of.

Carolina chickadee parents feed their young almost exclusively on insects. Caterpillars are their favorite. It takes about 9,000 caterpillars to raise one brood. Studies have shown that when insects aren't available, the young can die if fed only seed. This is why chickadees prefer to nest near native trees (and, in turn, native insects) as opposed to yards with nonnative plants. Their reproductive success is at stake.

Some people have tamed chickadees to the point of feeding them by hand. I did this once. It was amusing to watch them chisel open seeds or try to wrestle them from my fingers when I refused to let go. Even if your chickadees aren't quite so bold, these little dynamos are fun to watch all year long — whether pestering a predator, stealing a tuft of hair from a dog or making use of a bird house.

This Carolina chickadee was photographed at Mariner Point Park on the Gunpowder River in Harford County, MD. (Iwolfartist/CC BY 2.0)

Chickadees can live up to 12 years, although wild ones have shorter lifespans. They are easy to attract, so be a good neighbor and really get to know the Carolina chickadee. ■

Alonso Abugattas, a storyteller and blogger known as the Capital Naturalist (capitalnaturalist.blogspot.com), is the natural resources manager for Parks and Recreation in Arlington County, VA. He is filling in this month for regular On the Wing columnist Mike Burke.

Don’t be a slowpoke – the Bay’s turtles need your help now

By Kathy Reshetiloff

The bog turtle, a federally threatened species, is one of the world’s smallest turtle species, with an average weight of less than 4 ounces. (Pete Pattavina/ U.S. Fish & Wildlife Service)

The diamondback terrapin helps limit marsh loss by eating periwinkle snails, which can overgraze marshes. (J.D. Willson/CC BY 2.5)

The eastern box turtle, which can live 50–80 years, is the primary seed disperser of the spring-flowering mayapple. (Stephen Friedt/CC BY-SA 3.0)

Spotted turtle hatchlings have one spot on each section of their shell, and the number of spots increases with age. (Trisha M. Shears/CC BY-SA 3.0)

Turtles have been roaming the Earth since the days of the dinosaurs — some fossils date back more than 220 million years.

In addition to being culturally significant in many societies, turtles are important to the environment. Some plant species depend on turtles to disperse their seeds.

The U.S. is a global hotspot for turtle biodiversity. It is home to more terrestrial and freshwater turtle species than any other country. Some species are found only here. And the Chesapeake Bay watershed, with its diverse habitats of streams, rivers, meadows, bogs, forests and marshes, supports a variety of turtle species.

Bog turtle

The bog turtle (*Glyptemys muhlenbergii*), a federally threatened species, is the smallest turtle in North America and one of the smallest in the world, maxing out at 4.5 inches. Bog turtles weigh about 110 grams (3.8 ounces) on average — the same weight as 42 pennies! Fossilized bog turtle remains discovered in Maryland’s Cumberland Bone Cave, were dated to the Irvingtonian Age (1.8 million to 300,000 years ago).

Diamondback terrapin

Diamondback terrapins (*Malaclemys terrapin*) are the only turtles known to spend their entire lives in coastal, brackish marshlands. They help keep marshes healthy by eating periwinkle snails, which, left to their own devices, can graze a marsh down to mud. While not as threatened as they were in the late 1800s and early 1900s, when turtle soup was very popular, diamondbacks still face threats — most notably the loss of marshland from sea level rise.

Diamondbacks have also been inadvertently drowned in crab traps, but simple, low-cost bycatch reduction devices on traps can help them escape. Maryland now requires recreational crabbers to have these devices on their traps.

Eastern box turtle

The eastern box turtle (*Terrapene carolina carolina)* is one of the primary seed dispersers for the spring-flowering mayapple. Seeds consumed by box turtles also have a higher probability of germinating. The estimated life span of a box turtle ranges from 50 to 80 years. The sex of a box turtle depends on the temperature of its nest before it hatches. Eggs incubated in nests that average less than 80 degrees Fahrenheit tend to be males; those in warmer nests tend to be female.

Spotted turtle

Spotted turtles (*Clemmys guttata*) are small, aquatic turtles, named for the yellow dots scattered across their dark shells. Males have black or tan chins and yellow eyes, while females have yellow chins and orange eyes. Hatchlings have one spot on each section of their shell, and the number of spots increases with age. They favor shallow aquatic habitats such as marshy meadows, swamps and bogs with abundant vegetation to bask on.

Although renowned for lengthy lifespans, turtles take a long time to reach reproductive age — often a decade or more. Because most don’t survive to adulthood (hatchlings and juveniles are bite-size snacks for predators), adults often must reproduce for their entire lives to sustain their population.

Turtles are among the most imperiled vertebrates in the world. More than 60% of the planet’s 356 species of turtles are considered threatened or are already extinct.

On top of habitat loss, climate change and car strikes, turtles face a growing threat that’s harder to see: illegal collection. Turtles are collected illegally in the U.S. for the pet trade, food and traditional medicine — exacerbating other threats.

To help protect turtles

- Report suspected poaching behavior. If you know or suspect someone is collecting or selling wild turtles, call the U.S. Fish & Wildlife Service’s tip line at 844-FWS-TIPS or email fws_tips@fws.gov. You can also contact your state wildlife agency.
- If it’s safe to do so, help a turtle cross a road. Escort or gently carry it across the road in the direction it seems to be heading. Don’t ever move a turtle to an altogether different location. They are more likely to survive in familiar habitat.
- Pet turtles require specialized care for decades, so be sure you are ready for the commitment. If you are, be a cautious consumer. Before purchasing a pet turtle, ask for certification that it was bred in captivity and not captured from the wild.
- If you are no longer able to care for a pet turtle, don’t release it into the wild, where it’s not likely to survive and could introduce diseases to wild populations. If you can’t find your turtle a new home, take it to an animal shelter.
- Create a turtle-friendly yard by growing native plants, eliminating pesticide use, keeping some leaves on the ground in the fall and building small log or rock piles for cover.

Kathy Reshetiloff is with the U.S. Fish and Wildife Service’s Chesapeake Bay Field Office.