

CHESAPEAKE

BAY JOURNAL

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Independent environmental news for the Chesapeake region



Scientists dredge for lowdown on Chesapeake Bay blue crabs

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MELTING AWAY



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E-BIKES GALORE



Popularity spurs management issues at some parks **PAGE 24**

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Fred Pomeroy, left, and Roman Jessian of Dorchester Citizens for Planned Growth collect water samples near the outfall from Valley Proteins in Linkwood, MD. Environmental groups have filed suit over the state's recent approval of a discharge permit. See page 10. (Dave Harp)

ON THE COVER

Katie Beth Jones (left) and Alison Smith of the Virginia Institute of Marine Science haul a dredge net on deck during the blue crab winter population survey. (Timothy B. Wheeler)

Bottom photos: Left by Dan Allard, center by David Trozzo, right by Dave Harp.

CORRECTIONS

In the January/February issue, the depth to which soft-shell clams can bury themselves in sediment should have been stated as 10 inches.

Equipment in a photo that accompanied a story about fracking in Dimock, PA, should have been described as a drilling rig.

The air monitoring article conflated work by the Delmarva Land & Litter Coalition with a monitoring project led by the Maryland Department of the Environment in partnership with the University of Maryland Eastern Shore, Campbell Foundation and Delmarva Chicken Association. The DLLC is not affiliated with the monitoring project.

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EDITOR'S NOTE



New to the Bay Journal? Welcome!

Last month, we made a special effort to introduce the *Bay Journal* to more people across the Chesapeake region. Hundreds have already chosen to subscribe, and we hear from more every day. If you are among them, welcome! We're so happy you've joined the *Bay Journal* community of readers.

In this issue, you'll find an article about blue crabs and the research taking place to assess their population (see page 18). The winter dredge survey, as it's known, is critical for predicting blue crab abundance in the coming year and for flagging concerns that might call for management action. The article by Tim Wheeler explains the process and explores the questions researchers have been asking since last year's bleak survey results. It's the kind of work the *Bay Journal* is known for: a look at the scientific process itself, and not just the findings.

Several articles touch on the interplay between modern lifestyles and their impacts. Air pollution from data centers is a growing concern in Northern Virginia, while environmental justice issues continue to evolve in that state's community of Brown Grove. Across the region, e-bikes are helping more people get outside and ride further, but their popularity has raised management issues in some parks and public forests. In Pennsylvania, energy production has left large numbers of oil and gas wells abandoned, unplugged and leaking.

And Hilary Harp Falk, after a year as the president of the Chesapeake Bay Foundation, sat down for an interview with the *Bay Journal* about the state of the Bay restoration (see page 22). In some ways, her comments mark the start of a critical, regional conversation. Bay leaders say that key cleanup goals will not be met by the 2025 deadline — and the region must now tackle difficult questions about what worked, what didn't and what's next for the Bay and its rivers. Some people, like Falk, are asking foundational questions how best to improve and reshape the restoration effort. You can depend on the *Bay Journal* to keep you informed and engaged as the process unfolds.

— Lara Lutz



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BY THE numbers

500,000

Approximate number of Canada geese that spend the winter along or near the Chesapeake Bay

20,000–25,000

Approximate number of feathers on a Canada goose

85,568

Total miles of rivers and streams in Pennsylvania

1,591,012

Acres of freshwater wetlands in Pennsylvania

100

Feet in height that club moss grew about 350 million years ago (now it grows to 6 inches high)

400 million

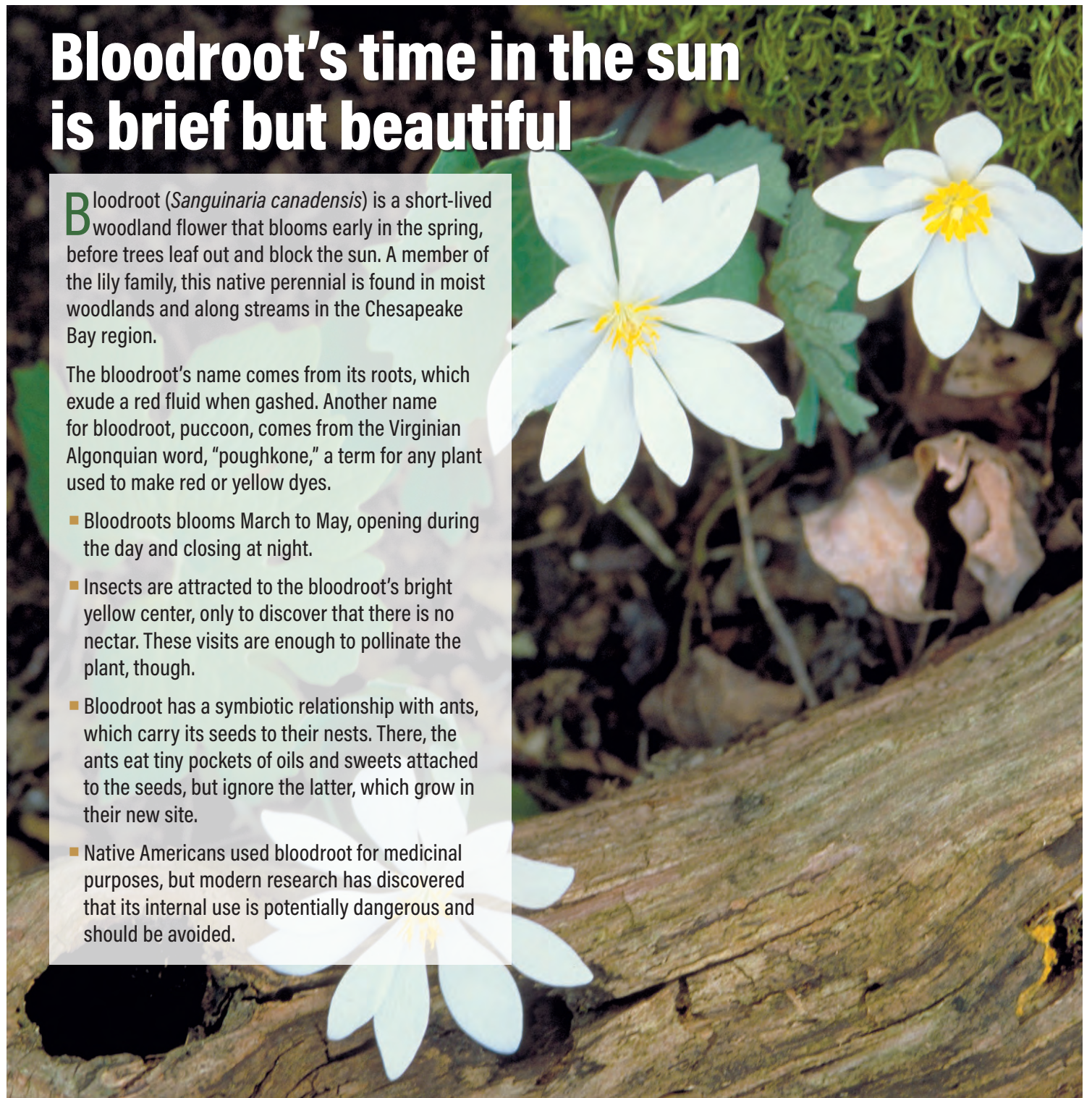
Years in age of the oldest known club moss fossil

Bloodroot's time in the sun is brief but beautiful

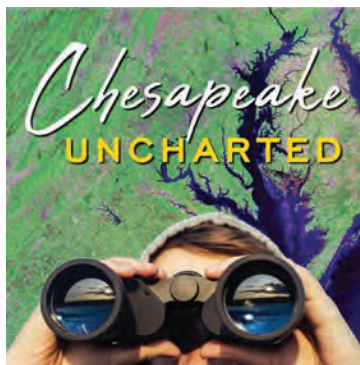
Bloodroot (*Sanguinaria canadensis*) is a short-lived woodland flower that blooms early in the spring, before trees leaf out and block the sun. A member of the lily family, this native perennial is found in moist woodlands and along streams in the Chesapeake Bay region.

The bloodroot's name comes from its roots, which exude a red fluid when gashed. Another name for bloodroot, puccoon, comes from the Virginian Algonquian word, "poughkone," a term for any plant used to make red or yellow dyes.

- Bloodroots blooms March to May, opening during the day and closing at night.
- Insects are attracted to the bloodroot's bright yellow center, only to discover that there is no nectar. These visits are enough to pollinate the plant, though.
- Bloodroot has a symbiotic relationship with ants, which carry its seeds to their nests. There, the ants eat tiny pockets of oils and sweets attached to the seeds, but ignore the latter, which grow in their new site.
- Native Americans used bloodroot for medicinal purposes, but modern research has discovered that its internal use is potentially dangerous and should be avoided.



(Dr. Thomas G. Barnes/U.S. Fish & Wildlife Service)



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LOOKING BACK

30 years ago

Coastal Zone program takes effect

The federal Coastal Zone Management Act required states to beef up their nonpoint source pollution controls to curb runoff from almost every type of land use. ■

— *Bay Journal*, March 1993

20 years ago

Change the 2010 cleanup deadline?

Officials said it was unlikely the region would meet the 2010 Bay cleanup goals and pondered whether the timeframe should be expanded to 2015 or 2020. ■

— *Bay Journal*, March 2003

10 years ago

Funds lacking for Susquehanna stream gauges

Federal funding for stream gauges that monitored the Susquehanna River was cut two years earlier, and managers were struggling to sustain the program. ■

— *Bay Journal*, March 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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An ice climber prepares to scale a frozen waterfall in Pennsylvania's Ricketts Glen State Park. (Justin Smith)

Nasty winter weather is in the eye of the Bay Journal beholder

Often, foul weather gets in the way as *Bay Journal* staffers pursue their stories. Case in point: Writer **Whitney Pipkin** picked the coldest day of the year so far (Feb. 3) to visit the windswept Anacostia River for an upcoming story. After watching her companion's fingers turn white while flipping through some project renderings, she took photos — and then suggested they finish the interview inside the nearest coffee shop.

But this year, moderate winter weather has frustrated writer (and self-confessed winter lover) **Ad Crable**. He had hoped to accompany several ice climbers as they tackled frozen waterfalls in Pennsylvania's Ricketts Glen State Park for the story on page 17. But aside from a short cold snap in late December, climbable ice never materialized. He's also working on a story about sustainable logging with draft horses. The old-fashioned loggers like snow cover so they can drag out trees without damaging the forest floor. But snow cover has been in short supply.

In January, editor **Lara Lutz** enjoyed a visit with **Nancy Allchin**, an enthusiastic *Bay Journal* reader in Baltimore County, and her daughter, Joy. Nancy has had a love of parks and nature since her childhood outings in the 1920s. She earned a degree in chemistry from Skidmore College in 1946 and is an active supporter of environmental health. We're honored to have her among our readers.

And, at the start of the year, we were excited to welcome **Lara Fowler** of Penn State University to Bay Journal Media's Board of Directors. Lara is an attorney and mediator dealing with environmental, energy, and natural resource law, with a focus on water issues. She currently serves as chief sustainability officer and interim director of the university's Sustainability Institute.

We also extend our deep thanks to **Mary Gregory** of Brown Advisory, who completed her term on the board in December. We are grateful for the time and talent she's shared with us over recent years.

— A. Crable

DE picks first environmental justice coordinator

Delaware's environmental agency has hired its first environmental justice coordinator, elevating an official within the department who had been serving as an ombudsman.

The state Department of Natural Resources and Environmental Control announced Feb. 1 that Katera Moore had been selected for the position. Moore will work with underserved communities while developing the agency's "strategic vision" for environmental justice, officials said.

Moore, who holds a doctorate in earth and environmental sciences from the Graduate Center of the City University of New York, most recently had been the ombudsman for DNREC's waste and hazardous substances division. Her expertise is in urban geography, using an environmental justice lens to examine how socio-political structures impact disparities, according to a state bio.

"At DNREC, environmental justice is part of our DNA," Secretary Shawn Garvin said in a statement. "With her strong and diverse background... we look forward to Dr. Moore building on our commitment to expand and strengthen DNREC's capacity for

practicing and promoting a holistic environmental justice approach that benefits all Delawareans."

At the same time as Moore's hiring, the state announced the launch of an environmental justice website that officials hope will improve communication with affected communities. A new mapping tool is being developed for the site as well.

— J. Cox

Plan proposed to end sewage overflows in Harrisburg

The federal government, Pennsylvania, environmental groups and the city of Harrisburg have agreed to a new plan for the capital city to solve long-standing storm-related sewage pollution entering the Susquehanna River.

Raw sewage often mixes with rainwater and runs into the Susquehanna, rendering Harrisburg's riverfront unsuitable for recreation. Some of the offending sewage has come from the governor's mansion and state capitol.

The plan is a proposed revision to a 2015 consent decree for which regulators said progress was lagging. Under the revisions, Harrisburg's Capital Region Water authority must submit a long-term

control plan to end the pollution no later than Dec. 31, 2024. After that, raw-sewage discharge violations could cost the city federal fines of up to \$3,000 a day.

The water authority must also take interim steps, such as installing rain gardens that capture stormwater runoff, fixing broken and leaking sewer lines, and notifying the public when sewage-tainted overflows occur.

The overflows happen when century-old pipes that carry both sewage and stormwater are overwhelmed during storms, preventing the sewage from making it to a treatment plant. Each year, city outfalls to the Susquehanna River release about 800 million gallons of untreated sewage mixed with rainwater.

Harrisburg officials say they are addressing the problem and are considering a \$250 million plan to build underground storage tanks to capture and temporarily hold stormwater until it can be treated.

But progress has been inadequate, according to the U.S. Environmental Protection Agency and state Department of Environmental Protection. A federal court agreed in 2021 and allowed two environmental groups, the Lower Susquehanna Riverkeeper and Washington-based Environmental Integrity Project, to join negotiations.

The new plan would go into effect after a 30-day public comment period, which has not yet been scheduled, and after approval by a federal judge.

— A. Crable

MD oyster restoration project clears hurdles

As of January, the restoration of the Manokin River's oyster reefs was on shaky ground. The Maryland Department of Natural Resources had neither the funding nor the clear legal go-ahead to perform the work. Now, it has both.

The Manokin, a river in Somerset County on the Chesapeake Bay's Eastern Shore, is the last of five Maryland tributaries targeted for large-scale oyster restoration under the 2014 Chesapeake Bay Watershed Agreement. The plan commits Maryland and Virginia to restore oysters in 10 tributaries by 2025, five in each state.

The DNR plans call for rebuilding reefs and planting oysters across 421 acres of river bottom in the Manokin, a \$30 million project that's the largest such restoration Baywide and in the world.

See BRIEFS, page 6

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briefs

From page 5

The Maryland Board of Public Works, a three-member panel chaired by Democratic Gov. Wes Moore, removed the funding obstacle during its Feb. 15 meeting. The board approved the first installment of a \$9.1 million contract with the nonprofit Oyster Recovery Partnership.

The funding will enable the group to launch the active restoration of the Manokin as well as continue work in the remaining tributaries, officials say. The contract extends until the end of 2025.

Meanwhile, a Circuit Court judge on Feb. 3 lifted an injunction that had blocked the work from starting. The action stems from a lawsuit filed by the Board of Somerset County Commissioners in 2021 that had sought to stop the project. The latest legal development was first reported by the *County Times* of Somerset County.

The lawsuit argued that the state's plans to use stone to build reefs would make it "impracticable, bordering on impossible" to harvest oysters in the river, and would disrupt crabbing and fishing.

Attorneys for DNR countered that there would be no harm to the oyster industry because harvests have been banned in the Manokin since it was declared a sanctuary in 2010. As for other fishing impacts, they argued that such claims were "speculative."

The judge in the case denied the county's petition for a preliminary injunction barring the reef work, but the case remains open, according to the attorney general's office. — J. Cox

Richmond underscores equity in new climate plan

Virginia's capital city has officially declared war on climate change.

The Richmond City Council on Feb. 13 unanimously adopted a lengthy "action plan" that will serve as the city's blueprint for reducing greenhouse gas emissions and adapting to climate-related impacts.

The *RVAgreen2050: Climate Equity Action Plan* seeks to reduce emissions 45% by 2030 compared with 2008 levels and reach net-zero emissions by 2050. And, in fighting effects such as increasing heat and stormier weather, the plan emphasizes environmental justice to bring help where it's needed most.

"Climate action has to be equitable," council president Michael Jones said during the legislative session. "I live in a heat island. We know that it is 10 degrees hotter in parts of south Richmond. We know that when it drizzles, it floods. So, there are a lot of things that have to happen."

A stream of environmentalists and high school students addressed the council before the vote, praising the plan while cautioning against complacency.

Elle De La Cancela, a Richmond resident and a Chesapeake Climate Action Network regional coordinator, applauded the city for earlier steps such as declaring a climate emergency and creating an office of sustainability.

"And now we have a chance to adopt the next step of that: an equity-centered strategy to reduce our greenhouse gas emissions and to shape a better future for all Richmonders with a set timeline," she said. — J. Cox

PA to add EV charging ports along highways

With the sales of electric vehicles booming, Pennsylvania will receive \$171.5 million in federal funds to add charging stations along highways.

The grant money will be spread over five years as part of the Biden administration's Bipartisan Infrastructure Law passed in 2021. The grants will be used to add about 150 direct-current charging stations off exits on 15 interstates and at key intersections on four federal highways.

The Pennsylvania Department of Transportation has a goal of deploying at least 2,000 new electric vehicle charging ports at 800 sites by 2028.

The federal money will cover an estimated 80% of the cost of each charging station, including site acquisition, installation and ongoing operation. Third parties — likely service stations and roadside convenience stores or eateries — will provide the other 20% and can charge EV users for the service.

PennDOT expects that applicants for the money to install the charging ports will most likely be public-private sector entities, nonprofits and commercial companies. The application process is open until April 6.

PennDOT estimates there are 31,000 EVs in use in the state — nearly triple the number from 2019.

— A. Crable

Another stormwater pond begins to protect Ellicott City, MD

State and county officials gathered on Feb. 13 to celebrate the opening of a second large stormwater pond designed to hold back floodwater from the streets of Ellicott City, MD.

Flash floods devastated the historic mill town in 2016 and 2018, killing three people and damaging businesses and homes.

The project improved the prior Quaker Mill Flood Mitigation Pond at the intersection of Rogers Ave. and Patapsco River Rd. According to a county press release, it will store nearly 3.3 million gallons of stormwater, which would fill a football field with nearly 7.5 feet of water.

Of the \$2.8 million in project costs, \$2.1 million came from the Maryland Department of the Environment's Comprehensive Flood Mitigation Grant Program.

Design work is nearly complete on a 5,000-foot stormwater tunnel that will carry water away from the town and into the Patapsco River. — L. Lutz

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PA sets limits on two 'forever chemicals' in drinking water

Requirements to monitor water systems begins in 2024

By Timothy B. Wheeler

Following through on a move begun more than three years ago, Pennsylvania has set enforceable limits on two "forever chemicals" found to be contaminating many of the state's drinking water systems.

In January, the state's Environmental Quality Board established maximum contaminant levels in drinking water for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS).

"We are still learning more about these chemicals, and these new [maximum levels] are a step in the right direction," said Ramez Ziadeh, acting secretary of the Pennsylvania Department of Environmental Protection.

Those two compounds are among a group of highly persistent chemicals called per- and polyfluoroalkyl substances, or PFAS. Studies indicate that exposures to certain

PFAS can cause a variety of health problems, including decreased fertility, developmental delays in children and reduced immunity to infection.

Beginning Jan. 1, 2024, all water systems serving more than 350 people must begin monitoring for PFOA and PFOS, while smaller systems have until the beginning of 2025.

PFOA and PFOS have been used since the 1940s in a wide array of consumer and industrial products, including nonstick cookware and waterproof and stain-resistant fabrics. Their use in firefighting foam, especially on military bases and at airports, has led to widespread contamination of groundwater and surface waters.

With reports of PFAS being found in drinking water across Pennsylvania, Democratic Gov. Tom Wolf signed an executive order in 2018 calling for a comprehensive state response. Statewide sampling detected PFOA and PFOS in about one-fourth of the 412 water systems checked.

Safe drinking water standards are generally set at a national level, but PFAS were unregulated when Pennsylvania began to act.

The U.S. Environmental Protection Agency in 2016 had set a nonbinding health advisory limit of 70 parts per trillion, combined, for PFOA and PFOS.

Last June, the EPA set a new recommended safe level for PFOA of 0.004 ppt and 0.02 ppt for PFOS. Agency officials had pledged to propose maximum contaminant levels by the end of 2022 but delayed that to March 2023, with final action projected to take place by the end of 2023.

Meanwhile, amid growing scientific evidence of health effects at much lower levels of exposure, some states have acted to establish their own limits. Pennsylvania joins seven other states, including New York, that have set maximum contaminant levels or some other enforceable ceiling on one or more PFAS compounds. Delaware is expected to finalize limits this year.

The limits Pennsylvania adopted — 14 parts ppt for PFOA and 18 ppt for PFOS — are much less stringent than the EPA recommendations. DEP said it will adjust its levels to comply if the EPA sets lower national limits, and it will review the science if the EPA's are less stringent.

Of the more than 400 water systems sampled by DEP, 25 had PFOA in excess of the new state limit, while 22 exceeded the PFOS limit. Groundwater-based systems can sometimes reduce levels by switching off contaminated wells, but the cost of filtration equipment can range from \$47,000 to \$3.25 million, DEP estimated, depending on the size of the water system.

The state has started giving financial assistance to water systems with some of the worst PFAS contamination and expects to do more. In June, the Pennsylvania Infrastructure Investment Authority (PENNVEST) provided \$6.7 million for a treatment system at Harrisburg International Airport.

In January, it awarded \$5.5 million to a private water company to put treatment systems on two wells in Montgomery County near Philadelphia. State officials say they expect to receive \$256.5 million from the two massive federal funding measures Congress passed last year, which also could be used to address PFAS contamination. ■



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VA regulators might ease emission limits for VA data centers

Temporary variance would help deal with transmission problems

By Whitney Pipkin

Virginia regulators have proposed allowing nearly 300 data centers in Northern Virginia to use backup generators over a five-month period during which energy “transmission problems” are anticipated.

Many of these backup generators use diesel or natural gas, which releases pollutants that pose risks to human and environmental health. To protect regional air quality, Virginia’s Department of Environmental Quality regulates when and how frequently data centers can run their emergency on-site generators.

Each data center includes dozens if not hundreds of backup generators to keep it operating around the clock. Thomas Faha, director of DEQ’s Northern Regional Office, estimated in 2019 that approximately

3,000 generators had been permitted for Northern Virginia data centers, and the total has grown since.

During past interviews with the *Bay Journal*, state regulators said they anticipated multiple data center generators running at the same time only during a major emergency impacting the regional power grid.

The Northern Virginia counties of Loudoun, Fairfax and Prince William are home to nearly 300 data centers that are crucial to moving about 70% of the world’s internet traffic. Those centers, and the reliability of the internet, by extension, could be impacted by upcoming power transmission issues that are anticipated from March to July of this year, DEQ Director Mike Rolband said in a statement.

Responding to *Bay Journal* questions by email, DEQ spokesman Aaron Proctor said demand for electricity from the data centers “could potentially exceed the capacity of the area’s electric transmission system” during that time. He said the agency hopes the variance, once approved, will not be

invoked and that it is “intended only as a precautionary measure.”

PJM Interconnection, which coordinates electricity transmission in 13 states and the District of Columbia, issues warnings when conditions indicate that stress on the grid could lead to a declaration of emergency.

“Such warnings are rarely issued,” and, when they are, it is “for very short periods of time,” Proctor said. Since 2015, he added, the duration of such warnings has averaged 17 hours a year. He also said the variance for the region’s data centers would be the first issued “for this type of facility.”

DEQ officials a few years ago began looking at the cumulative impact of data centers’ backup generators should they all fire up at once. A report by the state secretary of natural resources in 2019 listed air emissions from data centers’ backup generators as a potential risk to air quality. In 2020, the agency began requiring new data centers to use emergency generators with the “best available control technology” to limit emissions, according to an industry report.

The current proposal from DEQ would

permit exceptions to those requirements during the temporary variance period. DEQ’s statement said the operators of generators must still calculate and report the emissions created by the equipment during that time. When asked what assurances residents living near the data centers would have about local air quality, Proctor said that DEQ operates real-time, continuous air quality monitors at a half-dozen locations near data center hotspots. Information from those sensors can be viewed on DEQ’s website.

The variance would become effective after being signed by DEQ director Rolland after the 45-day public comment period that ends March 14. It would expire on July 31.

During normal operations, data centers can be powered by a variety of sources, ranging from the municipal electric grid to their own solar panels. Google and Amazon, which operate many of the region’s centers or contract with them, have each committed to use energy entirely from renewable sources by 2030 and 2025, respectively. ■

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2022 was another hot year in the Chesapeake watershed

NOAA report says average global temperature was 6th warmest on record

By Jeremy Cox

Global air temperatures continued to sizzle in 2022, making it one of the hottest years in more than a century's worth of recordkeeping. No heat records were challenged in the Chesapeake Bay region, but the memory of cooler-than-normal temperatures grew ever fainter.

Overall, Earth's land and sea surface temperature was 1.55 degrees F above the 20th-century norm, making it the sixth-warmest year on record, according to the National Oceanic and Atmospheric Administration. Global recordkeeping goes back to 1880, but the 10 warmest years on record have all occurred since 2010.

Average temperatures in the Mid-Atlantic region were 1.9 degrees above the 1901-2000 average, making it the region's 19th warmest year on record. Among Mid-Atlantic states, 2022 averages typically ranked among the top 20 or 30 hottest years on record.

Closer to home, the Chesapeake Bay area didn't set any new heat records for 2022, but most states in the watershed continued their long-running warming trend.

Maryland, for example, was 1.9 degrees above average in what was its 17th warmest year. No county within the Bay watershed experienced cooler-than-normal temperatures for the year. The place with the greatest departure from the norm was Baltimore, where the average temperature was 2.9 degrees above normal for the year.

One of the region's most significant pockets of abnormal warmth was in southeast Pennsylvania, where Dauphin, Lancaster, Lebanon and York counties endured 2.4–2.6 degrees more heat than usual. Another was on the Delmarva Peninsula, where the Maryland counties of Somerset, Wicomico and Worcester joined with the Virginia county of Accomack experience average temperatures of 2.3–2.7 degrees above normal.



An outdoor thermometer registers 100 degrees F on a summer afternoon. In 2022, the average summer high in the Bay region was nearly 2 degrees above the 20th-century average. (Pete Johns/CC BY-NC-ND 2.0)

For much of the U.S. East Coast, climate change is projected to bring not only warmer temperatures but also more weather extremes, such as stronger storms. The Mid-Atlantic region was hit with 1.9 more inches of precipitation than usual, but 2022 still ranked as the driest year since 2017.

Here is a look at some of the most notable weather occurrences over the past calendar year, as tracked by NOAA:

- An EF-1 tornado that swept through Lycoming County, PA, was the first March tornado recorded in the county.
- During May, large hail pounded parts of Maryland and Delaware. A hailstone measuring 2.25 inches in diameter in Sussex County, DE, registered as the second-largest of its kind in state history.
- In July, straight-line winds of up to 110 mph were reported in Caroline County, MD, and Sussex County, DE.
- An April 18–19 nor'easter brought 14.6 inches of snow to Binghamton, NY, setting a record for the city's largest two-day snow total for April.
- Six inches of rain fell in Maryland on July 2, leading to flash flooding around several waterways. For example, Gwynn Falls in Baltimore rose 7.7 feet in 30 minutes. ■

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MD gives poultry rendering plant approval for expansion

Environmental groups file legal challenge to Valley Proteins discharge permit

By Timothy B. Wheeler

Maryland state regulators have approved the expansion of a controversial poultry rendering plant on the Eastern Shore, but environmental groups have filed suit challenging the decision, saying it fails to address water quality problems in a Chesapeake Bay tributary.

The state Department of the Environment in late December renewed the discharge permit for the Valley Proteins Inc. rendering plant at Linkwood. The permit will allow a nearly fourfold increase in the amount of wastewater the facility can release into the Transquaking River in Dorchester County.

MDE spokesman Jay Apperson said the permit imposes “substantial reductions” in pollution levels in the discharges. Regulators have added more conditions beyond those proposed in 2021 to address public comments, he said, including more monitoring and adequate staffing of the company’s wastewater treatment operation.

Environmental activists, though, said that MDE, in approving this permit, has put the company’s needs ahead of water quality in the Transquaking.

“There may be some improvement here, but not enough,” said Fred Pomeroy, an oyster farmer who is president of Dorchester Citizens for Planned Growth. He said that MDE was “blatantly wrong” to let Valley Proteins increase its maximum daily discharge from 150,000 gallons to 575,000 gallons, given the chronic pollution problems at the plant. “They have not earned a fourfold increase,” he said.

Neighbors and environmental groups have complained for years about the Valley Proteins facility, which takes up to four million pounds of chicken entrails and feathers daily from poultry processing plants and renders them into pet food.

They also faulted the state for failing to address violations at the plant over the past decade and letting it operate with an outdated wastewater treatment system under a discharge permit that expired in 2006. Those permits are supposed to be reviewed and updated every five years, but MDE had a backlog last year at this time of nearly 200 so-called “zombie” permits.

The state and environmental groups sued the company in February 2022 after one organization, ShoreRivers, captured drone images showing a discolored discharge



A truck leaves the Valley Proteins chicken rendering plant in Linkwood, MD. (Dave Harp)

coming from Valley Proteins’ outfall into a waterway that leads to the Transquaking River. That prompted MDE to inspect and briefly shut down the plant after finding more violations.

The company settled those lawsuits in a Sept. 12 consent decree, promising to fix violations and curb polluted runoff from the site. It also agreed to pay a \$540,000 penalty to the state, plus \$135,000 to the environmental groups for ongoing water quality monitoring and restoration.

In a 2021 public hearing and through written comments on the discharge permit, critics called for MDE to impose more stringent limits and withhold permission for expansion until the plant can meet them.

“There’s no stopgap or check in place where, if noncompliance continues, should they still be allowed to increase their flow?” said Matt Pluta, director of riverkeeper programs at ShoreRivers.

MDE said the company’s request to expand met state regulations. The plant will have to meet “substantially stricter” pollution limits in its discharge after a three-year “compliance period,” the agency said, during which it is expected to upgrade its treatment system. After that, MDE said the company may increase its discharge.

MDE’s permit does aim to lower overall nutrient discharges after the first three years. Once the plant’s treatment system is upgraded, its annual discharge limits will be 44% lower for nitrogen and 79% lower for phosphorus, according to MDE. Those

two nutrients are generally responsible for algae blooms, oxygen depletion and fish kills in the Bay and its tributaries.

Suann Guthrie, spokesperson for Darling Ingredients, the Texas-based company that bought Valley Proteins last year, said, “We are committed to continuing to work closely with the Maryland Department of Environment to ensure the Linkwood facility is in full compliance with all relevant rules and regulations.”

On Feb. 17, though, the Chesapeake Bay Foundation, Dorchester Citizens for Planned Growth, Friends of the Nanticoke River, ShoreRivers and Wicomico Environmental Trust filed suit in Dorchester County Circuit Court seeking judicial review of the permit. They contend that MDE did not set tight enough limits and requirements to ensure that plant operations

won’t harm water quality in the Transquaking River and downstream in the Bay.

The Transquaking, like most Bay tributaries, suffers from excessive nutrients, mainly from runoff and seepage from farmland. The Valley Proteins discharge flows downstream into a dammed stretch of the river known as Higgins Mill Pond. Locals say the poorly flushed impoundment suffers from bad water quality, diminished fish, and algae outbreaks that have poisoned pets and led to no-swimming warnings.

Under federal and state laws that govern discharge permits, the groups say, MDE is required to ensure that Higgins Mill Pond and the Transquaking are safe for swimming, fishing and wildlife habitat.

In approving the permit, MDE said it was taking a closer look at water quality in the pond and would modify the discharge permit if tighter limits are warranted. But it said its modeling at this time indicates the pond would be impaired even if the rendering plant wasn’t there.

The environmental groups counter that state regulators used information from the nearby Chicamacomico River, which is different in key respects from the Transquaking, to estimate whether that river and downstream waters could handle the discharge from Valley Proteins.

“MDE relied on insufficient data about the Transquaking River and its watershed when issuing this permit,” said the Bay Foundation’s Eastern Shore Director Alan Girard. “While the agency claims the new permit would reduce pollutants, it doesn’t ensure water quality will be protected.”

The lawsuit asks the court to send the permit back to MDE to address its alleged deficiencies. ■



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VA court allows residents to challenge zoning decisions

Brown Grove advocates call decision a win for surrounding community, environmental justice

By Whitney Pipkin

The Virginia Supreme Court unanimously ruled Feb. 2 that residents impacted by the construction and operation of a sprawling distribution center have the legal standing to challenge certain zoning decisions.

Attorneys representing those residents, who live in and near Brown Grove, a historic Black community in Hanover County, VA, said the decision has “significant implications for communities and the environment in court.”

Lawyers representing the Wegmans Food Market grocery chain filed on Feb. 10 a notice of their intent to request a rehearing of the case with the Virginia Supreme Court. Until the company files additional documents, it is not clear on what grounds they would seek the rehearing.

The residents first brought the challenge after local leaders approved plans by Wegmans to build a 1.7-million-square-foot distribution center on a 217-acre property located partially on forested wetlands within the community.

In 1995, the property was subject to what the court decision called “speculative zoning,” when the owner requested permission for light industrial use, subject to certain conditions. There was no prospective buyer or plan at the time.

Twenty-four years later, the owner agreed to sell the property to Wegmans, but the company’s conceptual site plan did not fully comply with the zoning restrictions. The owner filed a request to change or remove some of those conditions on the land, including those that limited the height of buildings. The county approved those changes, despite local opposition and a lack of public input opportunities, according to the court decision, and the project moved forward.

The residents argued in the suit that they would be directly impacted by increased traffic, noise and light pollution coming from the construction and operation of the facility. After a lower court dismissed their claims, they appealed to the state Supreme Court.

After hearing oral arguments in November, the high court decided in February that the residents could experience “particularized harm” from living so close to the facility. This decision will allow their concerns to be fully heard by lower courts that had previously dismissed them.



Renada Harris (left) and Diane Smith Drake stand at a Morris family grave in a cemetery in Brown Grove, VA, on property adjacent to the construction site of a Wegmans distribution center. (Dave Harp)

“Our lawsuit was filed in 2020 and has never been addressed,” said Rod Morgan, a plaintiff in the lawsuit whose family of five lives within 1,000 feet of the site. “I am confident that once heard by an impartial court, the Wegmans property rezoning will be set aside.” Morgan is involved with the group Protect Hanover, which formed to oppose the project.

Virginia recently recognized Brown Grove as a rural historic district, the second of its kind in the state. Many of the residents of Brown Grove trace their lineage back to Caroline Dobson Morris, the “mother of Brown Grove,” who settled there with 13 children after being freed from slavery.

The historic designation gave Brown Grove more defined boundary lines, including two historic churches, gravesites and the remains of a 1927 school, all of which may have strengthened the community’s environmental justice case against the proposed development.

But the Wegmans distribution center

are impacting local water quality and their quality of life. There has been evidence of noise disruption as well. In November, Hanover County fined the construction contractor working on the Wegmans site on a noise ordinance violation for operating construction equipment after 9 p.m.

Brown Grove is a relatively small area with about 200 homes on rural, wooded lots. It also includes a landfill, concrete plant, airport, truck stop serving the nearby highway and an old gas station that some suspect wasn’t properly closed — all of which has raised environmental justice concerns about the addition of another facility generating a large volume of truck traffic on a two-lane road.

A separate lawsuit brought by Brown Grove residents over environmental justice concerns was previously dismissed. The community has had conversations with representatives from the U.S. Environmental Protection Agency about becoming a test case for environmental justice concerns, but progress on that front has stalled.

Robin Broder, acting executive director of Waterkeepers Chesapeake, said in a joint press release with the group Protect Hanover that the Supreme Court’s decision is relevant to other environmental justice communities in the state and their ability to “have their day in court.”

The groups called the court decision “significant to all commonwealth communities that are fighting harmful zoning decisions and are pushing back against further environmental injustices by giving residents harmed by zoning decisions access to courts.”

Steve Fischbach, litigation director for the Virginia Poverty Law Center, wrote an amicus brief for the case on why legal standing matters, especially to environmental justice communities. He said his group is pleased with the court’s decision.

“The court recognized that Virginians who live in communities directly impacted by decisions of local zoning authorities will not lose their day in court to challenge zoning decisions that result in ‘particularized harms’ such as increased traffic, noise, flooding and light pollution,” he said. “The decision is particularly important for low-income communities across Virginia that often disproportionately suffer from these and other kinds of ‘particularized harms.’” ■



A sign along Ashcake Road in Brown Grove, VA, asks passersby to consider the history of the community as part of a protest against a 1.7 million-square-foot distribution center being planned for approximately 200 acres nearby. (Dave Harp)

had already earned almost all of the permits needed by mid-2021. Construction began soon after. Residents say changes to wetlands in the area, in particular, already

Whale die-off raises stakes in VA offshore wind bid

Unexplained rash of humpback and right whale deaths brings scrutiny to turbine construction

By Jeremy Cox

As Dominion Energy's massive wind-energy project proposed off the coast of Virginia enters a critical new regulatory phase, it faces strengthening political headwinds.

Two years of design work and wide-ranging scientific investigations, which, among other pursuits, tracked the flying altitudes of migrating birds to evaluate threats from turbine blades, have led to an important milestone: the Biden administration's publication in December of the project's draft environmental impact statement, or EIS.

The Richmond-based energy giant's bid to build the largest ocean-based renewables project in the nation hinges on acquiring approvals from several state and federal agencies. But none looms as large as the verdict, expected by September, from the Bureau of Ocean Energy Management, which oversees the leasing of offshore energy resources. The EIS is central to the bureau's decision-making process.

What would be a controversial undertaking even under normal circumstances has been roiled in recent months by a spike in deaths among large whales along the U.S. East Coast. The stakes were already high over concerns about potential impacts on birds and the region's seafood industry.

From the beginning of the year through Feb. 10, eight humpback whale strandings were reported between Maine and Florida, including two off Virginia. Four North Atlantic right whales have turned up dead or injured during the same period.

Whale distress is not new to the region. "It's been a period of several years where we have had elevated strandings of large whales, but we are still concerned about this pulse over the past six weeks or so," said Sarah Wilkin, who coordinates the Marine Mammal Health and Stranding Response Program of the National Oceanic and Atmospheric Association.

Examinations of dead humpbacks since 2016 suggest that about 40% were linked to vessel strikes or entanglement in fishing gear, scientists say. The rest remains inconclusive.

So far, only two small pilot wind projects operate in the Atlantic: Dominion's two turbines off Virginia Beach and Orsted's five-turbine wind farm off Rhode Island. More than a dozen wind projects, though, are in various stages of development between



This rendering illustrates the vessel that will transport and install the foundations and turbines for a wind facility offshore of Virginia. (Courtesy of Dominion Energy)

North Carolina and Massachusetts.

The nascent offshore wind industry has been accused of causing the surge in whale deaths. Critics allege that the sonar equipment used during surveys of the ocean floor could disorient the whales and cause them to become stranded.

But the federal scientists said that there is no evidence that offshore wind projects are to blame for the whale deaths. The type of sound imaging used by the wind industry is likely outside the presumed hearing range of humpbacks, said Erica Staaterman, a marine acoustics expert with BOEM. The sounds are also far quieter than those emitted during oil and gas exploration, which employs "air guns" to map deep beneath the sea floor.



Dominion Energy constructed these two wind turbines offshore of Virginia as a pilot project ahead of its larger \$10 billion undertaking. (Courtesy of Dominion Energy)

"Any impacts to marine life are a significant issue for Dominion," said Scott Lawton, an environmental technical advisor for the company. "We want to avoid that at all costs."

During the construction of the two initial turbines, Dominion deployed a "bubble curtain" to envelop the work site and dampen the sound of the pilings being driven into the sea floor. Sarah Glitz, a marine biologist with the advocacy group Oceana, said she is heartened to hear that the company will be using that technology again during its 2024–26 construction period.

She said that she accepts NOAA's determination that no evidence implicates wind turbine construction in the whale strandings. "But," she added, "we want to make sure there are strong safeguards for marine life" for the Virginia project and others.

Bird experts say that the proposed Virginia project is far enough offshore that it shouldn't impact most birds along their primary East Coast migratory route, the Atlantic Flyway.

"Most of the birds ... use the nearshore," said Bryan Watts, director of the Center for Conservation Biology at the College of William and Mary. "We're talking [from] the beach to about a kilometer offshore."

But there are exceptions, such as the whimbrel, a dappled shorebird that flies over the open ocean during its migrations between Canada and Brazil. William and Mary has partnered with the Nature Conservancy and Dominion on a study to track their altitude over the project site.

The researchers managed to catch and tag 15 of the elusive birds last fall on Virginia's Eastern Shore. The team won't have the data from the globe-crossing birds until they return in the spring and fly within range of a U.S.-based cell phone tower.

"It's like you're waiting for a text from your kid," said Judy Dunscomb, a Nature Conservancy scientist.

But the researchers did get a flutter of auspicious news from one bird that abruptly returned to Virginia shortly after starting the journey. On its way out, Lawton said, the whimbrel soared over the project site at about 10,000 feet, well above the 600-foot-high wind turbines. On its return, the bird zoomed just above the surface of the ocean — well below where the blades would sweep. ■

Can the age-old use of biochar help solve modern problems?

Research examines potential for helping crops, environment

By Ad Crable

Biochar, created in an ancient practice that turns organic waste into a charcoal-like substance, is getting a closer look for its potential to help address modern-day problems such as climate change and nutrient-laden runoff.

The material has been lauded over the past decade, with advocates calling it a simple and important tool to capture carbon from the air, soak up stormwater runoff and build up healthier soils in agricultural and urban settings.

But it has not become widespread in either production or use.

That may be changing. A major push by government agencies and other organizations seeks to close research gaps, set quality standards, scale up production — likely with federal aid — and better promote biochar through demonstrations sites in Chesapeake Bay states and beyond.

Advocates hope to see its widespread use within a decade.

In simple terms, biochar is created by turning plant and animal waste into a carbon-rich product by heating them at high temperatures without oxygen. The process is called pyrolysis.

Biochar has been used as a soil amendment in some places around the world for more than a thousand years. Recent research shows that it can suck carbon from the air and store it in the ground, where it can enrich soil for hundreds of years. Some call it a biological carbon battery.

The latest Intergovernmental Panel on Climate Change report praises biochar as an important climate change mitigation technique.

It also retains nutrients in the soil, keeping them close to plant roots where they can stimulate both crop growth and the production of microbes that improve soil health.

Farmers in the Bay states could not only add biochar to crop fields, but also to feedlots, where it would absorb nutrients and other contaminants. They also could apply it to pastures to improve productivity.

But except for scattered experimental uses, biochar is not widely used in the Bay states. Pennsylvania only has three biochar



Biochar is spread on a field in Iowa to make the soil healthier and reduce the release of greenhouse gases by storing carbon underground. (U.S. Biochar Initiative)

suppliers or manufacturers. New York has two, while Maryland and Virginia each have one.

In large part, this is because questions remain about its effectiveness, which can change with various soil types and the climate of the application site, as well as the application methods.

To answer those questions, the bipartisan Biochar Research Network Act has been introduced in both houses of Congress. If passed as part of the next Farm Bill, it would allocate \$50 million annually to establish a network of up to 20 research facilities across the nation to test the effectiveness of biochar.

Those research gaps are the biggest obstacles to greater use of biochar, according to the December findings from a summit of government agencies, nonprofit organizations, conservation groups and biochar producers.

A paper generated from the gathering seeks to have sustainable and widespread commercial production of biochar available in the next five years.

Biochar “is not a silver bullet, but it is part of a natural climate solution and a tool in soil health,” said Rachel Seman-Varner, senior soil health and biochar scientist in the American Farmland Trust’s climate initiative. The trust organized the summit, along with the Foundation for Food &



These carbon-rich pellets, or biochar, were made by burning leaf waste. (U.S. Department of Agriculture)

Agriculture Research and the National Center for Appropriate Technology.

Participants stressed that biochar is not a one-size-fits-all solution. A wide mix of materials have been used to produce biochar, including forest slash piles, animal manure, crop residue, food waste, yard waste, cotton gin waste, hulls of rice and walnuts, and even diapers.

As a result, biochar products can vary greatly in properties and have different impacts based on soil types. The amount of heat used to create biochar can also impact the outcome.

“There’s still a lot we don’t know. The research results have been inconsistent. We need a systematic research effort,” said Chuck Hassebrook, who helped write the paper for the nonprofit National Center for Appropriate Technology. He expressed optimism that this will be accomplished with passage of the research bill now before Congress.

More production facilities will also be needed if biochar is to become mainstream, Hassebrook said. “I think there is a lot of potential here, but it is going to take some early support from the federal government to launch this industry.”

Meanwhile, biochar experiments are popping up nationwide, including in the Bay watershed.

In December, the National Fish and Wildlife Foundation awarded the Center for Watershed Protection \$699,500 toward a \$1.7 million project to use biochar to help capture stormwater and remove nutrients in Waynesboro, VA; Arlington County, VA; Carroll County, MD; Howard County, MD; and Hanover, PA, as well as at transportation sites in Harford and Cecil counties, MD, and near Middletown, DE.

The biochar used in those projects will be serve as a soil amendment in bioretention basins, rain gardens, dry ponds and tree plantings. It will also promote soil health in conservation landscaping and under solar arrays.

Biochar could be useful in treating sewage, too. At Penn State University, researchers who completed a three-year federally funded biochar project found that wastewater from sewage treatment plants can be run through biochar filters to remove up to 95% of pharmaceuticals.

Sewage treatment plants aren’t equipped to filter out pharmaceuticals, which is a big concern when they discharge into waterways or when biosolids are spread on fields that produce crops eaten by humans.

Meanwhile, the U.S. Department of Agriculture in September named the nonprofit U.S. Biochar Initiative as a partner in a \$30-million effort to use the material to lower the carbon footprint of beef production.

There is also a push to allow farmers who produce or use biochar to profit from selling carbon credits. And the USDA recently recognized the use of biochar as a soil amendment in major conservation programs, allowing farmers to apply for funding to help pay for putting biochar on their fields. ■



Federal infrastructure funds could be a boon for fish passage

Projects that fix or remove culverts and dams help clear the way for aquatic species

By Whitney Pipkin

Removing dams and improving road crossings that block the flow of fish through a waterway usually requires a significant flow of another sort: funding.

So, when the Bipartisan Infrastructure Law opened the spigot for an additional \$200 million over five years to help address the problem of fish passage, experts took note. A spokesperson for the U.S. Fish and Wildlife Service, which is channeling the funds to projects through an annual grantmaking process, called the funding a “once-in-a-generation investment” in streams and communities.

One megaproject in the Chesapeake Bay watershed is receiving more than \$1 million through the program to reconnect nearly 200 miles of stream habitat for brook trout in the headwaters of the Potomac River. The project removes 17 barriers in Maryland, Virginia and West Virginia, including dams and poorly designed culverts (pipes or tunnels that carry water under roads and railways).

Another \$455 million over five years from the same infrastructure law is aimed at restoring ecosystems and addressing climate change and could be funneled toward projects benefiting migratory fish.

Meanwhile, the National Oceanic and Atmospheric Administration is also set to provide millions of dollars annually over five years to projects that remove barriers to fish, some of them focused on migratory species important to tribal communities.

Plus, regional, state, city and transportation budgets often set aside funds that can bolster such efforts.

Beyond the biggest projects, fish passage experts say the work has seen slow but steady progress over recent decades. Many of the large dams that had been blocking the mainstems of rivers have been removed, and the work of removing other barriers is extending farther up tributaries.

Since its inception in 1987, the Chesapeake Bay Program’s fish passage workgroup has seen more than 2,000 miles of streams and rivers opened by fish passage projects in the Bay watershed. That exceeded a goal in the

2014 *Chesapeake Bay Watershed Agreement* of opening 1,300 stream miles to fish passage by 2025. So, in 2020, the Bay Program set a new target to open an additional 132 miles every two years.

The Bay Program is tracking progress on 31 outcomes for a healthier watershed, “and fish passage has been one of the most successful,” said Katlyn Fuentes of the Chesapeake Research Consortium, who staffs the Bay Program workgroup.

Progress has slowed since 2019, as most of the large dams have been removed, leaving a variety of smaller projects to be tackled.

“Now, we’re dealing with projects that are still important for any given stream and for the target fish for that small watershed. But it’s not opening up the big number of stream miles we could gain in the first 20 years of doing all this,” said Alan Weaver, fish passage coordinator for the Virginia Department of Wildlife Resources, who’s been on the workgroup since 1993.

The low-hanging fruit of fish passage projects has largely been picked, Weaver said. That is good news, but it also makes it

harder to decide which factors to prioritize for the next batch of improvements.

Should projects that open an entire stream come first? Or should funds focus on the first set of barriers blocking migratory fish from returning to the areas where they once spawned? Or maybe projects should just take place when states or localities decide a stream crossing is due for an upgrade for other reasons, and fish passage can be improved in the process.

“Back then, we just had paper lists of project plans each state had. We were going down the list and checking things off,” Weaver said.

Much of the progress on removing more large dams in the Bay region has been slowed by private ownership and by

Top photo: Volunteers from the James River Association join the U.S. Fish and Wildlife Service and Virginia Department of Forestry to install plants along Flowerdew Hundred Creek, where an ineffective culvert was removed to promote fish passage. (James River Association)



Travis Tindell from the Virginia Department of Forestry plants a sedge along the banks of Flowerdew Hundred Creek after a culvert was removed to improve fish passage. (James River Association)

concerns that the process could release excess sediment pollution. Also, new funding has placed an increased emphasis on culvert replacements and removals instead.

“Within the last 10 years, the culvert issues for fish passage have been in the spotlight,” said Jessie Thomas-Blate, associate director of river restoration at the national nonprofit American Rivers, which historically focused on dam removals.

The design of many culverts, often built as small concrete tunnels or with corrugated metal pipes, cause problems because they block the efficient flow of water. They may be too small or carry too little water for aquatic life to pass through. They also tend to collect debris and trigger backups, causing flooding upstream and, if the water eventually bursts through, erosion downstream. Improving the design of a culvert or removing it altogether can both reduce flooding and help fish reach more habitat.

Now, the Chesapeake Fish Passage Prioritization Tool and the North Atlantic Aquatic Connectivity Collaborative (NAACC) help guide decision makers and funders. The Bay Program workgroup has spent years tweaking the Chesapeake-based tool, which uses almost 40 different metrics to rank projects. Today, the tool helps fish passage workers prioritize the nearly 4,000 known blockages in the Bay watershed.

“The actual number is probably much higher than that,” said Jim Thompson, fish passage coordinator for the Maryland Department of the Natural Resources and chair of the workgroup. “When I give presentations to students and fisheries groups, I show a map of Maryland with all

the streams and major road crossings. Not every one is a blockage, but many are.”

Zooming in

Setting up the next iteration of fish passage projects in the region has required a good bit of counting — and a lot of painstaking work, driving around to see which culverts need immediate attention.

Lisa Moss, a fish biologist with the Virginia Fish and Wildlife Conservation Office, began some of that work with the help of a grant from the Chesapeake Bay Trust in 2016.

Before she started, “there had been no assessment done [of culverts] in the lower James drainage area,” said Moss, who evaluated 320 stream crossings, adding each into regional databases. “It really laid the foundation for partners to go out and do more.”

One of those partners, the James River Association, helped Moss with some of her work. Seeing the great need for this type of work in the James watershed led the group to dip its toe directly into related projects.

After three years of planning, the association worked with the Virginia Department of Transportation to remove about 200 feet of a little-used road that crossed Flowerdew Hundred Creek, just south of pristine habitat in the James River National Wildlife Refuge. The project, completed in April 2022, opened about a mile of stream for river herring to use when migrating upstream to spawn in the spring.

Working with the National Fish and Wildlife Foundation, U.S. Fish and Wildlife Service and Virginia DWR, the



Flowers bloom at Flowerdew Hundred Creek, near the James River National Wildlife Refuge, several months after a project that improved fish passage. (James River Association)



These freshwater mussels, grown at the U.S. Fish and Wildlife Service's Harrison Lake National Fish Hatchery, were among the 600 planted in Flowerdew Hundred Creek in Virginia in October 2022 as an added benefit to a fish passage project. (James River Association)

Richmond-based nonprofit got a taste of the complicated — and satisfying — work of improving fish passage. The partners also added native plants to the stream's riparian corridor, stabilized the banks and planted freshwater mussels nearby, “because we saw them there in the process of removing the culvert,” said Erin Reilly, the group's staff scientist.

“Herring show up between March and April, sometimes May, depending on water temperatures and flow,” she said. “We'll be looking for them.”

The Flowerdew project inspired Moss to look for similar opportunities. Moss had already worked with the Piedmont Environmental Council — a leader on culvert removals in headwater streams that host trout — on projects that involved working closely with VDOT. But this one, in particular, “took some detours.” What was originally envisioned as a culvert replacement

became a road removal once it became clear that the road was barely being used.

“It got me thinking, ‘How many roads are out there that nobody's using?’” she said. When that's the case, removing the crossing entirely “is the best possible fish outcome.”

Moss said that the more that groups can partner with transportation authorities, the more likely those agencies are to internalize fish passage priorities.

Technically, in Virginia law, the owner of a barrier to fish migration is responsible for providing fish passage, Weaver said, but “it doesn't have any teeth.” If a road that crosses a stream needs to be repaired in an emergency, fish passage isn't always a priority.

Each of the Bay states is at a different stage of quantifying and removing the thousands of remaining blockages in their waterways. Pennsylvania is known as a leader on dam removals, in particular, because of a streamlined permit program that makes dealing with faulty dams easier for owners. The state also has more than 9,900 assessments on stream barriers completed in the NAACC system, Moss said, compared with about 2,800 in Virginia and 3,000 in Maryland.

For reference, New York has more than 32,000 assessments, reflecting decades of fish passage progress in the Northeast.

These days, Moss spends much of her time training others across the Bay region to conduct the assessments she's done for the lower James. As she meets with river groups and transportation officials, she's encouraged.

“We still have work to do to bring everybody on board,” she said, “but at least we're at the table.” ■



Wetlands are part of the landscape at Maryland's Calvert Cliffs State Park. (Will Parson/Chesapeake Bay Program)

Can AI track wetlands better than people?

Chesapeake Conservancy is teaching computers to produce more accurate maps

By Whitney Pipkin

The jury is still out over whether we trust artificial intelligence with journalism and art. But, in the right hands, the technology could help the Chesapeake Bay region do something it hasn't ever done well: track wetlands.

A team at the nonprofit Chesapeake Conservancy has developed an "AI deep learning" model that can map wetlands with 94% accuracy. The results of the project were recently published in the peer-reviewed journal, *Science of the Total Environment*.

For the project, the team fed thousands of data points into a machine-learning model, which mimics a brain's ability to assimilate information, to enable it to identify wetlands. These landscapes can take the form of marshes, swamps or vernal ponds, to name a few.

"We do hope this will eventually influence policy at the local, state and Baywide scale and beyond," said Joel Dunn, president and CEO of Chesapeake Conservancy.

The U.S. Environmental Protection Agency defines wetlands as areas where water covers the soil or is present at varying times of the year. Applying that definition has been the subject of legal wrangling and back-and-forth policymaking since the Clean Water Act first declared in 1972 that certain wetlands and waterways should be protected.

Debates over the legal definition, along

with outdated information about where wetlands have existed historically, makes it hard to clearly delineate wetlands on maps. Satellite imagery helps, but it brings challenges, too.

"The difficulty of mapping wetlands comes down to their variability in space and time," said Mike Evans, a senior data scientist with the conservancy. "If you think about what a forest looks like from above, it's green and trees. [From above,] wetlands can look like a forest or like a marsh. That changes from location to location and also throughout the course of the year."

The AI technology could produce better maps and make it easier for developers and conservationists to leave more wetlands intact when planning projects. The work could even identify properties where wetland restoration might be a good fit.

The conservancy has already used high-resolution data from aerial images to track changes in land use across the Bay watershed. The results last year showed that tree canopy was being lost more quickly than previously realized.

To map wetlands, the team trained the computer model using data from three areas across the country — in Minnesota, Delaware and New York — that have a variety of wetland types. That data included aerial and satellite imagery and light detection and ranging (LiDAR) data that use sensors to detect variations in the

landscape. They tested the model by asking it to examine an area of Nebraska with an outdated wetlands analysis.

The model was able to identify wetlands with 10% more accuracy than the outdated data sets used to train it. The program even showed, in some cases, where wetlands would be if development had not occurred, based on patterns it identified in the landscape.

"It doesn't just regurgitate the data that is fed to it," said Susan Minnemeyer, the vice president of climate strategy at the conservancy. "The model is trying to understand the relationships between data sets."

A combination of recent technological advancements made it the right time to do this work, Evans said. Experts can now use cloud computing to do work that previously required banks of super computers. At the same time, there have been advancements in remote sensing data and machine deep learning, which uses artificial neural networks to process complex layers of information.

Humans have undervalued the ecological importance of wetlands for hundreds of years, filling them in to reduce mosquito populations or build infrastructure. In the process, North America has lost an estimated 36.5% of its wetlands since 1900, said Kumar Mainali, data science lead on the wetlands mapping project.

But scientists now know the crucial role wetlands play in maintaining water quality and supporting wildlife while reducing

erosion, storm damage and flooding. Wetlands also store more carbon than rainforests, keeping gases that contribute to climate change out of the atmosphere.

The Chesapeake Bay Watershed Agreement has a goal of creating or reestablishing 85,000 acres of wetlands and enhancing an additional 150,000 acres of degraded wetlands by 2025. But the state-federal partnership was only about 19% of the way to that goal by 2021.

Despite the necessity of wetlands, agencies have struggled to keep track of these environments, which are so subject to change. Land subsidence and sea level rise on the coasts can chip away at wetlands or push the habitats into new areas. Development that hardens previously soggy areas can also change how water moves across a much broader area.

One of the benefits of an AI approach to tracking wetlands is that it can be updated to account for changes in the environment, Evans said. These "living" maps can be used to direct field technicians, who often need to spend time on the ground confirming the presence of wetland species, for example.

The model was informed by the U.S. Fish and Wildlife Service's National Wetlands Inventory. But it was also able to make improvements over areas of the national data set that were last updated as far back as the 1970s or '80s. Some of the oldest wetlands data was compiled using aerial photographs.

"The data that we rely on to minimize impacts to wetlands is distressingly outdated," said Becca Madsen, a manager at the Environmental Policy Innovation Center and a former researcher at EPRI, an independent energy research institute that supported the conservancy's project. Meanwhile, "the Infrastructure Investment and Jobs Act is pouring hundreds of billions of dollars into projects that will have an impact on the landscape. There has never been a better time to invest in updating our nation's wetland data."

The conservancy's Dunn agrees. He is trying to get funding for a much larger data layer covering an entire region — possibly the Chesapeake Bay watershed — which he estimates would cost about \$450,000. The work already done, which included hiring two scientists with doctorates in this type of work, was supported by EPRI, the Grayce B. Kerr Fund and Lincoln Electric System in Nebraska.

"We're at the dawn of a new era," Dunn said, "which is the application of AI and machine learning to some of the most challenging conservation problems of our time." ■

Ice climbing in Bay region melting away in face of warm winters

Enthusiasts call recent months the region's worst season ever

By Ad Crable

In places like The Narrows in Pennsylvania, Swallow Falls in western Maryland and The Unicorn in Virginia's Shenandoah National Park, frozen waterfalls and seeps become a much-anticipated playground for the extreme sport of ice climbing.

It's a demanding passion that requires engineering skills and muscles and mental moxie different from rock climbing. For starters, you have to climb in bitter cold.

Ice climbers like David Giacomini pray for entrenched arctic cold fronts to create the walls of ice they scale using a pair of ice axes as arm extensions and, on their feet, spiked crampons for precarious toeholds.

"When I'm leading ice climbing, everything quiets for me and I'm in a world of complete tranquility," said the 51-year-old Silver Spring, MD, businessman who created the DC, VA, WV and PA Ice Climbing Community page on Facebook, with 1,900 followers.

"There's not many experiences where you can come into a place of complete peace and quietness and become one with nature."

It's a blank canvas with routes that, unlike rock climbing, get drawn anew with each new freeze. The color of the ice can vary from white to blue to any of the colors of the minerals inside the rock beneath. There can be walls of ice or frozen columns, and obstacles in the shape of mushrooms and chandeliers. Climbers often hear running water just under the ice, and sometimes they get sprayed.

Climbers look at the puzzle and make their way up, splayed against the ice. Their safety net comes from being hooked into a rope fixed to the top or the more dicey method of driving screws into the ice and being belayed by a partner at the base. With curved ice picks and crampons, even short falls can cause injuries. "It's not for the faint-hearted," Giacomini said.

At some point, most ice climbers experience the "screaming barfies," a brief but agonizing condition stemming from all the blood draining from your hands while wielding ice picks overhead. When the climb is done and the blood rushes back, climbers sometimes throw up from the pain. It can also cause temporary hearing



Ice climbers Bob Perna, on the ice, and belayer Scott Grimes tackle columns formed by frozen seeps at Ricketts Glen State Park in Pennsylvania. (Justin Smith)

or vision loss and dizziness.

But it takes prolonged snaps of well-below freezing temperatures to create climbable ice. And freeze-thaw cycles can loosen the anchoring rock under the ice or cause the ice layer to pull away from its base.

This winter has been, by far, the worst season in memory for many climbers in Bay drainage states—and the worst among three or four warm winters in a row.

Giacomini, who admits to "becoming drunk with ice climbing," has gone out just once this winter. "This is a real thing. This has been the worst season ever, hands down," he said.

"Maybe you should make this story about climate change," quipped Bob Perna, a 70-year-old retired builder from West Chester, PA, who has led ice-climbing trips for four decades.

"In 40-plus years, I've never experienced these temperatures," said Perna, who in early February drove to New York's Adirondacks to find safe ice. "I talked to the younger climbers, and people were saying, 'I don't know about making an investment' [in ice-climbing gear]."

Until driving eight hours north, Perna this winter had only climbed two days. That was in December when a freak polar vortex brought record cold to his favorite climbing routes: the frozen series of 22 named waterfalls in Ricketts Glen State Park in northeastern Pennsylvania. The



Ice picks and anchoring screws are among the gear needed for ice climbing. (Bob Perna)

ice quickly melted, and there have been no good ice formations since then.

"There's no question that we're destroying our planet and for those that play outside in it," he said.

Lost ice means lost revenue for some. Valley to Summit, a Philadelphia-based outfitter, has been leading trips to view the frozen waterfalls at Ricketts Glen for eight years. The trips have become increasingly popular with up to six groups of 16 participants a day.

"A mild winter is devastating. Yeah, it hurts," said founder David Mildenberg. "But we don't have harvest insurance like farmers."

A check of weather records near Ricketts Glen, one of Pennsylvania's ice-climbing meccas, helps to explain why walls of ice are getting harder to find.



Bob Perna climbs ice columns in Pennsylvania's Ricketts Glen State Park. (Dan Allard)

From 1981 to 1985, the average minimum temperature for January was 5 degrees. From 1986 to 1990 it was 8 degrees, followed by 5 from 1991 to 1995 and a frigid minus 13 from 1996 to 2000. Then winters started getting noticeably warmer, with the average low temperature rising to 18 by 2005 and at least 20 degrees ever since.

Well aware of the global warming forecasts of more temperate winters, ice climbers in the region are grappling with the possibility that nearby ice climbing in their home states may be vanishing.

"I hope this trend we have had for the last few years changes. If not, driving eight hours will be the norm rather than the exception to getting ice for us down here in the Mid-Atlantic," Giacomini posted on his ice-climbing Facebook page.

Instead of seeking out local ice playgrounds, those who can afford it might have to plan multiday trips to more northern climes such as the Adirondacks or Catskills in New York, or the White Mountains of New England.

Others are relying more on the newer sport of dry tooling, which involves using ice-climbing tools to scale bare rock year-round (preferably avoiding established rock climbing routes because the tools can scar rock).

"Dry tooling is the only thing that has kept me sane so far," Perna said. ■



Scientists dredge for lowdown on Chesapeake blue crabs

Last winter's survey saw troubling drops in population, prompting harvest restrictions

By Timothy B. Wheeler

The fortunes of the Chesapeake Bay's blue crabs can be read in the bottom of the estuary and its rivers.

Every winter for more than three decades now, teams of scientists in Maryland and Virginia have laboriously sampled the depths with steel-toothed dredges to look for crabs burrowed into the sediment or sand, waiting for spring.

On a relatively balmy day in early February, the crew of the research vessel *Bay Eagle* from the Virginia Institute of Marine Sciences spent six hours checking for crabs by towing a dredge along the bottom of Mobjack Bay, which lies between the Rappahannock and York rivers on the Bay's western shore.

Sometimes, the dredge came up nearly empty. Other times, it yielded a motherlode of shells, oysters, clams, worms and anywhere from one to a dozen crabs, rendered uncharacteristically docile by the frigid water. Wearing thick gloves, crew members stooped or knelt on deck to pick through the muck to find the crustaceans, some as tiny as a pinky fingernail.

"One little boy in there with all these women," noted Michael Seebo, a senior marine scientist at VIMS, after the crew found a lone male crab among an otherwise all-female group.

Like a lot of science, the annual winter dredge survey is messy and repetitive. But the data it has meticulously collected since 1990 has proven remarkably prescient at predicting how many crabs there will be in the coming year to catch and eat. The results of each year's survey are a barometer of the health of the Bay's signature crustacean. And they help regulators in both states manage commercial and recreational crabbing to prevent overfishing.

The findings of this winter's survey are even more anxiously awaited than usual. Last year's found the crab population at its lowest abundance in more than 30 years. The number of females old enough to reproduce was down, though still above the minimum level deemed necessary to sustain the population. But the number of juvenile crabs — the critical link between previous and future generations — was the second lowest ever, only slightly better than the record low in 2021.

This isn't the only checkup the two states make of the Bay's crabs. They've been conducting annual trawl surveys in warmer weather for years. But the winter survey is considered the most reliable because that when it's easiest to catch crabs. They settle on the bottom and stay put when the water temperature dips below 50 degrees Fahrenheit. It's not actually hibernation, but the crabs remain dormant until the water warms again.

"The wintertime gives us that chance to really get a quick snapshot on year-to-year changes up or down in the population," said Seebo, who's been involved with the survey almost since its beginning. "I've put a lot of pride and time into making it consistent, and the people I work with are good people. And I think that the information that comes out of it is valuable to the [fishery] managers."

Random sampling

So from December through March, crews from VIMS and the Maryland Department of Natural Resources check 1,500 places on the bottom of the Bay and its tributaries, half in each state. Each crew also samples 25 spots in the other state, to check the consistency of their results.

Top left photo: Blue crabs scooped up from the bottom of Mobjack Bay during the winter population survey varied greatly in size. (Timothy B. Wheeler)

Top right photo: Brian Watkins, small boat coordinator with the Virginia Institute of Marine Science, kneels to pick through oyster shells while looking for crabs during the annual survey. (Timothy B. Wheeler)

Rather than actively search for slumbering crabs, the crews sample locations randomly selected by a computer. Voight "Bubba" Hogge, captain of the VIMS survey boat *Bay Eagle*, relies on GPS to guide the vessel to the pre-selected spots.

Then the vessel tows a 6-foot-wide dredge along the bottom for one minute at a speed of 3 knots so samples are collected consistently. The dredge, much like the ones Virginia watermen once used for wintertime crabbing, is lined with a mesh bag fine enough to catch all but the tiniest of crabs.

Mobjack Bay, with wide open water branching into several rivers and creeks, is a microcosm of the Chesapeake. Salinity varies from its mouth to its headwaters, like the Bay, and its depth is similar to the 21-foot average for the larger estuary.

Last year the survey didn't catch many crabs in Mobjack Bay, according to Alison Smith, a veteran VIMS research specialist on the survey crew.

Smith and Katie Beth Jones, also a research specialist, wrestled the dredge's contents onto the deck after most tows. When it came up loaded with muddy shells and shellfish, though, they needed help from the rest of the crew, including small boat coordinator Brian Watkins, Seebo and even the skipper.

Each crab discovered amid the detritus got measured, its sex determined and its particulars recorded for later analysis. Most were females, which was not surprising because females migrate to the lower Bay in the fall to be ready for spring spawning.

The results of this winter's survey likely won't be known until May, after the field sampling is finished and the numbers crunched. The outcome could ease — or deepen — worries about the stability of the fishery.

Rom Lipcius, the VIMS crab researcher who oversees Virginia's half of the survey, said he was concerned by the 2022 survey results, but not alarmed. The crab population is prone to ups and downs, reflecting the crustaceans'



Katie Beth Jones and Alison Smith, research specialists with the Virginia Institute of Marine Science, measure crabs and check their sex while senior marine scientist Michael Seebo writes down the data. (Timothy B. Wheeler)

complicated life cycle, which spans the entire Chesapeake and even depends on Atlantic Ocean currents near the Bay's mouth.

"It's not unexpected to see these sudden drops in a given year," Lipcius said of the female stock. "What we don't want to see is a consistent drop where it flattens out and continues low."

That's what happened starting in the late 1990s, when survey after survey for a decade found the crab population below the long-term average. In 2008, fisheries managers imposed harvest limits for female crabs, hoping to preserve enough of them to start a rebound.

The female population increased after that. Though it has gyrated from year to year, it has only once slipped below the sustainability threshold of 72.5 million, in 2014.

But since 2017, adult female crab abundance has trended downward. The 2022 population estimate of 97 million is the lowest it's been since their numbers dipped below the threshold.

By itself, that hasn't been enough to perturb scientists. What's stirred unease is a corresponding two-year plunge in the number of juvenile crabs.

"That adds a little bit of extra concern to the pot," acknowledged Lipcius.

Little impact on harvest

Fishery managers in both states responded to the sub-par 2022 survey results by tightening harvest rules through the second half of the season that had already begun.

Maryland watermen faced their first-ever bushel limits on male crabs in late summer — a response to surveys finding them at their lowest level in three decades as well. The state also ended the commercial season two weeks early, on Nov. 30, and reduced the allowable catch of females from July through October. Even recreational crabbers got cut back to only one bushel a day, down from two daily before.

The Virginia Marine Resources Commission, meanwhile, imposed new restrictions on commercial harvests from Oct. 1 to the end of the season on Nov. 30. Those reduced

catch limits will continue for the first six weeks of the 2023 season, which begins in April.

Despite the bleak survey results and added catch restrictions, the 2022 commercial harvest didn't take that big a hit. Legal sized crabs were scarce throughout spring, but the catch picked up in late summer and through fall. Preliminary figures from DNR show that Maryland's watermen landed about 22.7 million pounds of crab last year, with all but about 1 million pounds coming from Chesapeake waters. That's on par with Maryland's 2021 harvest from Bay waters.

Virginia's watermen landed about 15.3 million pounds of crabs in 2022, according to preliminary data from the Virginia Marine Resources Commission. That's 8% below the 16.6 million pounds harvested in 2021. Adam Kenyon, the VMRC's deputy fisheries chief, said catch reports showed an overall reduction of harvester effort.

In the Potomac River, where a bistate commission regulates fisheries, watermen faced similar restrictions. Still, the 2022 harvest of 2.5 million pounds was slightly higher than the year before, according to Martin Gary, the commission's executive secretary. The number of boat trips to harvested crabs dropped, as did the number of crab pots deployed, Gary said, but watermen caught more per trip.

Whatever the outcome of this winter's survey, Lipcius said he has advised Virginia's fishery managers that more needs to be done to ensure that a larger number of spawning females get a chance to reproduce before they are caught. That might mean limiting the spring catch rather than making an overall harvest reduction, he said.

Watermen have questioned the reliability of the winter dredge survey at times, but scientists and managers note there's only been one year where its results failed to track with the harvest.

That said, Lipcius acknowledged the survey's estimate of juvenile crabs is based on more limited data than other segments of the population because the survey vessels can't get into the shallows where many young crabs spend the winter. The mesh liner in the dredge also isn't fine enough to catch the tiniest of juveniles. That creates more uncertainty around juvenile abundance, he said.

Even if not alarming, last year's results were concerning enough that scientists and fishery managers in Maryland and Virginia agreed it was time to perform another comprehensive stock assessment of the Bay's crab population. The last one was in 2011.

This one, Lipcius said, will revisit all the assumptions about crabs that went into the earlier assessment and incorporate the results of other surveys besides the winter dredge. Experts also plan to analyze the data using one or more additional mathematical models that might be more sensitive to the different stages of crab maturation or variable conditions in different parts of the Bay or in different seasons.

They also plan to evaluate whether environmental conditions may have changed, including predation by other fish. Striped bass and red drum are known to feed on juvenile crabs. But nonnative blue catfish, which have proliferated throughout the Bay since being introduced in Virginia years ago, are a newer and likely bigger threat. A 2021 VIMS study estimated they were consuming a couple million little crabs a year in just one stretch of the James River.

"The blue crab has one hell of a complicated life cycle in the Bay," Lipcius said. "We're trying to account for more of the life history than in the past." ■



Crew members with the Virginia Institute of Marine Science conduct research for the Bay's winter crab survey, pawing through shells, seaweed and mud to find lurking crabs. (Timothy B. Wheeler)

Wildlife refuge pushes back against development pressure

County-owned land next to MD refuge eyed for university housing, shops, restaurants

By Timothy B. Wheeler

With 13,000 acres of forest, meadow and wetlands, the federal Patuxent Research Refuge has been called the “green lungs” of the burgeoning Baltimore-Washington area.

Those green lungs are at risk these days, though, from a proposal by Prince George’s County to develop 97 mostly forested acres of public land on the refuge’s southeastern fringe into a “mixed-use transit village” next to the MARC commuter rail station at Bowie State University. A county-sponsored report by the Urban Land Institute in 2020 envisioned building graduate student housing, shops and eateries, and possibly some offices, a brewery and a data center.

Refuge manager Jennifer Greiner of the U.S. Fish & Wildlife Service said she hopes it’s not too late to get the county to reconsider. That land has served for decades as a buffer for the refuge from the noise, light and pollution of nearby traffic and development, she said.

Greiner wrote to the county’s economic development chief in December suggesting that the U.S. Fish & Wildlife Service would like a chance to buy that tract, along with another 100-plus mostly wooded acres of adjoining county-owned land, to add to the refuge.

“There are a lot of reasons not to build in there,” Greiner said in an interview. “Even if it weren’t next to the wildlife refuge, it still seems ill-advised to develop there.”

Much of the 219 acres of public land between the refuge and Bowie State is high-quality forest, she said. Satellite images show more than 11,000 trees, which a NASA scientist estimated sequester 3,500 tons of carbon, she said.

Those woodlands also effectively shield sensitive forest habitat on the refuge used by birds and bats, Greiner added, including endangered northern long-eared bats.

Preserving the forest would help air quality, she said, and clearing trees and disturbing wetlands on the site would increase sediment runoff to streams that feed into the Patuxent River, a Chesapeake Bay tributary that flows through the refuge. Prince George’s, which is Maryland’s second most populous county, lost more forest than any other county in the state from 2013 to 2018, according to a recent study by the



Jennifer Greiner, manager of the U.S. Fish & Wildlife Service’s Patuxent Research Refuge in Maryland, kneels in a mature forest next to the refuge on land owned by Prince George’s County. The county is weighing plans to build a “mixed-use transit village” on the site. (USFWS Patuxent Research Refuge)

Harry R. Hughes Center for Agro-Ecology of the University of Maryland.

“[The refuge] is beset by threats on every boundary now,” said Richard Dolesh, board chair of the Friends of Patuxent. Only last year, a proposal to sell 105 mostly wooded acres owned by the National Aeronautics and Space Administration that border the refuge got tabled.

Established in 1936, Patuxent is the only national wildlife refuge dedicated to research. Since 1996, research there has been conducted by the U.S. Geological Survey. But the refuge remains vital deep-forest habitat for migratory songbirds such as the scarlet tanager and the wood thrush.

Angie Rodgers, the county’s deputy chief administrative officer for economic development, referred queries about the project to others on the staff. Jose Sousa, an assistant, replied by email that the county and Bowie State have been talking about developing the site for more than a decade. The county issued a public request for expression of interest from potential developers in 2021, he noted, and followed up with a request for specific proposals in June 2022.

But Greiner said she only learned about the proposed development last summer from someone who had seen the county’s call for proposals. The wildlife service has long been interested in acquiring that land,



Sandy Spencer, a Fish & Wildlife biologist at the research refuge, looks at a lake on adjacent county-owned property that may be developed. (USFWS Patuxent Research Refuge)

she said. It had even attempted to buy it years ago when it was owned by a different public entity.

Janet Gingold, chair of the Prince George’s group of the Maryland Sierra Club, called it a “complex situation,” noting that her group generally supports transit-oriented development.

“We hope that a plan can be developed that limits the development to the area closest to and within walking distance of the MARC station and preserves most of the forest land as part of the Patuxent Research Refuge,” she wrote in an email.

“This is a very important test of how we take climate change mitigation and adaptation into account as we make land-use decisions, not just developer profits,” Gingold added. “The Patuxent Research Refuge is a treasure that must be safeguarded.”

The Patuxent River Commission, a multi-jurisdictional advisory body created by the state legislature to look out for the river’s welfare, wrote the county in December, urging it to consider the wildlife service’s offer to buy, or protect via easement, all or part of the 219-acre tract.

Dolesh of the Friends of Patuxent suggested there still could be a “win-win”

outcome if the county would set aside the other 100-plus acres of county-owned land to buffer the refuge.

But Greiner said that unfortunately it’s the acreage closer to the MARC station that has the most mature forest.

She pointed out that the county’s push to develop this forested land appears out of step with its new “climate action plan.”

Adopted by the county council in July, that plan sets a goal of reducing greenhouse gas emissions in Prince George’s 50% below 2005 levels by 2030, with a further goal of carbon neutrality by 2050. Among its more than two dozen recommendations, the plan calls for maintaining countywide forest and tree cover at 52% through 2030 and expanding it to 55% by 2050.

Greiner said she’s not insensitive to the needs of Bowie State, Maryland’s oldest historically Black university. She said that she hopes the refuge and the university can collaborate on using the forest as a “giant outdoor learning laboratory” for students while limiting development on the 3 acres or so of land the school owns adjacent to the MARC station.

“I’m hopeful that maybe they’ll press the pause button,” Greiner said. ■



Above: An abandoned and unplugged conventional gas well leaks water in Pennsylvania's Allegheny National Forest. (Laurie Barr)

Left: This abandoned conventional gas well is in Pennsylvania, which has more abandoned oil and gas wells than any state in the nation. (Laurie Barr)

Report: PA gas wells routinely abandoned, left unplugged

Others says findings are inaccurate, based on flawed reporting system

By Ad Crable

A governor-ordered inquiry into how well conventional oil and gas drillers in Pennsylvania are obeying environmental laws has found a “culture of noncompliance,” with drillers routinely abandoning wells without plugging them as required to prevent the release of methane, a potent greenhouse gas.

Pennsylvania has more abandoned oil and gas wells than any state and the oldest oil and gas industry in the nation.

The report, released in late December by the state Department of Environmental Protection, which regulates the industry, also found that about 56% of well owners failed to report the amount of waste they generated, as required by law, as well as where it was taken for disposal.

DEP looked at environmental compliance from conventional oil and gas operations (not from hydraulic fracturing or “fracking”) between 2017 and 2021. Violations for abandoning wells without plugging them

was the most common infraction. The agency issued 3,123 violation notices to 256 companies for that problem during the five-year period and charged 15 of them with fines.

“The widespread reporting noncompliance by the conventional oil and gas industry denies DEP and the public critical information about the operating status of individual wells, the overall industry and, in the case of mechanical integrity assessments, may pose a threat to public health and safety and the environment,” the report said.

It warned that the cost to clean up abandoned wells may fall on taxpayers.

“A significant change in the culture of noncompliance as an acceptable norm in the conventional oil and gas industry will need to occur before meaningful improvement can happen,” it concluded. “This record of noncompliance will require DEP to further develop and refine its techniques for deterring violations.”

DEP is in the process of updating its regulations regarding the conventional oil and gas industry.

The probe was requested by former Democratic Gov. Tom Wolf in 2022 after the state legislature passed a law that preempted an arm of DEP from raising the

amount of bond money that oil and gas companies must pay to cover the cost of plugging inactive wells.

The current law caps the bond at \$25,000 for each new well. No bonding is required for wells drilled before 1985 — or approximately 60% of known abandoned wells.

At the urging of environmental groups, the Pennsylvania Environmental Quality Board had agreed to consider raising the bond amount to \$38,000 per well.

DEP has said the average cost to plug a well is about \$33,000.

The Republican-controlled legislature passed a bill freezing the current bond amount. Wolf allowed that bill to become law without his signature, but he requested that DEP probe environmental compliance by the industry “to revisit whether the commonwealth is doing enough to ensure that this industry is being a good environmental steward by preventing the abandonment of wells.”

Abandoned gas wells have become a massive financial and environmental problem in Pennsylvania and have received more recent scrutiny because methane emissions are 86 times more potent than carbon dioxide for their potential contribution to global warming over a 20-year period.

A 2016 study of Pennsylvania’s abandoned oil and gas wells published in the journal *Environmental Sciences*, gave an estimate of up to 750,000 abandoned wells. Moreover, it found that methane emissions from leaking wells were a “substantial

source of methane in the atmosphere,” especially from a small proportion of high-emitting wells.

DEP’s records show about 31,000 known abandoned wells. But its estimated number of unknown wells stretching back to 1859 is approximately 200,000. The agency has said fixing them at taxpayer expense could range into the billions of dollars.

Environmental groups contend that if present-day wells are also being abandoned without being sealed, even with bonds in place since 1985, the price tag for fixing the problem may be growing. There are about 100,000 active oil and gas wells in the state.

In 2022, the federal Infrastructure Investments and Jobs Act made Pennsylvania eligible for \$104 million in the first phase of a well-plugging initiative. But DEP estimates that will cover the cost of plugging only about 277 wells.

Members of the oil and gas industry say the DEP report is inaccurate. The Pennsylvania Independent Oil and Gas Producers Association accused the agency of “a continuing adversarial approach.”

In writing its report, said Daniel J. Weaver, the association’s president and executive director, DEP relied on a flawed reporting system and “distorted data from that system to support predetermined conclusions.”

Many of the wells listed as violations are already part of a consent order to resolve the problem, and long-resolved or improperly issued violations notices remain in the computer system and were counted, Weaver said.

Oil and gas operators are simply not walking away from wells, added Arthur Stewart, president of Cameron Energy Co., a gas well operator and chair of DEP’s Pennsylvania Crude Development Advisory Council.

“Routine abandonment is wildly unrealistic. If an operator abandons a well, the operator can be fined daily and sent to jail. Abandoning a well is, in fact, very expensive in money and lost freedom,” he said, claiming that the high numbers cited by DEP include repeat notices of the same violations, sometimes issued to well owners who are long dead.

Many of Pennsylvania’s abandoned wells predate the bonding requirement that began in 1985, he said. “In other words, the people that abandoned those wells had no skin in the game ... My company operates over 1,000 wells and my company has never abandoned a well. [We plug] as many old wells as we drill new.”

DEP had not responded to questions about its report before this issue of the *Bay Journal* went to press. ■

New Bay Foundation leader calls for shifts in Bay cleanup

After a year at the helm, Hillary Harp Falk talks about redefining what it means to save the Bay

A little over a year ago, Hilary Harp Falk took over as president and CEO of the Chesapeake Bay Foundation, becoming only the third leader of the group since its founding in 1967. Before joining CBF, she spent nearly 13 years with the National Wildlife Federation, where she rose to become chief program officer.

Falk has roots in the Bay watershed and history with CBF. A Maryland native, she says she developed a passion for conservation while exploring the Bay's edges in her childhood with her father, photographer Dave Harp (who is the *Bay Journal* staff photographer). She began her career as a college intern for CBF and, after graduating, became an educator at its Port Isobel Education Center.

She took the helm at a time when it was becoming increasingly clear that the Bay restoration effort would likely miss many of its goals by the self-imposed deadline of 2025. Thirteen months later, she sat down with Tim Wheeler, the *Bay Journal's* associate editor and senior writer, to talk about the future of the restoration effort and CBF's role in it.

What follows are excerpts of the interview, edited for space and clarity.

Question: When you became president at CBF, were you surprised to find the Bay restoration effort, which is 40 years old this year, wasn't further along?

Answer: It's been interesting to be away for a decade working on national issues and to come back and see both a lot of progress over the last decade and some of the same challenges. We're all grappling right now [with] this big transition in the Chesapeake Bay movement, with new leaders, at a critical moment for the cleanup. I think there's plenty to reflect on and consider, and a lot to be excited and optimistic about.

Q: Why do you think there hasn't been more progress?

A: It's really important to acknowledge that 2025 was an important deadline, but it was never going to be the finish line. While we've made significant progress in reducing pollution from wastewater treatment, we still have not made the reductions that we need in polluted runoff from farms, cities and towns. Certainly, the defining challenge of the Bay movement now is to address pollution running off farms.



Hilary Harp Falk, president and CEO of the Chesapeake Bay Foundation, said the region is grappling with a critical moment in the effort to "save the Bay." (David Trozzo)

"The pollution to the Bay is not just nitrogen and phosphorus and sediment. It's also legacy pollution, toxics and temperature."

— Hilary Harp Falk, Chesapeake Bay Foundation

Q: You have suggested that the restoration effort needs a dose of "integrity and honesty." Can you elaborate?

A: We've been really focused on the Chesapeake Bay Blueprint [officially called the Bay's total maximum daily load, or TMDL] and the numbers that we need to hit. What I get concerned about is, are we making meaningful progress and looking at what it's really going to take to return clean water to the Bay? I think we need to look at the quality of our plans as much as we need to look at the quantity behind our plans. We have some of the best science and the best modeling in the world. But how can we really couple that with a robust monitoring system and understand how to meaningfully verify progress?

Q: Some key elements of the restoration effort have been questioned, including how well some farm practices actually control polluted runoff. Do we really know what's working and what's needed?

A: Two thoughts on that. First, climate change changes everything.... We need to know a lot more about how climate change is impacting the Bay. Second, we need to pay for outcomes, especially as it relates to polluted runoff from farms. We need to know through documented proof that the investments we're making are going to have the desired outcome. And I think that is certainly a big gap in the Bay cleanup right now. We are investing an incredible amount of money into the cleanup generally [and] especially best management practices on farms. We need to know that they're working and that we can see the benefits to local rivers and streams.

Q: Is reducing nutrient pollution really the most important part of restoring the Bay? The federal Clean Water Act calls for fishable and swimmable waters. How does reducing the Bay's nutrient load make the water fishable or swimmable?

A: We need to focus more on people and communities. And when we do that, we know that the pollution to the Bay is not just [the nutrients] nitrogen and phosphorus, and sediment. It's also legacy pollution, toxics and temperature. And those are the kinds of things that we need to focus on in addition to looking at the [nutrient and sediment] goals under the Blueprint.

Q: Not long ago, CBF didn't pay much attention to toxic pollution. Is that changing?

A: Absolutely. The communities that have been left behind, the frontline and fence-line communities that regularly deal with environmental injustices, are very interested in knowing what's in the water and what's impacting their communities. And so, here at CBF, we're very focused on making sure that the benefits of clean water and healthy communities are enjoyed by everybody.

Q: There is a lot of concern these days about PFAS [per- and polyfluoroalkyl substances], so-called "forever chemicals" in water supplies, streams and fish. Is CBF doing anything to be more of an advocate in that area?

A: We're pretty concerned about PFAS too. Like other toxic chemicals, we know that we need to know a lot more. We just don't know enough in order to advance advocacy for addressing them.

Q: You've talked about the importance of putting people and communities at the center of the Bay cleanup. What does that mean?

A: It means that we need to make sure that we're looking at the siting of different energy sources, and we need to make sure that we're not neglecting communities that have been left behind, by ensuring that they have the support they need to challenge the issues that they face.



The Bay cleanup effort needs more focus on people and communities, said the new CBF president. Here, outdoor sculpture at Paradise Creek Nature Park in Portsmouth, VA, celebrates the connection between humans and nature. (Will Parson/Chesapeake Bay Program/2020)



Reducing nutrient pollution from agriculture is a major challenge for all of the Bay states. Falk said there must be documented proof that the region's investments will be effective. (Will Parson/Chesapeake Bay Program)



Bay cleanup actions must be coupled with a "robust monitoring program," Falk said. Here, Fisseha Mengistu of the U.S. Geological Survey conducts water quality monitoring in Charles County, MD. (Will Parson/Chesapeake Bay Program/2018)

Q: What has CBF been doing lately to make its leadership, staff and work more diverse and inclusive?

A: We're really excited this year to bring on a vice president for diversity, equity, inclusion, and justice. [Carmera Thomas-Wilhite, former director of urban conservation initiatives at the Conservation Fund, recently returned to CBF, where she began her career as the Baltimore program manager.] We're focused on making sure that our organization is inclusive and equitable. And we're working to build trainings and webinars so that our staff knows and can understand the history of this country and this movement, which includes racism, sexism, classism, and other forms of oppression. [It's important that] we are advocating for the rights of everyone to have clean water and clean air, and that we are standing shoulder to shoulder with communities who have not enjoyed those benefits or are having issues with flooding or different environmental injustices.

Q: In discussing the Bay restoration, you said recently, "We'll take a quick look back, but we also know in an age of climate change that we can't go back. That Bay doesn't exist anymore." What did you mean by that?

A: A lot of times we evoke the Bay of 400 years ago, before colonialism. So much has changed during that time. The Bay watershed is now home to almost 19 million people. We're in the age of climate change. That means we are not going back to *that* Bay. But it doesn't mean that we can't have

a really bright future, because we have made so much progress on Bay restoration. We see some examples where we are improving water quality. We see the boom in oyster restoration and oyster aquaculture.

Q: What do you consider a restored Bay, then? Is it one full of crabs, rockfish and oysters or invasive blue catfish and snakeheads? Or all of the above?

A: I think a restored Bay is one where we have healthy habitat, we have resilient shorelines, we have healthy fisheries. And I think all of those things are absolutely possible.

Q: You've said you are among a new generation of Bay leaders, such as those at the Chesapeake Bay Commission and EPA Bay Program office. What do you bring to this effort that's new or different?

A: Well, like many of the new Bay leaders, I've gotten to be part of and watch the last 40 years of effort, science [and] restoration. So, I'm pretty clear on the challenges that we face. But also we are optimistic, determined, and I think we also are collaborative. We're all talking all the time, and I think that those relationships and collaboration will set us apart.... We all know that we stand on the shoulders of the first generation to really raise the alarms about the Bay. We are now taking the baton and need to look at new and creative ways of leading, trying different things, making new mistakes and really building a future that we can all be excited about.

Q: You've described Adam Ortiz, the U.S. Environmental Protection Agency's regional administrator, as a "wonderful partner." What does that mean? CBF is part of a lawsuit accusing the EPA of not doing enough to get Pennsylvania on track with its share of pollution reductions.

A: It means that we've had really productive conversations about the current lawsuit.... I think the EPA is in good hands right now. I think they're doing a lot of important work, specifically behind the scenes, talking with leaders in Pennsylvania and really understanding the problems that Pennsylvania faces. And I think that's exactly what the EPA should be doing, in addition to holding the states accountable and making sure that the EPA is there to enforce the laws.

Q: After years of debate and inaction, Pennsylvania last year created the state's first dedicated source of clean water funding. But it comes from federal money and isn't nearly enough to close the state's funding gap for Bay restoration work. What's happened with that since?

A: The Clean Streams Fund was a really important down payment and a moment for leadership for Pennsylvania. But it was a down payment. There's so much more that Pennsylvania needs to do. Pennsylvania is one of our biggest challenges. But I also think it's a huge opportunity, especially when Pennsylvanians are leading. And I see a lot of really great leadership in Lancaster County right now, building

community-based plans that are defined by people who live there. Community based organizations, members of our team [and businesses are] all pulling together to figure out what Lancaster needs to do to protect its rivers and streams. When we see that kind of effort, it gives me a lot of hope. That's the way things are going to change.

Q: What would you put in a new Bay agreement if you were creating it? How would you craft it?

A: I'd make sure that it includes climate mitigation goals in addition to climate adaptation goals. We're not going to save the Bay without addressing the climate crisis. I think we need to take a hard look at toxics and other chemicals of concern.... We need to really focus on growing the monitoring data. And we should really be focused on our biggest challenges and our biggest opportunities, which means a lot more thinking about agriculture and soil health.

One of our challenges is that we have really defined the Bay cleanup based on nitrogen, phosphorus and sediment. Now we have an opportunity to look more broadly at a number of other issues. As we are updating the *Chesapeake Bay Watershed Agreement*, that's a huge opportunity to look past nitrogen, phosphorus and sediment into other issues and really redefine what it means to save the Bay. ■



Park, forest managers struggle to manage new wave of e-bikes

Electric bikes provide more outdoor recreation options but raise some concerns

By Ad Crable

Electric bikes, one of the hottest trends in recreation, can be a god-send for people getting on in years or with medical impairments, helping them heal, stay fit and continue to enjoy the many benefits of being outdoors.

Even healthy people say that the pedal-assist feature on e-bikes allows them to go farther, climb steeper hills and see more scenery than on a standard bicycle. It can also be an equalizer on long or challenging rides, allowing children to keep up with their parents, or an injured or less fit person to keep up with a partner or group.

Nationwide, annual sales of e-bikes have climbed rapidly, from 417,000 in 2020, to 750,000 in 2021 and 928,000 in 2022. The cost of an e-bike ranges from \$700 to \$5,000 and more. A charged battery lasts for about 30–100 miles. The common 750-watt motors provide roughly the same power as the legs of a professional bike racer, leading some exercise purists to view them as “cheating.”

But these quiet, motorized e-bikes can go quite fast — even without pedaling on many models — sometimes startling hikers, joggers, dog-walkers, stroller pushers and horseback riders. Trail managers often field complaints from people who were surprised by e-bikes passing or bearing down on them from behind.

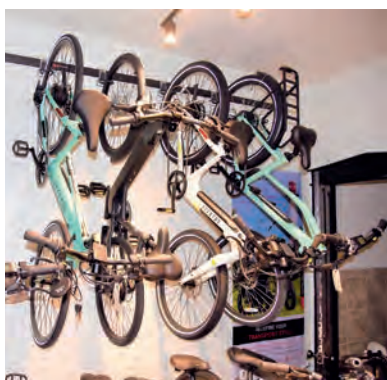
“I’ve been shoved off the path by people coming down the trail at me at ungodly speeds,” said Jim Hearn, who heads an advisory committee governing the use of the Enola Low Grade Rail Trail in Lancaster County, PA. “They are not pedaling at all. They’re basically dirt-biking on the trail.”

But others point out that, on a smooth, flat trail, conventional multi-geared bicycles can easily and just as quietly zip along at 20-plus mph.

The growing popularity of e-bikes has triggered environmental concerns, too. E-bikes are generally heavier and often come with fat knobby tires, inviting concerns about damage and increased erosion on dirt trails. Some also worry that e-bikes will send people farther into the backcountry, spoiling the wilderness experience, if not the wilderness itself. Similarly, some fret that the popularity of e-bikes is leading to overcrowded trails.

All of this has public officials and land managers in the Chesapeake Bay region scrambling to determine whether e-bikes should be treated as motorized or nonmotorized vehicles and how best to blend them into trails already seeing record numbers of users. Early on, most managers waited to gauge how this new activity unfolded before setting rules. But the number of e-bikes showing up on trails and in parks has forced the hands of many.

Perhaps predictably, e-bike regulations in Bay states vary widely, and many have already been modified from original guidelines.



An assortment of electric bikes lines a wall in a sales and rental shop in Lancaster, PA. (Ad Crable)

Top photo: Susan Russell and Bill Thompson ride electric bikes on a trail at Atkins Arboretum in Caroline County, MD. (Dave Harp)



The electric bike craze prompted Tim Hill, left, and Ryan Finger to open a store just for e-bike sales and rentals in Lancaster, PA, in 2022. (Ad Crable)

Contrasting rules

A popular 1,105-acre park in Lancaster County, PA, bans e-bikes from mountain bike trails and roads.

Yet the heavily used Enola rail-trail in the same county allows e-bikes without restrictions. “I guess [e-bike riders] have been respectful. We haven’t had any real issues,” said Ryan Strohecker, manager of the Manor Township portion of the trail.

At first, the U.S. Forest Service ruled that e-bikes were motorized vehicles and prohibited them on trails in national forests, restricting them to roads and other routes open to motor vehicles. But in late 2022, the agency said it would make e-bikes a distinct category and allow officials in each national forest to determine usage rules.

The National Park Service in 2019 decided to allow e-bikes wherever conventional bikes were allowed on roads and on its 16,000 miles of single-track trails. But after a consortium of conservation groups sued, a federal judge in July 2022 ruled that the agency must invite public views and weigh effects on the environment, including wildlife, because those weren’t considered in setting the open-ended policy. As this issue of the *Bay Journal* went to press, the public comment process had not been scheduled.

Maryland considers e-bikes the same as regular bicycles if the motors are no more powerful than 750 watts and can’t go faster than 28 mph. But e-bikes are prohibited, with some exceptions, on hiking and biking trails in state parks and forests. Exceptions include the Torrey C. Brown Rail Trail in Baltimore County and the Western Maryland Rail Trail, but in both cases e-bikers

must be pedaling when motors are on and can’t use pedal assist at speeds of more than 20 mph.

In Virginia, e-bikes are regulated like regular bicycles, but cities, towns and state agencies can set their own rules. In state parks and wildlife management areas, e-bikes can be ridden wherever conventional bikes are allowed if they have a feature that cuts off the electric motor when their speed reaches 20 mph.

In and around Washington, DC, e-bikes are prohibited on many park trails. Exceptions include the C&O Canal, Rock Creek Park Multi-Use Trail and the 18-mile paved Mount Vernon Trail.

In Pennsylvania, e-bike regulations are widely divergent — and in various hands. Take, for example, the Pennsylvania Game Commission, a nongovernment agency that controls 2.5 million acres of land open to both hunters and the general public.

In 2020, the Board of Game Commissioners unanimously gave preliminary approval to allow e-bikes on game lands to help hunters and trappers, especially aging ones, more easily get to favorite spots. Using what are known as cargo e-bikes, hunters can even haul deer out of the woods.

But six months later, at the final vote, Commissioner Michael Mitrick gave an impassioned speech, arguing that allowing e-bikes wouldn’t be compatible with the original purpose of game lands.

“[The game commission] protects by default certain game lands qualities, admittedly intangible, linked to wildness and yielding unique experience,” he said. “These cannot be manufactured. It can only be preserved where they yet remain. ...

[We have] no obligation to accommodate on those lands every manner of new mechanized conveyance that the marketplace develops and offers to the public.”

The preliminary approval of e-bikes on game lands was overturned in a 5–3 vote.

In late December 2022, after a two-month public comment period, the Pennsylvania Department of Conservation and Natural Resources announced a new e-bike policy for its thousands of miles of unpaved roads and trails in state parks and forests.

It treats e-bikes like traditional bicycles and allows them on trails and roads where regular bicycles have been allowed, though closures may take place for safety or environmental reasons.

As with Maryland’s two exempted trails, though, riders must be pedaling when using the motor and go no faster than 20 mph when using the pedal-assist function. Also, motors can’t be more powerful than 750 watts, and e-bikes can’t weigh more than 100 pounds.

DCNR noted that its policies were guided by its overall goal to “promote recreation for all” and sought to “create a culture around trail etiquette and safety.”

Because of the broadscale public comment process, it’s generally believed that the DCNR policy will become the model adopted by many communities and other agencies across the state.

Some 642 responses flooded in during the comment phase, including far-ranging advice and warnings from hiking and equestrian groups.

Among those weighing in was the Keystone Trails Association, the state’s largest hiking group. Hikers and traditional cyclists have not had widespread problems with e-bikes to date, noted Brook Lenker, executive director. And e-bikes have allowed people with physical impairments to stay outdoors.

But he worries about conflicts and trail damage if the number of e-bikes continues to grow dramatically. “I certainly hope it all works out that e-bikes are not a detriment to our public lands and [are] actually advantageous to the ones who would most benefit from [them]. But there’s so many unknowns. The perfect scenario might have been piloting and more evaluation,” Lenker said.

The Pennsylvania Chapter of Backcountry Hunters urged e-bikes to be kept off single-track trails.

Several officials from jurisdictions whose economies depend on outdoor pursuits urged the department to put out a welcome mat for e-bikers to attract a new wave of visitors.

A blessing for the ailing

To be sure, even those who want to limit e-bikes on trails acknowledge that the pedal-assisted bikes have provided a new lease on outdoors life for many.

One study found that riders of regular bicycles who purchased e-bikes rode nearly twice as much as before.

J.C. Remsburg, a 56-year-old resident of Quarryville, PA, rode 1,000 miles on his conventional bike last year and has no interest in an e-bike. But when his wife had knee surgery last year, it appeared their days of riding together were over — until she bought an e-bike.

“I can ride 60 miles at a time easy, and now she can keep up,” he said.

Ryan Finger, who co-owns an e-bike rental and sales shop in Lancaster, PA, said, “Seventy-five percent of our customers [are from] the older crowd. We just had a woman in yesterday who had knee surgery six weeks ago. She can’t pedal a traditional bike and would have had to quit otherwise. Now she’s riding rail trails.

“We’ve seen that over the last nine months so much. Or the husband is a big biker and his wife wants to go too but can’t keep up.”

Becky Schilling, jogging recently on the Warwick to Ephrata Rail Trail near Lititz, PA, said her parents, in their 60s, recently started using e-bikes. “They wanted to make sure if they go one way, they can still get back,” she said.

Getting along

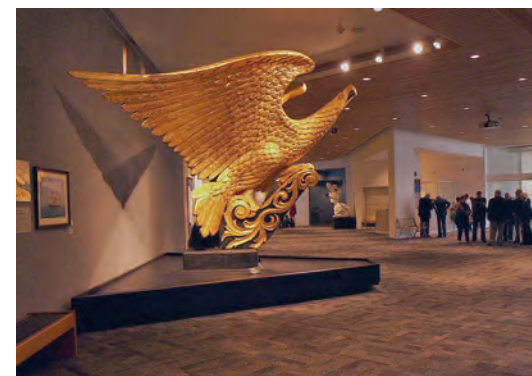
E-bike advocates complain that too many burdensome regulations are being levied out of ignorance.

“They’re just throwing rules out there and oftentimes they don’t have all the knowledge,” said e-bike shop owner Finger. For example, he said regular cyclists can easily exceed the 20 mph speed limit often placed on e-bike riders.

The best solution for all trail users, he suggests, is for everyone to follow simple trail etiquette. “I think what it comes down to is just respect other people,” he said.

Added co-owner Tim Hill, “You’re always going to have knuckleheads. You’ll never be able to govern everyone.”

At the top of trail courtesy dos and don’ts for cyclists is to ring a bell on their handlebar or call out a friendly “passing on your left” warning. The new DCNR e-bike policy lists 15 rules of the trail for riding, among them: Pass single file and yield to pedestrians. The last rule: “Expect the unexpected. Humans and animals can be unpredictable.” ■



Outside in: Explore nature through the Great Indoors

Photos, clockwise from left:

The Underground Railroad National Historical Park in Dorchester County, MD, celebrates the accomplishments of Harriet Tubman, who escaped slavery and led many others to freedom by guiding them through the surrounding landscape. (Dave Harp)

The Butterfly Atrium at Hershey Gardens in Pennsylvania is located inside the 16,000-square-foot Milton & Catherine Hershey Foundation Conservatory, which opened in 2016. (Hershey Gardens)

The eagle figurehead for the USS Lancaster is among the wide range of displays at the Mariners' Museum and Park in Newport News, VA. (Dave Harp)

By Jeremy Cox

A proverb from the coldest climes of Europe holds that “there is no such thing as bad weather, only bad clothing.”

You can certainly apply that sentiment to much of the Chesapeake Bay region during late winter and into early spring. Here’s a selection of average high temperatures for March: 42 degrees in Cooperstown, NY; 51 in Harrisburg, PA; 56 in Washington, DC; 53 in Harpers Ferry, WV; and 58 in Charlottesville, VA.

If you’re reading these numbers and saying to yourself, “Hmm, sounds like great hiking weather,” then this article is not for you.

There’s much to explore in the Great Indoors across the Mid-Atlantic. These are some of the best places, arranged by state, where you can explore maritime or nature themes all year — no cumbersome coat required.

District of Columbia

The balmy temperatures inside the 29,000-square-foot conservatory at the U.S.

Botanic Garden will have you shedding outerwear in colder months.

Built in 1933 by the federal agency known as the Architect of the Capitol, the greenhouse encloses two courtyard gardens and 10 garden rooms under glass. This climate-controlled world includes a tropical forest, a Hawaiian exhibit, an orchid room and a desert display. If you venture outside, you will be greeted by a vast gated garden that was added in 2006 as well as the iconic Bartholdi Fountain and Gardens, which are original to the campus.

The garden is at 100 Maryland Ave. SW, at the U.S. Capitol end of the National Mall. The conservatory is open 10 a.m. to 5 p.m. daily, year-round. Admission is free. Visit usb.gov.

Maryland

For an indoor-outdoor experience that can keep you mostly out of the cold, head to **Blackwater National Wildlife Refuge** on the Eastern Shore.

This “Everglades of the North” offers two warm ways to experience the refuge: a recently built visitors center — much larger than its

predecessor — and a self-guided driving tour through its prime wildlife-viewing area.

The two-story visitor center contains wildlife exhibits, an authentic eagles’ nest and spotting scopes that offer views of some of the refuge’s most popular wildlife-gathering spots. The wintery months are the best time to spot ducks, geese and other wildfowl congregating by the thousands here.

On your way out of the nature center, be sure to snag the brochure for the self-guided tour of the 4-mile Wildlife Drive. Try to spot a rare Delmarva fox squirrel among the pine trees and look for bald eagles circling high above Blackwater River.

The visitor center is at 2145 Key Wallace Drive, about 10 miles south of Cambridge. The center is open 10 a.m. to 4 p.m. Tuesdays through Sundays. All public areas are free, except for Wildlife Drive, which has a \$3 fee per vehicle. Visit fws.gov/refuge/blackwater.

If you’re at Blackwater, it would be a mistake not to travel the few hundred yards down the road to also visit the **Harriet Tubman Underground**

Railroad National Historical Park. The museum concentrates on Tubman's early life as a "conductor" on the Underground Railroad, the route traveled by enslaved people toward freedom in the North.

The museum is at 4068 Golden Hill Road in Church Creek. It's open 10 a.m. to 4 p.m. Tuesdays through Sundays. Admission is free. Visit nps.gov/hatu.

Since its opening in 1981, the **National Aquarium** has been one of the biggest draws on Baltimore's Inner Harbor.

It's not just a place for school field trips. There is something for everybody in its 250,000 square feet of indoor space and 2.2 million gallons of waters. For a local perspective, the exhibit called *Maryland: Mountains to the Sea*, found on Level 2, immerses visitors in four separate habitats found in the state.

If you're seeking something a bit more equatorial, head upstairs to the Upland Tropical Rain Forest, an enclosed re-creation of life in the South American tropics.

The aquarium is at 501 E. Pratt St. in downtown Baltimore. It's open year-round. March hours are 9 a.m. to 5 p.m. every day except Friday, when they are 9 a.m. to 8 p.m. Because hours are subject to change each month, check the website at aqua.org before you go. Admission is \$49.95/ages 21–69; \$39.95/ages 5–20 and 70 and older.

The **Calvert Marine Museum** shines a spotlight not only on the natural world and maritime culture of Southern Maryland, but also on the region's large and diverse contributions to paleontology. The displays include original fossils representing every known group gathered from nearby Calvert Cliffs.

The museum is at 14200 Solomons Island Road in Solomons, MD. Hours are 10 a.m. to 5 p.m. daily, year-round. Admission is \$11/adults; \$6/ages 5–12. Visit CalvertMarineMuseum.com.

Virginia

Perched on the north bank of the James River near downtown Richmond, **Maymont** is a shining example of Gilded Age splendor. The 1893 mansion may be the centerpiece of this 100-acre plot, but the attraction also has been burnishing its environmental bona fides in recent years.

The 29,000-square-foot Robins Nature Center underwent a \$2.3 million expansion in 2020 that added a James River-centric experience. The amenities include a 34-foot-tall interactive, river-themed sculpture; a juvenile sturgeon tank; digital touch-screen "pools"; child friendly activities and 30,000 gallons' worth of aquariums showcasing life in the James and Chesapeake.

It's worth braving the outdoors here to view two gardens, designed in the Japanese and Italian styles, as well as 200 species of exotic trees and plants growing elsewhere on the grounds.

Maymont is at 1000 Westover Road in



Richmond. The grounds are open 10 a.m. to 5 p.m. daily. Suggested admission is \$5. The nature center and mansion are open 10 a.m. to 5 p.m. Friday to Sunday. Admission (separate for center and mansion) is \$8/adults and \$6/ages 3–12 and 65-plus for each site. Visit maymont.org.

The **Mariners' Museum and Park** in Newport News was established in 1930 by local shipping industry magnate Archer Huntington as a love letter to all things nautical. The museum encompasses 90,000 square feet of exhibition space. Check out the small crafts center, which covers the topic with international scope.

The museum's biggest claim to fame may be its role as the official caretaker of USS *Monitor* artifacts. The *Monitor* was the U.S. Navy ironclad ship that battled its Confederate counterpart, the *Virginia*, to a draw in the Battle of Hampton Roads in 1862. It sank in the Atlantic Ocean off Cape Hatteras, NC, shortly thereafter. Among the 200 tons of salvaged materials is the Union vessel's famed gun turret.

The museum is at 100 Museum Drive in Newport News. It's open from 9 a.m. to 5 p.m. daily. Admission is \$1. The park is free and open 6 a.m. to 6 p.m. in March. Hours are subject to change monthly, so check the website at marinersmuseum.org before you go.

The 8,000-acre **Pocahontas State Park**, about 20 miles south of Richmond, was established in the 1930s by the Civilian Conservation Corps. It packs many activities in its nearly 8,000 acres. In warmer times, the 2,000-seat amphitheater, 90 miles of trails and aquatic recreation center should all be on your to-do list. But there is still plenty to keep you busy when temperatures dip.

The nature center and discovery center are tucked inside the visitor center. At the nature center, you'll encounter live animal exhibits, a beehive, pelts and bones of native fauna. The discovery center presents a sort of miniature version of the outdoor park experience, with a model yurt and a stationary bike linked to a virtual reality display that simulates the park's mountain bike trails.

The park is at 10301 State Park Road in Chesterfield. It is open from 7:30 a.m. to dusk daily. The visitor center is open 11 a.m. to 4 p.m. Friday through Sunday. The CCC museum is



open 1–4 p.m. Friday and 10 a.m. to 4 p.m. weekends. Parking is \$7 per vehicle on weekdays all year and on weekends November through March. Parking is \$10 on weekends April through October. Visit dcr.virginia.gov/state-parks/pocahontas.

Pennsylvania

Since its opening in 1937, **Hershey Gardens** has blossomed from a 3-acre rose garden into 23 acres of botanical sights. Some of the grandest can be found indoors.

The 16,000-square-foot conservatory serves as the main entrance to the gardens. Completed in 2016 at a cost of \$6 million, the facility blends old-world architecture with new-world amenities. The focal point is the butterfly atrium, home to hundreds of species from around the world. The temperature never strays outside 78–82 degrees in here, so be prepared for warmth.

Hershey Gardens is at 170 Hotel Road in Hershey. The attraction is open 9 a.m. to 5 p.m. daily in March. The hours are different other months of the year, so check the website at hersheygardens.org before visiting. The butterfly garden is open 9 a.m. to 4 p.m. Winter admission is \$11/adults; \$10/ages 62 and older; \$9/ages 3–12; and free/ages 2 and younger. Check website for post-winter pricing after March 24.

The **State Museum of Pennsylvania** in Harrisburg is charged with maintaining a collection of more than 9 million artifacts that tell the stories of the state's natural and cultural history. It is the largest collection focused exclusively on the story of Pennsylvania, covering the fields of art, history, archaeology, geology, paleontology and natural history.

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Above: The Robins Nature Center at Maymont, a historic estate near downtown Richmond, recently opened an exhibit highlighting the ecology of the James River. (Maymont Foundation)

Above left: The tropics house at the U.S. Botanic Garden in Washington, DC, is a warm place to explore during winter. (U.S. Botanic Garden)



The most well-known specimens at the U.S. Botanic Garden in Washington, DC, are its corpse flowers. (U.S. Botanic Garden)



An eagle returns to its nest on Holland Island in the Chesapeake Bay on the Vernal Equinox in 2022. (Dave Harp)

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A great blue heron finds a rocky perch among rapids in the James River as it flows past Richmond. (Michele A. Danoff)

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Oh, the sights you'll see, if you just go outside and look



CHESAPEAKE BORN

By Tom Horton

It's tough as you barrel along U.S. Route 50, Maryland's major beach route, to get a good view of the gravel pit through a screen of trees near Salisbury where I live.

But I instinctively try, November to March, because I know that flocks of tundra swans have flown to the Chesapeake Bay all the way from Alaska, and the gravel pit always seems to me like an ideal night refuge after feeding in nearby farm fields all day.

Much of the time, the swans disagree. I seldom see more than a handful there, usually none. But still I look. It's ingrained from a life spent hunting and nature writing.

And then, one early January morning the gravel pit was flecked with white from bank to bank ... more than a thousand swans had come in overnight.

For the next few evenings, as a waxing moon flushed full, I sneaked through the trees and bathed in the sight and sound of wild swans and their haunting music swirling down all around us — one of those minor miracles of the natural world. The thousands of oblivious motorists streaming by made it sweeter.

It recalled similar unexpected natural delights I've had, though I'm still like most moderns, way more indoors than out. You wonder what wonders we'd see, how it might change our comprehension, if we could truly live in nature.

The closest I came was the three years I lived on Smith Island, 10 miles out in the mid-Chesapeake, running education trips for the Chesapeake Bay Foundation.

There was a magical night, triple-lit by nature as we canoed through dark marshes: fireflies winking among the spartina tips, stars reflecting softly on the silken black



A heron takes flight from a gap in the marshes on a snowy morning along the Choptank River in Maryland. Bay Journal photographer Dave Harp captured this photo from the front seat of author Tom Horton's tandem kayak. (Dave Harp)

creek, and an outrageous bloom of bioluminescent algae gouting cold fire from our every paddle stroke.

And kayaking in a fog amid terrible bolts of lightning; a quadruple rainbow crossing Tangier Sound; and a day coming up the Bay from Tangier Island when my skiff's wake seemed to hold on the winter-dense water forever, leaving a long trail of pastel reflections, like I was painting with the whole Chesapeake as my canvas.

And one June, as I rested on an island beach, there came the heads of countless terrapins, swimming south, and the procession continued for the better part of an hour, hundreds at least, all homing in on nesting beaches.

A waterman neighbor, whose only interest in nature, I'd thought, was what he could eat or sell, surprised me by describing in great detail the "conversations" he'd have all summer with a pair of ospreys raising their young down the creek where he crabbed.

Sometimes magic happens where you've gone for years, thinking you knew the place so well. On a longtime favorite Virginia barrier beach, I watched a peregrine falcon swoop down on a migrating shorebird, a greater yellowlegs. The chase lasted for

a good 15 minutes, out and back across ocean and marsh, predator and prey disappearing from my sight at times.

The highest tech aerial displays of fighter jets and drones will forever seem clumsy compared with that day's aerial maneuverings. Then, as if tired of playing games, the falcon ended it almost nonchalantly.

Magic struck one April morning on the lonely Transquaking River in Maryland's lower Dorchester County, a place I'd paddled for many Aprils — but this time something began banging on my kayak rudder. Soon our slender craft were encased, bow to stern, on both sides, by spawning striped bass ... some of them 20 pounds or more, literally moving our kayaks as they boiled across acres of water.

I stuck my paddle down and below it was solid fish. If someone had been netting the river for stripers then, I don't believe they could have hauled in the net. And the Transquaking is not even listed as a significant spawning river for stripers!

Paddling once in Pennsylvania, I had an unforgettable chemistry lesson coming down the Susquehanna's West Branch where Bald Eagle Creek poured in. For days, the water of the West Branch had been crystal clear,

lovely as it wound through green hills — but also dead from acid mine drainage, unable even to grow algae.

Where Bald Eagle Creek's milky blue limestone water poured into the larger river, it neutralized the acid and life came back quickly, great blue herons plucking minnows from the shallows.

You needn't travel far to see magic. Biking a logging trail near home, past a drab stand of pines, sunlight kindled an emerald pool where it struck an extraordinary patch of thick moss.

Peering down at the concrete culvert that runs through a dilapidated neighborhood, I saw silvery schools of American shad, come all the way "home" from the continental shelves to spawn in downtown Salisbury.

And pruning bushes along the busy city street where I live, a magnificent bald eagle last summer swooped across the hoods of stalled traffic, angled between two dumpsters and ever so neatly snatched a doomed squirrel.

There was the howling, clacking, moaning and flapping I walked into one dark morning through a Potomac River forest — a savage din toward which I'd have proceeded far more tentatively if I hadn't known it was a massive heron breeding colony.

And the deer that came crashing through a wooded swamp where I'd paddled my kayak into brushy, briary headwaters that I fancied no kayak had ever reached. Hotly pursued by a rutting buck, the trembling doe stopped feet from my kayak. Our eyes met. Had it even briefly looked like a viable escape to her, I am certain she would have come aboard.

These days you can watch web videos of a wounded fox defying a pack of lions and orcas eating the livers of great white sharks — amazing natural events worldwide. But these online views lack the thrill of discovery; the wonder's not there.

It's here, all around, if we take the time. If we get outside. ■

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.

Farms need support now, for their own sake, and the Bay's

By Beth McGee

You are what you eat," the old adage goes. Now, many are saying, "You are what your food eats."

The way we produce food has profound consequences for the health of our communities, our environment and our local economies. Unfortunately, the status quo isn't working for us or our environment. We're losing our most productive soil, degrading our waterways with pollution and producing significant amounts of climate-warming greenhouse gases.

Agriculture, which covers approximately one-third of the Chesapeake Bay's 64,000-square-mile watershed, is the second largest land use in the watershed. And it is the biggest source of pollution for local waterways. We can't restore local rivers, streams and the Bay without reducing pollution from agriculture.

Many farm communities are struggling, too, as farmers age and farmland gives way to housing developments, data centers and distribution warehouses. Moreover, research suggests the nutritional value and diversity of the food we grow is declining — at a time when chronic diseases linked to diet, such as obesity and heart disease, are reaching epidemic levels.

We have an imperative to do better, and we *can* do better. Congress this year is deliberating on the most influential agricultural legislation in the nation: the Farm Bill. Renegotiated roughly every five years, the Farm Bill has far-reaching impacts on farm communities and the way food is grown and, in turn, on the quality of our waterways. It covers major programs like crop insurance, as well as key conservation programs that help farmers reduce pollution.

Increasing Farm Bill funding for conservation programs is critical. They are currently oversubscribed, meaning the funds fall short of the demand from farmers who want to implement conservation practices. Nationwide, according to the Institute for Agriculture and Trade Policy, roughly seven out of 10 applications that farmers submitted in 2020 for Environmental Quality Incentives Program (EQIP) projects were not funded. In Pennsylvania, the



Agriculture covers approximately one-third of the Chesapeake Bay watershed. Here, farmland is nestled along the Chester River in Queen Anne's County, MD.. (Will Parson/Chesapeake Bay Program)

Bay state that is furthest behind in reducing agricultural pollution, eight out of 10 were unfunded.

Separately, the U.S. Department of Agriculture can jump-start progress in Pennsylvania and other Bay states by making bold investments in the Chesapeake Bay States' Partnership Initiative that it created last year, which aims to increase conservation funding for this region.

In addition, policy changes in the Farm Bill are needed so these programs work for our communities and our environment, not against them.

A shift to regenerative agriculture is one of the most effective solutions to achieve multiple environmental and societal benefits. Regenerative agriculture is a holistic systems approach to farming, focused on building healthy soil — the foundation of all farm productivity.

Instead of degrading the land or simply maintaining its current state, regenerative practices work together to build up the land's ability to hold and filter water; produce nutrient-dense food; enhance ecosystem biodiversity, store carbon; and withstand floods, droughts and other

extremes linked to climate change.

Many of these practices also help farms cut costs and become more resilient to environmental and economic shocks. They do so by reducing the need for costly chemical inputs like fertilizers and pesticides, diversifying crops and revenue streams, and buffering the impact of extreme weather.

Many federal agricultural programs aren't set up to support regenerative farming, disproportionately serving conventional agriculture instead. For example, Congress initially prohibited Concentrated Animal Feeding Operations from accessing EQIP funds, but the law was changed in 2002 to allow their participation. Today, annual expenditures on animal waste storage systems on confined livestock operations are among the highest of all funded practices, according to the nonprofit Environmental Working Group. Congress can help address this imbalance by increasing incentives for regenerative farms in EQIP, the Federal Crop Insurance Program and the Conservation Stewardship Program.

A lack of technical assistance and outreach is most often the pinch point preventing the effective deployment of conservation

practices on farms. An increase in funding for technical assistance is essential, especially for facilitating a shift to regenerative agriculture. This would allow more trained staff to work with farmers one-on-one to plan and implement conservation practices. Experts in areas like soil health management are needed to assist farmers who want to move toward regenerative operations, which rely on combinations of practices working together.

In addition to funding, it's important to increase technical assistance capacity, to build out the pipeline of conservation professionals. Congress should direct the USDA to establish and expand partnerships with educational institutions, including community colleges, land-grant universities and historically Black colleges and universities, to educate and train the next generation of technical assistance providers.

Shifting the way we grow food isn't easy. Legislators and policymakers, however, can remove barriers and make it possible. Doing so will improve water quality, reduce greenhouse gas emissions and increase the resilience of farms amid climate change, provide economic benefits to rural economies and help this generation of farmers steward the land for the next. ■

Beth McGee, Ph.D., is director of Science and Agricultural Policy at the Chesapeake Bay Foundation.

SHARE YOUR THOUGHTS

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

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

Vibrio rising: With warming waters, it's time for vigilance

By Kelsey Bonham

Many of the intersections between climate change and public health concerns are visible. Flooding caused by sea level rise, for example, directly puts human health at risk when homes and businesses go underwater.

Some of these intersections are less obvious. One is the impact that climate change will have on pathogens such as *Vibrio parahaemolyticus* and *V. vulnificus*, two species of the vibrio bacteria found in coastal waters around the world — including the Chesapeake Bay.

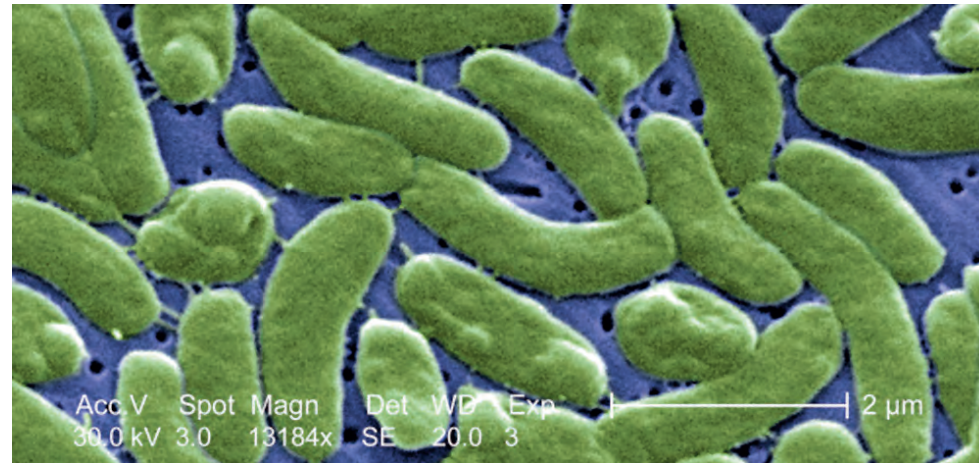
V. cholerae, which causes cholera, may be the most well-known species of vibrio, but its strong preference for freshwater environments excludes it from much of the Bay. Meanwhile, the *parahaemolyticus* and *vulnificus* species thrive in warm brackish water and can be found in the Bay every summer.

Many of us who spend time on or near the Bay have heard of vibrio at one point or another. Talk of “flesh-eating bacteria” can, unsurprisingly, spread quickly through communities. As Chesapeake waters warm, gradually becoming more hospitable to vibrio, I think it's time to take a more serious look at this dangerous microorganism.

Both *V. parahaemolyticus* and *V. vulnificus* can survive and reproduce independently in water, without a host. Both also sometimes attach to algae and sediment particles, allowing them to be consumed and hosted by filter-feeding oysters. Because of this, *V. parahaemolyticus* is the most common cause of seafood-associated food poisoning in the U.S., responsible for more than 45,000 cases per year. *V. parahaemolyticus* can also, though less commonly, infect humans through open wounds exposed to the water, causing skin infections and earning it the flesh-eating nickname. The medical term is necrotizing fasciitis.

Both forms of *V. parahaemolyticus* infection are usually self-resolving or require only moderate antibiotic intervention for healthy adults, but they can be more troublesome for elderly or immunocompromised people.

V. vulnificus infections are much rarer, with an estimated 100–300 cases per year



A colored microscopic view of a *Vibrio vulnificus* colony. (CDC Public Health Image Library)

in the U.S., but they are significantly more lethal. Unlike *V. parahaemolyticus*, it is more common to contract a *V. vulnificus* infection through an open wound, although seafood-associated infections are still possible. The mortality rate for wound-associated *V. vulnificus* infections is around 25%, and for the rarer seafood-associated infections, it can be greater than 50%.

Over the past few decades, both types of vibrio infections in the U.S. have been increasing. While the exact rate is difficult to pin down due to underreporting, the CDC observed a 78% increase in known vibrio infections between 1996 and 2006. This is likely because both species of vibrio, with rapid replication times of 8–9 minutes in favorable conditions, are incredibly responsive to their environment — and their environment is becoming more hospitable as the climate changes.

Vibrio abundance mainly depends on water temperature. Optimal temperatures have been shown in lab environments to be around 38 degrees C (100 F). Although the Bay never reaches temperatures even close to that, abundance has also been shown to increase steeply with temperatures above 15 degrees C (59 F).

The pathogen's presence in the Chesapeake has always peaked in the late summer, when water temperatures are at their highest. As summer highs increase, and as waters warm sooner and cool later, it is likely that vibrio will become more abundant and the period of highest risk will last longer.



Patty Peacock of Annapolis shows the scars remaining from a vibrio infection she contracted while tending her crab pots on Harness Creek in 2021. The infection was brought under control by prompt intravenous antibiotics. (Courtesy photo)

Many other factors will influence vibrio presence, abundance, spatial extent and infection rates in the future Bay. There are too many to discuss in detail here, but some notable mentions include salinity, turbidity, algae blooms and oyster populations — not to mention how and how often we interact with Bay water.

To make a complicated situation simple, the scientific consensus is that water temperature is the main determinant of vibrio abundance, and that in a warmer world there will be more vibrio in the Chesapeake's waters and oysters.

It is worth contemplating how our collective relationship with the Bay might change if five, 10 or 20 years from now, we start seeing genuine vibrio epidemics in Chesapeake communities. For now, the risk of contracting vibrio from swimming in the Bay or eating raw oysters remains relatively low. But if we've learned anything from the past few years, it's that avoiding disease in the first place is far easier than managing a rampant outbreak. I'm not suggesting that we stop swimming in the Bay or eating raw oysters — what a grim world that would be. Rather, this is a plea for us to collectively to keep a closer eye on vibrio before we are forced to do so.

The National Oceanic and Atmospheric Administration has been tracking vibrio occurrence in the Bay and elsewhere since 2005. Their findings are publicly available at products.coastalscience.noaa.gov/vibrioforecast. Scroll down to the U.S. map on that page and click the “Chesapeake Bay” label. That takes you to a variety of models that can help you assess risk and make informed decisions about whether to swim or eat oysters on any given day.

The NOAA tracker is hard to find, though, unless you know it exists, and nonscientific people might find it less than user-friendly. So I think it's time for state and local governments to step up and integrate these data into their public health alert systems. Beaches and boat ramps could post alerts the same way they warn of unhealthy levels of algae or fecal coliform. Seafood markets and restaurants could be required to include specific warnings about raw oysters.

But until those things happen, I suggest that you become your own vibrio “tracker.” Bookmark the NOAA web page and check it whenever you're heading for a Bay beach or hankering for oysters on a half shell. That little ounce of prevention is our best bet for the moment. ■

Kelsey Bonham is a 2022 graduate of Colgate University with a bachelor's degree in Environmental Geography and is currently based in Norfolk, VA. When not writing or sailing, she is an environmental educator with the Virginia Aquarium & Marine Science Center.



BULLETIN BOARD

VOLUNTEER OPPORTUNITIES

WATERSHEDWIDE

Project Clean Stream

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

Potomac River watershed cleanups

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

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 macro-invertebrates, collect stream data.

Citizen science: butterfly census

Friend of the Earth's *Global Butterflies Census* raises awareness about butterflies & moths, their biodiversity; collect population 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 and file the information on the census' interactive map, database. Click on "Projects" menu at friendoftheearth.org.

PENNSYLVANIA

Middle Susquehanna steward

The Penn State Extension's Master Watershed Steward program is expanding across the northern counties of the Middle Susquehanna watershed and now includes Elk, Potter, Cameron and McKean, Bradford, Susquehanna, Sullivan, Wyoming, Jefferson, Forest, Clearfield, Clarion, Centre, Clinton, Tioga and Lycoming counties. Get involved preserving 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.
- *Project Feederwatch*: 9 am-4 pm through April. Participants sign up for 1-hour shift every other week.

Beginners welcome. This citizen science program, part of a North American effort run by the Cornell Lab of Ornithology, counts birds that visit feeders November through April. The data tracks winter bird population trends. Drop-ins are welcome.

VIRGINIA

Reedville Fishermen's Museum

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

Goose Creek Association

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

Check out cleanup supplies

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

Virginia Living Museum

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

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: waterquality@pwsxcd.org, pwsxcd.org.

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.

MARYLAND

Stream buffer field work

Stream Link Education needs volunteers, ages 10+, to help perform forest maintenance field work 9-11 am March 18 & 25 at tree buffers in Frederick County. Info: <https://www.streamlinkeducation.org/volunteer>.

Lower Shore Land Trust

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

Ladew training course

Learn how to become a tour leader for school field trips at Ladew Topiary Gardens in Monkton, 9 am-12 pm April 11, 14, 18 & 25. Course includes plants and animals of the gardens, general ecology concepts, teaching techniques. Background checks required. Register: Sheryl Pedrick at 410-557-9570 x226, spedrick@LadewGardens.com.

Anita C. Leight Estuary Center

Meet at Anita C. Leight Estuary Center in Abingdon. Ages 12 & younger with adult. Info: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org. Anita Leight Estuary Center

- *Invasiators*: 1-3 pm March 19. Ages 14+ Remove invasive plants, install native species, learn about problem plants, removal & restoration strategies. Wear sturdy shoes, long sleeves, work gloves. Weather permitting. Preregistration recommended.
- *Marsh Cleanup*: 9 am-12 pm March 25. Bosely Conservancy. All ages.
- *Clean Out Bluebird Boxes*: 10-11:30 am March 22. Ages 4+ Nesting season is near. Help clean out bluebird boxes. Learn how to maintain your own box. Register by March 21.

Eden Mill Nature Center

Meet at Eden Mill Nature Center in Pylesville for these events. Register for all programs at edenmill.org. Questions: edenmillnaturecenter@gmail.com.

- *Preschool Nature Series*: 9:45-10:45 am or 11 am-12 pm March 7, 14, 21, 28 & April 18 & 25 & May 2, 9, 16, 23. Ages 2-5 w/adult. Celebrate spring with nature games, activities, story, craft, snack. Short hike (weather permitting). \$11 per registered date.
- *Owl Prowl*: 6 pm March 3, 10, 11 & 7:30 pm March 31, April 1, 14, 15. Ages 8+ Learn about Maryland's native owls while calling, tracking them in the woods. \$14.
- *30 Years of Wildlife Photography at Eden Mill*: 6:30-8 pm March 29. Ages 12+ Join Frank Marsden, who has spent 30 years at Eden Mill observing, photographing, teaching about wildlife for a photography presentation, lively conversation, the stories behind the photographs.
- *Bird Banding*: 8 am April 15, 21, 29 & May 5, 13 at the Joe Vangrin Memorial Pavilion located near the trail head. All ages. Learn about banding birds at Eden Mill.

Conservation opportunities

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

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,

continued on page 36

Submission Guidelines

SUBMISSIONS

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

DEADLINES

The *Bulletin Board* contains events that take place (or have registration deadlines) on or after the 11th of the month in which the item is published through the 11th of the next issue. Deadlines are posted at least two months in advance. April issue: March 11
May issue: April 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. A
2. C
3. C
4. B
5. Yes, but not in Bay region.
6. A & C



BULLETIN BOARD

continued from page 35

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 March, April and May 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

DISTRICT OF COLUMBIA

Rain barrel workshop

The Alliance for the Chesapeake Bay is presenting a virtual *Riversmart Homes Rebate Rain Barrel Training* 12-1 pm March 23. The barrels capture rainwater, make it a usable resource by allowing it to seep back into the ground slowly and filter out pollutants, recharge the water table, prevent stream erosion during heavy storms. Free. Register: allianceforthebay.org > under "Events." Rebates from the District Department of Energy & Environment are issued as a direct reimbursement to applicants at a rate of \$2 per gallon captured. Web search: "doee rain barrel rebate."

VIRGINIA

Virginia Living Museum

Visit the Virginia Living Museum in Newport News for these events. Admission: \$19.95-\$23.95/ages 13+; \$14.95-\$16.95/ages 3-12; free/ages 0-2. Info: 757-595-1900.

■ *Mazes & Brain Games*: Timed admission 9 am-5 pm through April 23. This interactive exhibit demonstrates how the brain adapts as it works to solve problems and create solutions. Solve problems through improvisation, trial & error, observation & testing, logic & reasoning. Learn why these same methods are important for animals to keep their minds active, healthy. Included with admission.

■ *Naturally Speaking - Lighting Matters, An Introduction to Light Pollution*: 6-7 pm March 16 (virtual or in person). Laura Greenleaf of the VA Chapter of the International Dark Sky Association will discuss causes and consequences of light pollution, explain basics of responsible outdoor lighting, nightscape conservation. Free. Preregistration required: 757-595-9135, reservations@thevlm.org. Cash wine/beer bar.

■ *Reptiles & Amphibians Weekend March*: 9 am-5 pm March 26-27. Get close to a variety of species on display and in live animal programs. Watch *Rainbow Puppet Show - Really Radical Reptile Revue*. Learn about herptile care & enrichment, tips on owning them as pets and *FrogWatch* and *Turtle Census*, the museum's citizen science projects. Included with admission. Check out *Behind the Scenes Tours* (\$65) and a planetarium show, *Noisy Neighbors: A Frog Story* (\$6. Ages 0-2/free).

PENNSYLVANIA

Nixon Park Nature Center

Events at Nixon Park Nature Center in Jacobus are free and require preregistration unless noted otherwise. Info: 717-428-1961 or NixonCountyPark@YorkCountyPA.gov. When registering, include number of participants, names, children's ages, phone number.

■ *Nature Walks*: 2-3:30 pm March 19 (*Welcome Spring*); April 2 (*April Pools*); April 16 (*Wildflowers*). Look for flora & fauna in the woods.

■ *Birdhouse Workshop*: 1-2:30 pm March 26. Build a birdhouse for cavity nesters, learn how to monitor & maintain it. Birdhouse kits \$15 each. Limit two per family.

■ *Spring Fungi - Wonders of a Waking Forest*: 10 am-12 pm April 1. Join the Eastern Penn Mushroomers Club for this talk, light snacks. No registration. Info: EPennMushroomers.org.

Susquehanna Book Club

Join the Nature Book Club to discuss the book, *Blue Mind: The Surprising Science That Shows How Being Near, In, On, or Under Water Can Make You Happier, Healthier, More Connected, and Better at What You Do* by Dr. Wallace Nichols, at 7 pm March 27 on Zoom or at the Middle Susquehanna Riverkeeper Association office in Sunbury. Free. Preregistration required: middlesusquehannariverkeeper.org/nature-book-club.html.

MARYLAND

Marine welding course

The Chesapeake Bay Maritime Museum and Chesapeake College are offering a seven-session course, *WEL: Special Topics-Marine Welding Processes*, 6-8:30 pm Mondays, March 27-May 8. Students will learn about environmental and process-based concerns associated with welding in a marine environment as well as the basics of GMAW (MIG) and GTAW (TIG) processes. They will explore different ferrous and non-ferrous metals, focused on steel, stainless steel, aluminum, copper-based alloys while gaining understanding of galvanic scale, different metals, degradation above and below the waterline. Sessions take place at either Chesapeake College in Wye Mills or CBMM's working shipyard in St. Michaels. No prior welding experience necessary. \$850 fee includes all tools and materials. Full and partial participant scholarships available. Contact Jenn Kuhn at jkuhn@cbmm.org. Preregistration required: bit.ly/MarineWelding2023.

Ladew children's program

Children, ages 2-6 with an adult, are invited to *Whatever the Weather*, 10:30-11:30 am or 12:30-1:30 pm April 4. Nature walks, stories, songs, activities about weather. Make weather wheels. Fee of \$20 per child/adult pair; \$6 each extra sibling, includes admission to gardens, nature walk, butterfly house (in season). Registration recommended. Contact: LeeAnne Kahl at 410-557-9570 x223, lkahl@LadewGardens.com.

Anita C. Leight Estuary Center

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

■ *Family Feed*: Participants choose time March 16, 23, 30. All ages. Behind-the-scenes opportunity to help feed animals. Free. Register at least 24 hours ahead.

■ *Owl Prowl*: 7-8:30 pm March 17. Meet at Bosely Conservancy. Listen, look for owls. \$8.

■ *Critter Dinner Time*: 1:30-2:30 am March 18. (register by 3/17) All ages. Learn about turtles, fish, snakes while watching them eat. Free.

■ *Meet a Critter*: 1:30 p.m March 19. All ages. Learn about a live animal up close. Free. Register at least 48 hours prior.

■ *Children's Gardening Series*: 10:30-11:30 am March 25, April 8, May 13. Ages 6-12. Grow food, flowers. Learn about seeds, life cycles, insects. Crafts, games. \$30 Register by March 22.

Spring lectures at Ladew

Take part in the *Spring Lecture Series* at Ladew Topiary Gardens in Monkton in-person or virtually. Refreshments start at 10 am for in-person participants. Talks begin at 10:30 am. Fee for each talk is \$40/ in-person; \$20/virtual. Info: ladewgardens.com>. Some of the lectures include:

■ *Water in the Garden; Modest to Marvelous*: March 23. Kelly Billing, water garden consultant and designer, will discuss creating an ecosystem and maintaining water quality.

■ *Birds of Ladew - ID Clues & Natural History of Common Species*: March 23. John Canoles, eco-science professional ecologist, shares photos, offers tips on identifying the gardens' common species.

■ *Small Space Garden Design*: April 6. Kathy Jentz and Teri Speight, authors of *The Urban Garden: 101 Ways to Grow Food and Beauty in the City*, will share basic design principles for finding, maximizing garden space, as well as creating privacy, adding light to shady areas, low-or-no-budget solutions, wildlife gardening, cutting gardens, container gardening.

■ *Native Groundcovers - Living Mulch*: April 13. Horticulturist Duncan Himmelman, will present a selection of tough, versatile native plants to use as ground covers in a variety of growing conditions.

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.

CHESAPEAKE CHALLENGE

— Kathleen A. Gaskell

Weed? More like wonder plant

“Dandelions are just friendly little weeds
who only want to be loved like flowers.”

— Heather Babcock, *Of Being Underground & Moving Backwards*

Need an excuse to avoid the back-breaking job of pulling up dandelions from your lawn? This quiz contains a couple to choose from. Answers on page 35.

- Dandelion roots are wide-spreading and strong enough to aerate hard-packed soil, allowing it to soak up water and reduce erosion and runoff. What is the typical length of its taproot?
A. 6-18 inches B. 8-20 inches C. 10-22 inches
- The dandelion's taproot not only extracts nutrients such as calcium and nitrogen from the soil, but it also makes them available to nearby plants. What was the length of one extraordinarily deep taproot?
A. 6 feet B. 11 feet C. 15 feet
- Why are dandelions beneficial for wildlife?
A. They are an important nectar source for more than 100 insects, including butterflies, moths and especially bees.
B. Their seeds are eaten by many bird species, including sparrows, goldfinches, ruffed grouse and bobwhite quails.
C. All of the above
- Dandelions are ruderals, or pioneer plants. What does this mean?
A. Their seeds “hitch rides” on birds and other animals that brush up against them.
B. They are the first plants to grow in areas that have been disturbed by wildfire or construction.
C. They are a great plant for beginner gardeners.
- The common dandelion is an introduced species from Europe. Are there native North American dandelions? Yes or no?
A. Alaska B. Idaho C. Oregon
- Although manufacturers of herbicides would have you believe that the common dandelion is public enemy number one, it is listed as invasive only in which of these two states?
A. Alaska B. Idaho C. Oregon

Title image: Dandelion. (Michele A. Danoff)

A A bright dandelion flower. (Michele A. Danoff)

B The incredible edible: All parts of a dandelion have culinary use. When dried and ground up, the roots make a coffee substitute. Young greens can be eaten as a salad or sautéed. Flower heads can be battered and fried or made into wine. Petals can be added to baked goods. Check the internet for preparation cautions and details.

C This dandelion shows all three stages of the stem: closed seed head, open seed head, and flower. (Greendiva/CC BY 2.0)

D An open seed head tops the stem of a dandelion. (Rob Young/CC BY 2.0)



Lion's teeth salad & dandy wine

It's not known if there was a mayflower on board the *Mayflower*, the ship that in 1620 carried English Pilgrims to what is now the United States. But it is widely believed the Pilgrims brought along a plant known for its culinary and healing uses: the common dandelion. In fact, both parts of this plant's scientific name, *Taraxacum officinale*, have pharmaceutical roots. *Tar ashaquq* (from which we get *Taraxacum*) appears in the writing of Medieval Persian physician Abū Bakr al-Rāzī, a highly regarded figure in medical history. *Officinale* is a Latin term to describe organisms with medicinal, herbal and cooking uses.

Power plant: A dandelion has more vitamin A than spinach and more vitamin C than tomatoes, as well as vitamins B and D. It also contains iron, calcium, potassium and zinc. All parts of the plant are edible.

Is jelly your jam? Make your own! For a recipe, visit thejamesriver.org and search for “dandelion jelly.” (Note: Avoid consuming dandelions if you are taking a blood thinner, diuretic, medicine to control blood sugar levels or antibiotics, or if you have gallbladder problems. Also, medical conditions aside, avoid any plant where a fertilizer, herbicide or pesticide have been applied, or where it has been exposed to passing vehicles' exhausts.)

To dye for: Want a yellow dye? Use the dandelion's flower. Want purple, magenta or tan? The internet provides recipes that combine parts of the dandelion with different dye fixatives to produce different colors.

Toothy translations: Dandelion comes from *dent de lion*, which is French for lion's teeth and refers to the plant's toothy leaves. The German and Greek words for dandelion also mean lion's teeth.

A dose of dandelion: Everyone from the ancient Romans, Greeks and Chinese to Europeans and Native Americans have prescribed dandelions for a variety of ailments. As for modern medicine, most scientific studies have involved animals; there have been no qualitative studies for humans. This wildflower shows promise as a diuretic, appetite stimulant and anti-inflammatory. (Once again, it is suspected that dandelion chemistry does not mix well with certain pharmaceuticals and should not be taken without your doctor's consent.)



A

To keep monarchs flying, feed the hungry caterpillars



By John Montgomery

I remember how excited I would get as a child before entering the local butterfly enclosure. My friends, family and others there were always on the lookout for one of the most iconic pollinators in the Americas: the monarch butterfly.

Decades later, while partnering with a monarch conservation group, I was thrilled to see the awe remain in the eyes of today's children during the group's yearly monarch release. Crossing borders and biomes, monarchs are still a source of wonder and an inspiring symbol of summer in the Chesapeake Bay region.

You have probably read the bad news about monarchs: Their population has all but crashed since the early 1990s. The organization Save Our Monarchs estimates that we've lost 90% of our monarchs in those three decades.

But there is good news too — that we can do something to fix the problem. We all can take simple actions to help these creatures during their extraordinary migration. If you have the space and ability, grow native plants where you can, including species of milkweed, the monarch caterpillar's exclusive host plant.

Two populations of monarchs spend the warm months in the U.S. About 99% are eastern monarchs, which winter in Mexico and in the warm season migrate into the eastern two-thirds of the U.S., even as far as southern Canada. The western population winters in California and stays west of the Rocky Mountains in the warm season.

The entire migration process involves three or four consecutive generations of monarchs. The eastern monarchs spend three or more months — early November into February — in the oyamel fir forests of central Mexico, in swarms so thick that they obscure the trees' trunks and foliage. In February or March, their biological alarm clock sounds, and they fan out to the north, laying their eggs exclusively on



Tyler Walston, Maryland agricultural projects coordinator for the Alliance for the Chesapeake Bay, inspects a monarch passing through his pollinator garden in Salisbury, MD, during the fall migration. (Alliance for the Chesapeake Bay)

milkweed plants in northern Mexico or the southern U.S.

Those eggs hatch, grow into caterpillars that feed on the milkweed before pupating and becoming the next generation of butterflies, which continues the journey.

That process repeats itself until the third or fourth generation, which somehow knows it's time to stop laying eggs, for now, and head back to Mexico. That generation is the long-distance anchor of the relay, covering the entire return trip and living six or seven times longer than its spring and summer forebears. It's also the generation that, after a winter's rest, begins the cycle again.

The monarchs' presence in Mexico has profound cultural meaning as well. Millions of people participate in *el Día de los Muertos* (the Day of the Dead) on Nov. 1 and 2 to observe the butterflies, seen as the spirits of loved ones returning.

Whether eastern or western, monarchs are all, most importantly, pollinators. *Steward's Corner* readers likely already know the importance of pollinators for human and ecosystem health around the globe.

Although there have been some sporadic years of increased monarchs, the downward trend unfortunately persists, due mostly to habitat loss. There is hope though, and we as individuals can help. We can plant more!

different species of flowers allows them to store fat and sugar, giving them the energy to make their journeys across the continent.

If you have a yard, garden or community space where you can plant freely, consider converting some of it into a native meadow or pollinator garden. The most valuable garden is one with staggered bloom times — so there's something for the early arrivals, the larger summer crowd and those monarchs that may have missed the mass exodus memo.

Another aspect to consider is that adult monarchs are most attracted to yellow, pink, orange and purple flowers.

The aptly named butterfly weed (*Asclepias tuberosa*) is a member of the milkweed family. Unlike common milkweed (*A. syriaca*), it boasts early orange flowers from June to August. Common milkweed blooms around the same time but has pink, pinkish-purple or purple flowers. Throughout the growing season its leaves are a crucial food source for monarch larvae. (Don't be fooled by the similarly named butterfly bush, which is a different species altogether. The latter produces flowers that attract adult butterflies, but it is of no use to larvae.)

Some other beneficial native plants for adult monarchs are in the sunflower family (*Asteraceae*) — especially goldenrods, which can be easily maintained. Other good summer-to-fall options include New York aster (*Aster novi-belgii*) and New England aster (*Aster novae-angliae*), purple flowers that provide nectar from August to October. These species are also drought-resistant.

Whatever native plants you choose, species diversity with varying bloom times is vital to providing monarchs with the nectar they need to thrive, especially during their arduous fall migration.

It's relatively easy to find native plant nurseries nowadays, as these species' benefits become better known. Don't hesitate to visit a native plant vendor and ask about making your space monarch-friendly.

Right about now, eastern monarchs are beginning their journeys back to the Chesapeake from Mexico, so we should do anything possible to ensure the prosperity of one of our most inspiring and beloved pollinators. Whatever you do, don't forget the milkweed. ■

John Montgomery is the communications and social media coordinator for the Alliance for the Chesapeake Bay.



A monarch butterfly caterpillar feeds on common milkweed on Maryland's Poplar Island. (Will Parson/Chesapeake Bay Program)

Monarchs need a variety of native flowering plants during all stages of their life, the most important of which are milkweed species. Adult butterflies lay eggs on milkweed leaves, and monarch caterpillars (larvae) feed exclusively on the plant. Simply put, no milkweed means no monarchs.

Once caterpillars emerge as the butterflies we love, they feed on nectar from other flowering plants. The nectar of up to 33

As water rises, coastal swamp sparrows will need refuge



By Mike Burke

A cool breeze was no match for the radiant sun. Spring was declaring its early arrival with lengthening days and warming sunlight. Our jackets were unzipped. It was good to be outdoors and even better to be at the Patuxent Research Refuge in Laurel, MD.

We were on a little loop trail, bordered on one side by a modest stream. A couple of small muskrat lodges appeared through the riparian scrub that separated the path from the water. We could hear and occasionally see sparrows along the entire stream segment.

Although they were everywhere, they didn't easily give up their identities. Birds would periodically pop into view before quickly retreating to the safety of the stream-side grasses. A hidden white-throated sparrow finally gave away its identity when it started to sing, "Oh, Canada, Canada, Canada."

A moment later a song sparrow flew in, landing on a small shrub. It didn't sing, but the identifying black central patch on its breast helped me add another species to my list. More sparrows came up to see who had arrived. A red-winged blackbird joined the club, swinging wildly on a blade of grass.

A new sparrow hopped up from the grasses. This time, I got an excellent look. A dark brown stripe ran through the eye, and the bird had a brown cap. It stood on notably long legs. The wing coverts were a mixture of black and brown. The eye-catching primary feathers were a rich reddish brown. I was looking at a swamp sparrow.

During most seasons, males, females and juveniles look remarkably alike. The species has the usual mix of browns, blacks and whites/grays that characterize most sparrows. Unlike most of its cousins, it adds extensive reddish-brown feathers to its color palette. In breeding season, the male's brown cap turns that same color and the eye stripe blackens.

The swamp sparrow (*Melospiza georgiana*) spends its winters in an area that stretches



Swamp sparrows spend much of their winter in southeastern North America. When not migrating, they can nearly always be found on or near the ground and, as the name suggests, rarely far from water. (Dave Inman/CC BY-NC-ND 2.0)

from the southern border of Pennsylvania over to Iowa and south well into Mexico. Year-round populations can be found in parts of New York State and Pennsylvania. The summer breeding range includes the northeastern quadrant of the lower 48 states and most of Canada.

As their name suggests, swamp sparrows are nearly always found near water. Wetlands with tall reeds, sedges and cattails are favorite haunts. Some taller bushes or small trees make a site even more appealing. When they are not migrating, these sparrows spend most of their lives on the ground or just above it. They dart with ease through thick vegetation. Their long legs help them maneuver in shallow water areas.

As always, location is driven by diet. Swamp sparrows eat seeds from grasses, fruits such as blueberries, and a long list of invertebrates: ants, bees, beetles, caterpillars, damselflies and dragonflies. They exhibit remarkable versatility in their eating habits. During the winter, this sparrow's diet is approximately 85% vegetation. In the summer, about 85% is animal matter. That protein-rich food is ideal for the extra energy needed for migration and reproduction.

Female swamp sparrows select and construct their nests on the ground or in low vegetation. The site is usually quite close to water level, and nest inundation is

a major threat. The clutch ranges from one to six eggs, typically three or four. In the Chesapeake region, these birds have two broods annually.

Males perch on a high shrub or sapling overlooking the nest site, guarding it from other males while singing from dawn to midday. The song is usually described as a clear, slow, liquid trill. At the end of the season, swamp sparrows become gregarious, often forming large flocks that can include other species of similar size.

There are three recognized sub species of swamp sparrows. Two of the three breed in freshwater features. Only the subspecies *M. g. nigrescens*, the coastal plain swamp sparrow, breeds in the Mid-Atlantic in tidal fresh and brackish waters. The breeding range begins with the Nanticoke River and goes north as far as the Hudson River.

The overall population of swamp sparrows is considered stable at about 23 million birds of breeding age (1 year). Today, the biggest threat to their continued success is climate change. Throughout most of its breeding range, weather is expected to be wetter in the future. Deluges are predicted to increase in step with sea level rise, expanding the risk of nest inundation. The Mid-Atlantic coastal area is largely developed right up to the water's edge, leaving no room for wetlands to naturally shift to higher ground.



The swamp sparrow has the same mix of brown, black, white and gray seen in most sparrows. A touch of rich reddish-brown in its feathers and on the breeding male's crown help distinguish it from its cousins. (Ryanacandee/CC BY 2.0)

The loss of coastal wetlands could put an end to the subspecies.

Our greatest asset is preserved lands like the various National Wildlife Refuges that dot the landscape. There are more than 500 of them nationwide, including a dozen or so directly in the Mid-Atlantic swamp sparrow's range. The 13,000-acre Patuxent Research Refuge, among its many benefits, is a haven for threatened and endangered species. As the rising tidal waters of its namesake river push ever inward, the refuge may add the Mid-Atlantic swamp sparrow to its list of threatened birds.

I watched the bird drop silently out of view into the grasses. Was that a sign of an ominous future? In the end, it will be up to us to answer the question with resilience and hope. ■

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

Fight against harmful plants before they take over your yard



BAY NATURALIST

By Kathy Reshetiloff

Whether coming in like a lion or a lamb, spring lures us outdoors to spruce up yards with new plantings. Winter can take a heavy toll on “landscaped” areas. Shrubs and small trees may have lost branches to ice and heavy wet snow. The melting snow and rain may have washed away soil in some areas.

But when considering what plants to include in your landscape, rule number one should be: Avoid invasive nonnatives. Able to creep over vast expanses of land, these aggressive plants can wreak havoc, taking over your yard and the local environment. Instead, consider native plant species.

Plants native to North America are those that occurred prior to European settlement. A nonnative plant is one that has been moved by human activity — sometimes intentional, sometimes not — from its native range to a new environment. Many nonnative plants are valuable for agriculture, forestry and horticulture, and pose little environmental risk, though they may not provide the food and shelter that our wildlife needs.

Native plants are sometimes described as “invasive” — but only to mean they are more aggressive than others in spreading or establishing themselves in new areas. Ordinarily, when we talk about invasives, we mean nonnatives that spread readily *because* they are not native and for a variety of reasons can outcompete and displace natives.

That’s the definition I’m working with here: By invasives, I mean nonnatives that cause or are likely to cause economic or environmental harm.

Because invasive plants have been introduced into an environment in which they did not evolve, there are no natural predators, parasites or other controls to keep them in check. The damage can be significant. By outcompeting native species for light, water and nutrients, invasives can eliminate entire natural plant communities.



The native redbud (left) is a good alternative to the nonnative Bradford pear tree. (Katja Schulz/CC BY 2.0 and D. Wright/CC BY-NC-ND 2.0)



The native Virginia creeper (left) is an alternative to the nonnative and often invasive English ivy. (Matthew Beziat/CC BY-NC 2.0 and Susan Smith/CC BY-NC-ND 2.0)



They change the composition of the landscape. The ecological balance of plants, animals, soil and water achieved over many thousands of years can also be damaged.

As native plants are displaced, animal populations that rely on those plants for food and shelter also decline. When invasive plants take over wetlands, forests or meadows, we lose native plants and the habitats that local wildlife need.

According to the Invasive Plant Atlas of the United States, there are almost 1,600 invasive plant species in the U.S. In the Mid-Atlantic region, there are more than 600 invasive plant species, according to the Mid-Atlantic Invaders Tool.

Annually in the U.S., the impacts of invasive plants and animals cost an estimated \$120 billion, according to a 2005 study published in the journal *Ecological Economics*. This figure, likely higher by now, includes reduced productivity and sales from agriculture and forestry; impaired use of waterways and land; harm to the health of

people and animals; lower property values; and the costs of preventing, controlling, monitoring and regulating invasives. Nearly a third of that \$120 billion is attributable to invasive plants.

So be careful when choosing plants. You could unknowingly introduce a harmful invader. Become familiar with invasive plant species in your area. Ask for native alternatives at nurseries. If you discover an invasives species in your yard or garden, remove and replace it with a native one.

Here are few troublesome plants to avoid and some suggested alternatives.

- **Purple loosestrife** (*Lythrum salicaria*)
Native alternatives: blazing star (*Liatriis spicata*), cardinal flower (*Lobelia cardinalis*), obedient plant (*Physostegia virginiana*)
- **English ivy** (*Hedera helix*)
Native alternatives: Virginia creeper (*Parthenocissus quinquefolia*), American alumroot (*Heuchera americana*), golden ragwort (*Packera aurea*)
- **Winged burning bush** (*Euonymous alata*)

Native alternatives: red chokeberry (*Aronia arbutifolia*), Virginia sweetspire (*Itea virginica*), highbush blueberry (*Vaccinium corymbosum*)

- **Bradford pear** (*Pyrus calleryana* ‘Bradford’)
Native alternatives: redbud (*Cercis canadensis*), serviceberry (*Amelanchier canadensis*), southern arrowwood (*Viburnum dentatum*)

For information about common invasive plants and native plant options, check out Plant Invaders of Mid-Atlantic Areas (invasive.org/midatlantic/fieldguide), Mid-Atlantic Invaders Tool (invasive.org/midatlantic) or contact your state Cooperative Extension Service office. To learn about native plants suited to your location, check out the Chesapeake Native Plant Center (nativeplantcenter.net) or contact your state’s native plant society. ■

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