CHESAPEAKE
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Independent environmental news for the Chesapeake region

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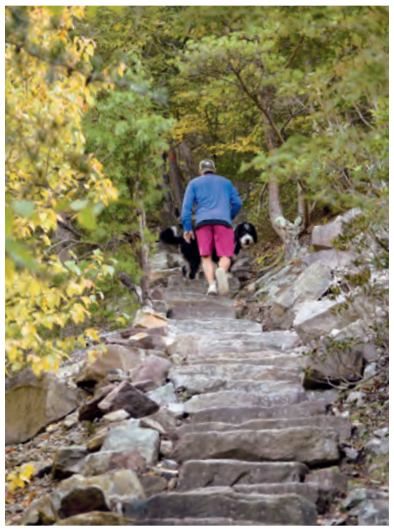

Jason Graney and his dog scale the sandstone steps built by quarry workers in 1936 that now form Pennsylvania's Thousand Steps trail. Read the article on page 24. (Ad Crable)

EDITOR'S NOTE

The readers survey helps us learn about you — and from you

Bay Journal staffer Khristna Paysour has been exceptionally busy over the past two months. She's processing responses from thousands of readers to our summer survey. We're overwhelmed! And grateful. Although the information is still being tallied (and responses continue to come in), here's what we've gleaned so far.

- *Bay Journal* readers are thoughtful, inquisitive, creative, funny and engaged. Your comments are a delight, with general feedback and ideas for news coverage, photos, marketing, fundraising and more. Thank you for the kind words and constructive comments.
- Our readers are energized by a wide range of topics. High on the list are the Bay, local streams and rivers, and wildlife and habitat (on land and in water). Some would like to see still more reporting on climate change, development and conservation, and wildlife.
- Readers rely on the *Bay Journal* for clear, balanced reporting. Approximately 95% ranked it as a "trusted" or "most trusted" source of information.
- Readers are engaged with issues they care about. Approximately 85% said that information in the *Bay Journal* has inspired or helped them to take action.
- They want us to spread the word. Approximately 85% learned about the *Bay Journal* from someone they know, at a library or through a sample copy. But many said that we should do more to raise our visibility with the general public.

Bay Journal readers are an impressive bunch! And it's more important than ever to stay informed and share environmental news. You'll find one reason on page 20: *Leaders say 2025 Bay cleanup goals are likely out of reach.* We've been doggedly reporting on the formidable challenges that Maryland, Pennsylvania and Virginia face in meeting their goals by 2025. But this is the first time that state and federal leaders clearly conveyed this message to the public. Now the region will be tackling tough questions: How do we do better? And what's next for the Bay?

I hope you'll keep turning to the *Bay Journal* to learn how those questions are being answered — and how you can play a role in the process and challenges ahead. — *Lara Lutz*

ON THE COVER

Maryland Department of Natural Resources biologists Mike Porta (left) and Matt Baldwin weigh a sturgeon they caught in Marshyhope Creek in 2014. The fish was studied, then returned to the place where it was caught. (Dave Harp)

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

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BY THE numbers

18%
Increase in the population of the Chesapeake Bay watershed between 1990 and 2007

70%
Portion of the Bay watershed's population that lives in Maryland and Virginia

49%
Increase in the size of the average U.S. home between 1973 and 2015 — while the average number of people per household decreased

40 million–60 million
Years ago that oak trees began to evolve in North America, Europe and Asia

6–24
Months needed for an acorn to mature

25%
Amount of a deer's autumn diet that might be made up of acorns

The meager beginning of a mighty river

Locating the precise origins of the Potomac River has caused debate for centuries. But the official marker is in West Virginia's Fairfax Stone State Park in the Allegheny Mountains. The 4-acre park gets its name from the Fairfax Stone, placed at the headspring of the river's North Branch: a feeble trickle under a wall of stacked stones. It's a humble beginning for a river that eventually reaches depths of more than 100 feet as it flows 405 miles, past the nation's capital, to its confluence — 11 miles wide — with the Chesapeake Bay at Point Lookout, MD.

Above: A visitor to tiny Fairfax Stone State Park in West Virginia inspects the Fairfax Stone, marking the location of a spring that has been the subject of debate for centuries as the source of the Potomac River. In the foreground, the spring emerges from under a large rock. (Ad Crable)

- Thomas Jefferson's father was a member of the survey crew that erected the original Fairfax Stone in 1746 to settle a boundary dispute between Maryland and Virginia.
- The current stone is at least the fifth iteration of the marker, placed at the site in 1957. The earlier stones were stolen or vandalized.
- In 1897, a Maryland state survey crew placed their own marker, the Potomac Stone, at a site they believed to be the river's source, about 1 mile west of the Fairfax Stone.
- In 1910, the U.S. Supreme Court upheld the Fairfax Stone as a boundary marker.

bayjournal.com/podcast

LOOKING BACK

30 years ago

Nutrient targets set for major Chesapeake rivers

The Bay Program set specific goals for reducing nutrient pollution that were to be achieved by the year 2000. ■

— *Bay Journal,* November 1992

20 years ago

Corps reverses dam decision

The U.S. Army Corps of Engineers overruled recommendations from its Norfolk District to allow the construction of a 1,526-acre reservoir on Virginia's Western Shore. ■

— *Bay Journal,* November 2002

10 years ago

Groups file suit to block pollution trading

Environmental groups challenged the legality of fledgling trading programs that were being promoted as a cost-effective way to help reduce nutrient pollution in the Bay. ■

— *Bay Journal,* November 2012

ABOUT US

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

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WE'RE JUST A CLICK AWAY

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Bay Journal photographer Dave Harp is joined by a small onlooker as he shoots footage for the new Bay Journal film, Pop's Old Place. (Darlene Goehringer)

Presenting a new film: 'Pop's Old Place'

We're happy to report that another *Bay Journal* film, *Pop's Old Place,* is now available to watch for free on our YouTube channel or the *Bay Journal* website (BayJournal.com/films). The 30-minute documentary by photographer **Dave Harp** and columnist **Tom Horton** highlights a small livestock farm on Maryland's Eastern Shore that relies on pasture-grazing to improve the soil, raise healthy animals and reduce runoff. The Eastern Shore Land Conservancy hosted a screening in Cambridge, where Dave spoke to an audience of about 100 people and moderated a panel discussion about the film.

In Pennsylvania, staff writer **Ad Crable** is working on an article about the "treelay" organized by the Alliance for the Chesapeake Bay: a series of volunteer tree plantings scheduled back-to-back (relay-style) over a 24-hour period during the last weekend in October. To get a feel for the regional event, Ad pitched in with a shift from 2–6 a.m. "We planted trees as heavy frost formed under the glow of lights at an adjacent baseball field," Ad said, "with help from headlamps and caffeine. Steam rose from the stream we planted along."

Staff writer **Whitney Pipkin** has been closely following the land use debate in Prince William County, VA. Just as the *Bay Journal* went to press, the county Board of Supervisors voted to approve a zoning change that will allow the constuction of large data centers next to Manassas National Battlefield Park on land that had been designated for agricultural and environmental uses. In the weeks leading up to the vote, Whitney learned that residents were citing *Bay Journal* articles to help educate officials about the issue.

Research for this month's article on sturgeon took staff writer **Jeremy Cox,** along with **Dave Harp and Tom Horton,** onto Marshyhope Creek to witness state researchers in action. They got to the boat ramp at 6:30 a.m., and the biologists said they were going several miles downstream to unfurl their nets. The researchers had a motor-driven boat. The *Bay Journal* team had kayaks. "I had visions of burning arms and a sore back," Jeremy said. "Then, Horton flips out his phone and calls this guy he knows who just happens to live on that lower section of the creek and asks if we could use his dock. Not only does this guy answer the phone at that hour, but he meets us out there 15 minutes later to give us a friendly send-off. Moral of the story: Tom knows everybody and everything."

— Lara Lutz

Update: Board approves zoning for data centers in Northern VA

At the end of a 15-hour meeting, the Board of Supervisors in Prince William County, VA, approved a plan on Nov. 2 that paves the way for data center development on land that drains to a regional water supply. The 5–2 vote came just before 10 a.m. following a meeting that started at 7 p.m. on Nov. 1.

One of the two Republican supervisors who voted against the project, Jeanine Lawson, called the board's approval a "bold pillage of environmental land" and "dismissal of public concern." Board Chair Ann Wheeler, a Democrat, meanwhile, questioned whether the more than 30 environmental groups who came out against the project "have all the information."

Nearly 400 people signed up to make public comments on the Prince William Digital Gateway project, many staying up all night to do so.

The zoning change sets the stage for the development of data centers on 2,100 acres next to Manassas National Battlefield Park, on land formerly designated for agricultural and environmental uses with limited residential development.

The five Democrats who voted for the project cited the need for additional tax revenue. Language encouraging the protection of historical resources and assessing environmental impacts was added to the resolution before approval.

Prince William County already has set aside other land for data centers in its comprehensive plan and offers the industry a lower tax rate than neighboring Loudoun County. But officials say there is still more demand than available land.

Opponents of the development, including the environmental groups and 50 homeowners' associations, say they will continue to fight the project as it seeks future approvals. – *W. Pipkin*

Ellicott City sees first outcome of flood protection plan

Ellicott City, MD, finally has some protection against flash floods like the ones that devastated this historic mill town in 2016 and 2018, killing three people and damaging businesses and homes.

A stormwater retention pond has been carved out of a highway interchange about 2 miles up the Tiber-Hudson River from the community's Main Street. Built at a cost of $5.3 million, the pond is designed to hold up to 4.24 million gallons of runoff, enough to cover a football field with 10 feet of water.

This stormwater retention pond is the first of several projects intended to help lessen flash flooding in Ellicott City, MD, which was hard hit by extreme rainfall in 2016 and 2018. (Howard County, MD)

It is the first major public works project finished as part of the flood mitigation plan adopted by Howard County in 2019. The plan calls for building or expanding several stormwater ponds and boring a tunnel through bedrock to divert floodwaters. It also calls for demolishing four historic buildings at the bottom of Main Street and removing all but the facades of six others.

See **BRIEFS**, *page 6*

briefs

From page 5

Construction is under way on a second large stormwater pond, and preparations are being made to begin work on the tunnel. Overall, $167 million in local, state and federal funds have been secured to complete the plan, which will reduce but not prevent future catastrophic flooding from the cloudbursts that experts say are increasing in intensity and frequency. *— T. Wheeler*

New tech 'incubator' aims to control algal blooms

The University of Maryland Center for Environmental Science is partnering with the Mote Marine Laboratory & Aquarium in Florida to create a center that will seek, fund and assist projects using technology to reduce harmful algal blooms.

The UMCES Institute of Marine and Environmental Technology in Baltimore and Mote's Red Tide Mitigation & Technology Development in Sarasota will manage the initiative, dubbed the U.S. Harmful Algal Bloom Control Technology Incubator.

The partnership recently received a $7.5 million grant from the National Oceanographic and Atmospheric Administration to provide projects with funding, testing resources and guidance on the licensing and permitting processes.

Harmful algal blooms cause a variety of environmental, economic and human health problems. They occur when algae grow out of control and produce toxic or harmful effects on people, fish, shellfish, marine mammals, and birds. Blooms are growing in size and frequency.

IMET has the capability to perform lab-based experiments with freshwater blooms, and Mote has extensive field experience with "red tide" blooms in the Gulf of Mexico.

"Field demonstration of harmful algal bloom control techniques is needed to fill the gap between laboratory research and larger scale implementation," said UMCES President Peter Goodwin. "This is an ideal partnership to address a concerning global issue."

Annual solicitations for projects will be announced beginning in spring 2023. *– L. Lutz*

PA, MD add state-owned tracts to Old-Growth Forest Network

Maryland and Pennsylvania have added forested tracts containing some of the oldest trees in their states to the Old-Growth Forest Network.

Started in 2011 by Joan Maloof, a retired professor from Maryland's Salisbury University, the nonprofit Old-Growth Forest Network seeks to preserve at least one forest in every U.S. county where the trees haven't been timbered in at least 150 years — or where they can be protected to eventually sustain old-growth woods.

In September, a 14-acre tract known as the Schoolhouse Woods in Queen Anne's County, MD, was added to the network. Some of the oak trees are estimated to be more than 200 years old. A holly tree is an estimated to be 290–400 years old.

Schoolhouse Woods is part of the state-owned Wye Island Natural Resources Management Area. There are 6 miles of trails. The 1.2-mile Schoolhouse Woods Trail winds through the heart of the old-growth forest. The Holly Tree Trail leads to the centuries-old holly tree.

On Oct. 25, the Pennsylvania Department of Conservation and Natural Resources added the 120-acre Hemlocks Natural Area in southcentral Pennsylvania to the network.

Part of the Tuscarora State Forest, the Hemlocks Natural Area contains a virgin hemlock forest in a narrow ravine. Many of the trees are believed to be more than 225 years old, with the largest reaching more than 120 feet in height and 50 inches in diameter. Earlier this year, DCNR added Sweet Root Natural Area in Bedford County and Beartown Woods in Franklin County to the network.

Pennsylvania has 26 designated old-growth sites, the most of any state in the network. Maryland has 11 sites.

For information or to volunteer with the Old-Growth Forest Network, visit oldgrowthforest.net. *– A. Crable*

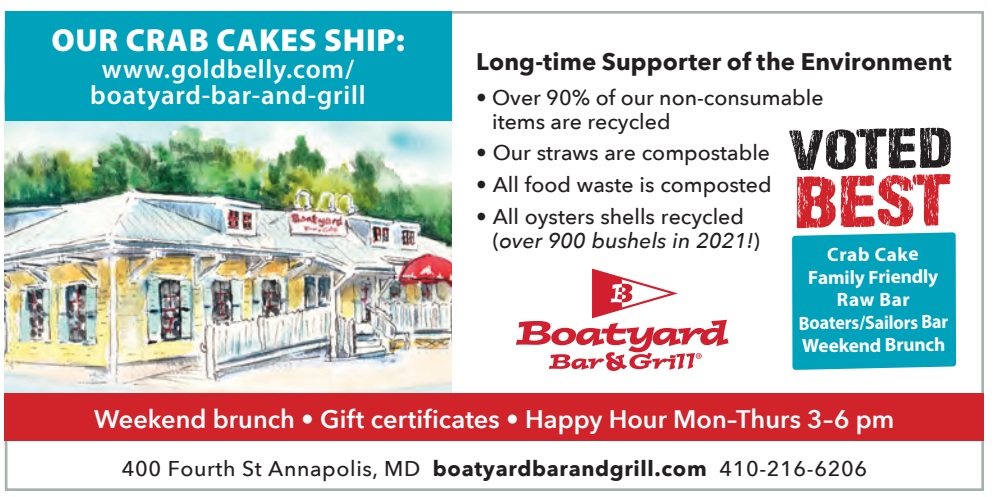
Constellation donates land for parks near Conowingo Dam

Constellation Energy Corp. has pledged to donate about 300 acres of land near the Conowingo Dam to the state of Maryland for inclusion in nearby parks, Gov. Larry Hogan announced on Oct. 17.

Hogan's announcement described Constellation's commitment as a collaborative effort involving state and local government agencies and nonprofit conservation groups.

Details about the lands being donated were not provided because the boundaries of the parcels in question are still being worked out, according to Constellation spokesperson Brandy Donaldson. But Joel Dunn, CEO of the Chesapeake Conservancy, one of the groups involved in the transaction, said the land will expand Susquehanna State Park and local parks in Havre de Grace and Port Deposit.

The donation is unrelated to the deal the company struck with the state in 2020 to settle a lawsuit over the dam, Donaldson said. In return for Maryland dropping the conditions it placed on the renewal of Constellation's federal license to generate power at Conowingo, the company pledged to spend more than $200 million over the next five decades to improve fish and eel passage over the dam and reduce sediment and nutrient pollution flowing downriver into the Upper Chesapeake Bay. *— T. Wheeler*



Striped bass spawning a mixed bag in Bay again this year

Numbers below average in MD but steady in VA

By Timothy B. Wheeler

Striped bass, struggling to rebound from overfishing, had another year of subpar spawning success in Maryland's portion of the Chesapeake Bay, survey results show.

The Maryland Department of Natural Resources reported Oct. 20 that its annual seine survey of juvenile striped bass yielded 3.6 little fish per net haul. That's a slight improvement over last year but far below the long-term average of 11.3 per sample.

The Virginia Institute of Marine Science, meanwhile, said a similar survey it conducts annually found average numbers of young striped bass in that state's waters. VIMS scientists netted 7.95 juvenile fish per seine haul, roughly in line with the historic average of 7.77 per seine.

Differences between the two states' survey results are not uncommon, and scientists say the reasons vary and can be difficult to determine.

But news of the below-average crop of juvenile striped bass in Maryland waters comes as the Atlantic States Marine Fisheries Commission, which regulates migratory fisheries along the coast, is preparing to review the effectiveness of catch restrictions imposed the last two years to help the population recover. The Chesapeake is the primary spawning and nursery ground for the Atlantic coastal population.

Striped bass spawning success varies from year to year, as it does with many other fish species, and it is influenced by environmental factors such as water temperature and rainfall. But experts note that the overall coastwide population of the migratory fish is maintained by periodic bumper crops of juvenile fish, which make up for less-productive years.

This is the fourth straight year and the 10th in the last 15 years that the DNR survey found evidence of below-average reproduction. VIMS said this was the 10th consecutive year of average or above-average juvenile fish counts in Virginia waters.

The striped bass population has been down before. It declined drastically in the late 1970s and early 1980s, prompting Maryland, Virginia and Delaware to impose fishing moratoriums and other states to severely restrict catches. The stock rebounded and remained abundant for years but began to decline again more than a decade ago.

In 2019, fisheries scientists found the population to be overfished, and the ASMFC ordered an 18% reduction in the catch coastwide, which led states to curtail recreational catches.

The commission is scheduled to get an updated stock assessment when it meets in early November.

Dave Secor, a fisheries scientist at the University of Maryland's Chesapeake Biological Laboratory, said he's concerned by the continued poor juvenile numbers in Maryland, because that survey has consistently predicted the species' coastwide abundance.

Secor said he believes more research is needed into what may be depressing the Bay population, including predation by invasive blue catfish and gradually increasing summertime temperatures worsening catch-and-release fishing mortality. ■

The Bay's population of striped bass began to decline about 10 years ago. (Dave Harp)

Petitions, spills, empty coolers: Menhaden controversy broils

Virginia groups seek more harvest limits

By Jeremy Cox

Recreational anglers and environmentalists are ratcheting up their pressure on Virginia leaders to shut down large-scale commercial menhaden harvests in the Chesapeake Bay.

Advocates collected more than 10,000 signatures calling on Republican Gov. Glenn Youngkin to do more to protect the small, oily fish. They submitted the petitions in late October to Youngkin's office and to the Virginia Marine Resources Commission, which manages the state's saltwater species and their habitats.

An online petition sponsored by the Theodore Roosevelt Conservation Partnership amassed about 8,900 signatures since June. Meanwhile, on the state's Eastern Shore, local activist Christi Medice circulated a paper version of the appeal, adding 1,500 more names.

Some of those supporters are independent commercial operators who, Medice said, are struggling to make a living. "They've got empty coolers, and that doesn't happen," she told the Marine Resources Commission at its Oct. 25 meeting.

Their ire is directed at Omega Protein whose Reedville, VA-based fleet of fishing vessels, guided by spotter planes, is responsible for about 70% of the East Coast menhaden harvest. The company processes what it catches into fish oils for humans, feed for pets and other products.

In its latest assessment, released in August, the Atlantic States Marine Fisheries Commission declared that the species wasn't being threatened by overfishing.

But conservation groups say that the overall assessment didn't necessarily reflect the condition of the Chesapeake Bay's menhaden population. They contend that Omega's Baywide annual take, capped at 51,000 metric tons of menhaden, doesn't leave enough for striped bass and other predators to eat. "The menhaden are out there to feed a whole lot of other critters," said Chris Moore, a Virginia-based scientist with the Chesapeake Bay Foundation. "If the menhaden aren't there, it means the [larger] fish aren't there."

In June, a coalition of 11 national and Virginia-based groups petitioned Youngkin to put the Bay off-limits to Omega Protein. Some state lawmakers, including Sen. Lynwood Lewis (D) and Del. Robert Bloxom (R), both of whom represent the Eastern Shore, have signaled they will file bills directing state agencies to study whether menhaden are locally depleted.

Omega spokesman Ben Landry doubts that such a study would be possible. Menhaden migrate in and out of the Bay, causing their numbers inside the estuary to ebb and flow dramatically, he explained.

"I think the concept of it is great," Landry said. "I just don't know how that gets done with any credibility."

The company has also been criticized for two fish spills this summer involving one of its contractors. During a July 25 incident, an Ocean Harvesters affiliated fishing captain told his crew to release a net full of menhaden about a mile off Kiptopeke State Park because of the presence of red drum in the net. A separate spill took place on July 5 when a net tore, releasing thousands of dead fish onto Silver Beach. In both cases, Omega dispatched crews to clean up the rotting fish. Landry described those as rare events that happen three or four times a year out of 2,000-plus sets of their nets.

Virginia Marine Police Chief Matt Rogers said that Omega wouldn't be charged in either case. Doing so would require establishing that the acts were committed with "criminal intent," and the investigation showed that there was none, he said.

"I understand the public outcry, but we want to make sure we don't have a knee-jerk response," Rogers said.

Still, the spills have stirred resentment on the lower Eastern Shore. "Here in Northampton County, we don't gain from Omega's actions at all, and yet we had dead fish up and down about 15 miles of our coastline to cope with," said Betsy Mapp, chairwoman of the Board of Supervisors. "That can't continue." ■

Chesapeake Wild puts $3.5 million toward better habitats

Grants support wildlife projects in Bay region

By Karl Blankenship

Freshwater mussels, brook trout and waterfowl are among the species that will benefit from the inaugural round of grants under a new habitat improvement program targeting the Chesapeake Bay watershed.

The Chesapeake Wild grants, announced Oct. 20, will fund 12 projects that are intended to improve habitats from oak forests to wetlands to riparian corridors, which are critical for a variety of species.

The program is funded by the U.S. Fish and Wildlife Service and overseen by the nonprofit National Fish and Wildlife Foundation. The projects will receive $3.5 million in federal funding and will leverage an additional $4.7 million in matching funds.

The grants will permanently protect more than 3,300 acres of fish and wildlife habitat and restore nearly 1,000 acres of forest and marsh habitat as well as more than 20 miles of rivers and streams across the Bay watershed. Several projects will improve public access to natural areas.

Three projects will bolster fledgling efforts to restore populations of freshwater mussels in the region. Freshwater mussels are some of the most imperiled aquatic species, but interest has been growing in the Bay region to harness their water-filtering ability to help clean rivers.

The James River Association will receive $51,800 to help develop a plan for restoring freshwater mussels in the James River, identify areas where mussel surveys and research are needed, and establish long range restoration objectives.

The Chesapeake Bay Foundation will receive $73,800 to identify areas where planting streamside buffers will also support mussel populations in Virginia.

Meanwhile, the West Virginia Land Trust will receive $499,800 to protect and restore one of two remaining populations of the endangered James spinymussel along the South Fork of Potts Creek. The project includes protecting land around the mussels' habitat and improving the creek itself to bolster the population.

Three Chesapeake Wild grants will help restore freshwater mussels, which help filter and clean water. (Whitney Pipkin)

Among other grants, the Indiana University of Pennsylvania Research Institute will get support for tree management practices that help oak forests — which are ecologically important but in decline in the Bay watershed — and develop management guidelines for oak forests for agency officials and consulting foresters.

Other grants will help the Eastern Shore Land Conservancy protect a wildlife habitat corridor between Blackwater National Wildlife Refuge and the Nanticoke River watershed; help Ducks Unlimited enhance waterfowl habitat at the Doe Creek Wildlife Management Area on Virginia's Eastern Shore; and aid the Western Pennsylvania Conservancy in removing stream barriers to help brook trout.

The program was created by legislation sponsored by U.S. Reps. John Sarbanes (D-MD), Bobby Scott (D-VA) and Rob Wittman (R-VA), who are co-chairs of the bipartisan Chesapeake Bay Watershed Task Force.

In a joint statement, they praised the grants under the program as "great news for the Chesapeake Bay and all those who call the 64,000-square-mile watershed home.

"These projects leverage the on-the-ground expertise of regional, state and local partners to conserve land; enhance resilience; restore critical habitat, including wetlands; and make recreational experiences more accessible to the public." ■

Tank that ran afoul of neighbors stirs change on Eastern Shore

New regs passed for storage of poultry slurry

By Jeremy Cox

A county on Maryland's Eastern Shore has moved to restrict the storage of a sludgy poultry industry byproduct after the construction of an open tank containing the liquid triggered a lawsuit and a flood of neighbor complaints.

The Wicomico County Council voted 5–2 on Oct. 4 to set new limits on how and where the substance, commonly known as DAF, can be stored. Outgoing acting County Executive John Psota neither signed nor vetoed the legislation. Under the county charter, the bill moved on to become law anyway.

The controversy began in 2019 when a landowner near Mardela Springs built a 3-million-gallon DAF storage tank. The substance consists of the leftovers of chicken-meat packing: the remaining fats, skin, feathers and bits of meat separated out by a production process called "dissolved air flotation."

Tanker trucks haul the slurry to nearby cropland, where it's sprayed onto the ground as a nutrient-rich soil enhancer. But if it can't be applied right away, industry groups say it must be stored.

Leading up to its construction, the circular, 23-foot-tall tank required no public hearings or approval from any planning board. Several nearby residents tried to overturn the county's approval through the court system, but the case and an appeal ran aground on procedural issues.

The opponents coalesced as the Neighborhood Action Group. They complained that the tank's foul odors wafted into their yards, and they decried the additional truck traffic on narrow, country lanes.

Debated and crafted over three COVID-slowed years, the new regulations ban DAF from being kept in open or partially open containers. Now it is only allowed in closed, transportable containers on the agriculturally zoned land where it is going to be applied. Even then, it can only be held for up to 45 days.

The new rules don't apply to the massive open-air tank that kicked off the dispute. It's already grandfathered in, officials say. But environmentalists applauded the long-awaited decision as a compromise between their concerns and farming interests.

"The bill protects local agriculture — allowing DAF to be stored on farms during application and at processing plants if created there — while prohibiting the countywide large-scale open storage opposed by the Neighborhood Action Group, the [Wicomico County] Farm Bureau and our groups," said Carol Dunahoo, a leading member of the Wicomico Environmental Trust and Friends of the Nanticoke River.

In Wicomico, where the chicken population outnumbers human residents 100 to 1, the farming community was divided over the bill.

Holly Porter, executive director of the Delmarva Chicken Association, warned council members that approving the bill could set off a chain reaction of bans against manure sheds, chicken houses and other agricultural structures. She recommended that the tanks continue to be allowed on agriculturally zoned land after getting the green light from planners during a public meeting.

A representative of Perdue Farms, the Salisbury-based meat-packing giant, also publicly criticized the bill. Andrew Getty called it unfair to target agricultural residuals and not biosolids transported from municipal sewage treatment plants to farmland for the same purpose.

At least two farmers spoke out in favor of the bill at the hearing. Lee Richardson, a fifth-generation farmer in Wicomico, prefaced his comments by drawing back a nearby curtain and peeking skyward.

"I just wanted to check that the sky is not falling tonight," he said, "and it's not going to fall because of this bill."

Richardson admitted that normally he speaks at public gatherings to oppose environmentalists. "I will fight for the poultry industry for the rest of my life," he added, "but it will be for the right thing, and tonight is not the right thing." ■

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Salmon farm developer withdraws discharge permit request

Sturgeon concerns spur quest for alternatives

By Timothy B. Wheeler & Jeremy Cox

A group of kayakers gathered to protest a proposal for a large, land-based salmon farm near Federalsburg, MD, on a Nanticoke River tributary. (Dave Harp)

Facing growing public pushback, a Norwegian company hoping to build a large indoor salmon farm on Maryland's Eastern Shore has — at least for now — dropped its bid to discharge wastewater into the only waterway in the state where endangered Atlantic sturgeon are known to spawn.

AquaCon Maryland LLC notified the Maryland Department of the Environment on Oct. 14 that it was withdrawing its application to discharge up to 2.3 million gallons a day of treated "purge" water into Marshyhope Creek, a tributary of the Nanticoke River.

The company said in a press release that the public comments on the application "drew attention to Atlantic sturgeons' use of Marshyhope Creek, which warrants further consideration and evaluation."

Ryan Showalter, the company's Easton-based lawyer, said in an email that AquaCon has not given up on developing an 18-acre salmon production facility in Federalsburg. He said that company officials decided to withdraw the application and investigate alternatives to year-round discharge into the Marshyhope.

MDE gave preliminary approval to the company's permit in June. Then the project drew pushback from scientists, environmentalists and local residents concerned about potential impacts on the creek and its fish, particularly sturgeon. An August hearing drew more than 100 people, with nearly all who spoke opposing it.

Yonathan Zohar of the University System of Maryland's Institute of Marine and Environmental Technology (IMET) and an adviser to the company, said after the August hearing he had recommended that AquaCon drop pursuit of the Federalsburg site because of the risks to sturgeon.

"If it was all going to be managed optimally there would be no harm to the sturgeon," he said, "but it's not a good site to pursue, just because of the sensitivity."

AquaCon's announcement came 11 days after Federalsburg town leaders signaled their strongest concerns yet with the project. In an Oct. 3 letter to MDE, Mayor Kimberly J. Abner and the four council members urged the agency to deny the discharge permit or at least withhold it until concerns are addressed.

At the center of those concerns is a substance called geosmin. While naturally occurring — it's the cause of the tangy smell in the air after a heavy rain — geosmin is responsible for the muddy flavor in many farm-raised fish. AquaCon purges its salmon of geosmin to remove that "off" flavor and would release it as part of the discharges into the Marshyhope.

But biologists who have studied the river's sturgeon warned that inundating the Marshyhope with such high quantities of geosmin could upend its fragile ecosystem and impact the endangered fish. A leading sturgeon researcher greeted the permit withdrawal with relief.

"I am delighted that AquaCon made the sensible decision to withdraw the application," said Dave Secor, a fisheries ecologist with the University of Maryland Center for Environmental Science.

AquaCon had proposed producing up to 15,000 metric tons of salmon a year at the Federalsburg facility. Its recirculating system would raise the fish in large indoor tanks filled with water from wells. That water would be almost entirely recycled, with fish waste filtered out and converted to methane to supply energy for the operation.

"Despite an initial misstep in siting the plant on one of Maryland's most vulnerable estuaries," Secor added, "we should recognize that AquaCon seeks to develop sustainable aquaculture practices, building on Maryland innovation at IMET. I hope that AquaCon can work with the state's environmental experts to search for a more sustainable location."

AquaCon estimated that the discharge volume could make up as much as 15% of the Marshyhope's flows during peak periods. But Judith Stribling, a retired Salisbury University biology professor, used data on low flow periods between 2000 and 2020 and found that the discharges would have accounted for 20% of that flow.

"That site was wholly inappropriate," said Stribling, also a former president of the Friends of the Nanticoke River.

Choptank Riverkeeper Matt Pluta credited public resistance for swaying the company's plans. He and Stribling said they hope that AquaCon will postpone its Eastern Shore efforts until technology is available — due out within a few years, according to industry experts — that could make off-site discharges unnecessary.

"I'd like to see something that's more in character with our area and not the massive operation that was proposed," Pluta added.

AquaCon CEO Pål Haldorsen said the company "looks forward to continuing to work with MDE to secure permits that authorize aquacultural production while protecting the water quality and health of the Bay ecosystem." The company release indicated it would continue to work with state and local authorities to develop a land-based salmon farm in the Mid-Atlantic region, with a focus on Maryland.

AquaCon originally considered four locations on the Eastern Shore. It ruled out one site near Cambridge and talked with officials about a site in Denton, but Showalter said the company isn't currently pursing approvals there.

Alan Girard, the Chesapeake Bay Foundation's Eastern Shore director, said that he is pleased by the withdrawal of the discharge application but the process "shouldn't have gotten this far." He said MDE needs to do a better job of investigating the potential impacts of a facility that size before proposing to issue it a permit.

"All of the issues that came up during the public comment period were coming from scientists and advocates," he said, who were "raising issues we thought the department should have identified and properly addressed prior to the permit coming out on the streets."

MDE spokesman Jay Apperson noted that the agency extended the public comment period on the permit for 60 days after the August hearing.

"While the location of the proposed facility has represented a unique challenge," he said, "aquaculture is a safe way to raise sustainable food. The department is committed to continued innovation and economic growth in this field while ensuring all necessary safeguards are in place to protect the environment and public health." ■

Bay Commission director hands off the baton

After 35 years of saving the Bay, Swanson cites need to press forward

By Timothy B. Wheeler

Not long after Ann Swanson began working to restore the Chesapeake Bay, she found herself speaking about it to a group of grade school students. One youngster raised his hand and asked her, "What are you going to do when the Bay is saved? What's your next job?"

Swanson recalls that question with a wry smile. She never got another job. She's been laboring for nearly four decades to clean up and revitalize the ailing estuary. On Nov. 21, she's retiring after almost 35 years as executive director of the Chesapeake Bay Commission, the tri-state legislative advisory body that's been a key player in the long-running regional effort.

The Bay still hasn't been saved and, in a sense, it never will be. But that it hasn't been for want of trying, especially on her part.

"She's had the spirit, the brainpower, the drive to keep pressing forward on all fronts," said John Griffin, a former Maryland natural resources secretary and gubernatorial aide who's known and worked with Swanson most of those years.

She's been at it since 1983, first as a grassroots coordinator for the Chesapeake Bay Foundation, then at the Bay Commission, where she was hired five years later.

The 21-member commission, representing the legislatures of Maryland, Pennsylvania and Virginia, has been a signatory of every Bay restoration agreement — along with governors and U.S. Environmental Protection Agency administrators. Swanson has been an adviser to those lawmakers and an advocate for the dozens of Bay-related bills and funding measures they've sponsored.

Photo: Ann Swanson, photographed near Annapolis, will retire this month after 35 years as director of the Chesapeake Bay Commission. (Dave Harp)

'Leader of the band'

"She's been really the leader of the band for decades," said U.S. Sen. Chris Van Hollen (D-MD). He called her "the conductor … the maestro" who's kept members focused on what's needed.

Swanson characteristically deflects credit to the commission members themselves and to her staff. But Maryland state Sen. Sarah Elfreth, the commission's current chair said, "she really guides a lot of our work," advising them on the most critical issues and what measures are most likely to succeed.

The Bay Commission post has been her dream job, Swanson said. It meant working collaboratively across state and party lines to pass legislation and get funding to improve the health of the Bay, its rivers and streams, and its living resources.

"I always wanted to work in conservation," she said. "I wanted to work at the regional scale."

But for some serendipitous networking, Swanson might have wound up elsewhere. She grew up on Long Island in New York and attended the University of Vermont, majoring in wildlife biology. She also earned a master's degree in environmental studies at Yale University. Her first job was as assistant state naturalist in Vermont.

It was an internship with the National Wildlife Federation that brought her to the Bay region. She got it with a little help from her physician father, who — worried about her job prospects — talked her up to a federation executive he met on a cruise. One of her mentors at the federation later urged her to apply for a job with the Bay Foundation.

Barely a month into her job with the foundation, she was present at the 1983 conference — sponsored by the Bay Commission — where the first formal agreement was signed by federal and state leaders pledging to work together to restore the Chesapeake and created the state-federal Bay Program. Remembering it today still moves her.

"It was 1,000 people who deeply cared. And it was an issue that had become so compelling and so politically important that everyone wanted to be in the room."

Back then, she and many others thought that kind of spirit could save the Bay in a decade or so. Within a few years, Maryland and Virginia passed laws to curb sediment pollution from construction sites, and those two states and Pennsylvania each banned the use of phosphate detergents. Maryland and Virginia passed laws limiting waterfront development. Pennsylvania adopted a law requiring farmers to manage fertilizer applications.

Broker of new ideas

The Bay Commission, Swanson said, "has played a critical role in in the trajectory of the whole Bay program because we've often been the broker of either a new idea or a … solution."

In the mid-1990s, amid tensions between Maryland and Virginia over the economically important blue crab fishery, the commission formed a bistate advisory committee that brought together legislators, watermen, scientists and fishery managers to hash out their differences. Swanson chaired a workgroup of scientists and economists that over eight years helped forge an agreement between the states to rely on science to manage crabs as a single fishery across state lines.

With Swanson organizing meetings and writing up testimony and talking points, the commission has also advocated, often successfully, for maintaining and even increasing federal funding for the Bay.

"Ann has been front and center in that effort," Van Hollen said, "and that includes everything from the annual funding for the EPA for

the Bay Program to our efforts to expand support from the agricultural conservation programs."

Van Hollen, who's worked with Swanson both in the Maryland legislature and in Congress, said she has a rare ability to distill and communicate the complexities of Bay issues. "She gets the science, she gets the policy and she gets the politics. That's just an invaluable combination."

She's also helped the commission work without rancor. It has both Democratic and Republican lawmakers, but they've operated collegially. While partisan differences have grown sharper in state legislatures, they have not carried over to commission meetings.

Politics absent

"It's probably the most bipartisan or nonpartisan organization that I've ever been involved with," said Pennsylvania Sen. Gene Yaw, a Republican commission member. "Politics doesn't come up."

Elfreth, a Democrat, credits Swanson with helping to maintain that culture.

Elfreth also views her as a mentor. "There's not been nearly enough women on the commission," Elfreth said. While their numbers have grown, she noted that at times in the past, "Ann has been the only female voice in the room." Seeing Swanson among the Bay restoration leadership, she said, has "meant a lot to me as a young woman starting off in my political career."

Those who think the Bay cleanup effort has gone soft or astray are less impressed with the commission or Swanson's leadership. Gerald Winegrad, a former Maryland state senator who served on the commission when Swanson was hired, said he hasn't seen it take any bold or controversial stances in recent years.

"Show me an organization that's done it better," Swanson countered. The commission "always has to consider the science, consider the appropriate policy and then consider the do-able," she continued. "The commission has never worked on policy that's pablum. They haven't. They've always pushed for something that was meaningful."

Initiatives advocated by the commission haven't always been embraced by all three states. It took Pennsylvania lawmakers 11 years to pass limits on lawn fertilizer similar to the bills that sailed through Maryland's and Virginia's legislatures in 2011.

"That had to be a high point," Yaw said of the fertilizer vote earlier this year. "It's something that she was really frustrated by." He credited the bill's ultimate passage to Swanson's persistence, noting that she had spent "a ton of time" in the past year visiting Harrisburg to buttonhole legislators.

She wasn't there just for the fertilizer bill, but also for bigger quarry. She was urging lawmakers to take advantage of a big influx of federal COVID relief funds and direct some of it toward cleaning up the state's rivers and streams — and, by extension, the Bay. In June, they approved using $220 million to create a Clean Streams Fund, with most of it slated to help farmers control nutrient– and sediment-laden runoff.

Ann Swanson, right, shares a moment with Maryland Senator Sarah Elfreth, chair of the Chesapeake Bay Commission, during a break at the commission's September meeting in Charlottesville, VA. (Dave Harp)

Ann Swanson delivers a presentation to the Chesapeake Executive Council at their meeting in Washington, DC, on Oct. 11, 2022. (Will Parson/Chesapeake Bay Program)

The vote broke a years-long stalemate over getting the legislature to financially boost the state's lagging Bay cleanup efforts.

Elusive goals

In the years since Swanson started at the commission, Bay water quality has improved — just not enough. The amounts of water-fouling nitrogen, phosphorus and sediment reaching it have declined over the decades, yet still only about 30% of the Bay and its tidal rivers meet water quality standards.

"The conservation, the protection of the Chesapeake Bay has proved far more difficult and much more of a long reach than I ever expected," she said.

Federal and state leaders recently acknowledged that many goals and outcomes pledged in the latest Bay restoration agreement, signed in 2014 by state and federal leaders, will not be met by their 2025 target date. There's talk of extending the deadline or rethinking goals.

For Swanson, that's no reason to let up now.

"We have more money on the table than we've ever had," she said, referring to the hundreds of billions of dollars funneled to states nationwide in the federal infrastructure and inflation reduction bills. "If we can just harness that, and make sure that we spend the money smartly, and listen to our science and use our targeting tools, we actually have the ability to leapfrog in terms of progress."

She's leaving that for others now. Asked how she felt about that, she looked away, and her voice thickened.

"I feel like my job … I didn't finish. However, I also feel that the time is right. Because there's got to be a newer younger generation coming up. I've been at this job 35 years, and it's done."

She'll be 65 in December. Her husband, Eric, retired five years ago and has taken a few trips without her because her work prevented her from going. Her mother is 93 and needs her care.

"I have gardens to grow, I have meals to cook, I have the world to see," she added. "There's got to be time in the day for friends. … And so, it's just the right time."

Elfreth said the commission hopes to have a new executive director by early next year. But she also hopes that Swanson will be willing to take calls to share her "treasure trove" of knowledge about Bay issues.

In her farewell address Oct. 11 to the governors and EPA administrator on the Chesapeake Executive Council, Swanson presented a bar graph showing how nitrogen reaching the Bay had declined about a third since the 1980s, when she began her career. Over the same time, the watershed's population grew by half, increasing the amount of polluted runoff and decreasing forests and wildlife habitat.

"In my really low days, I would say to my husband, 'You know what my tombstone is going to say? It's going to say, 'she died holding the line.' But what I want to point out is that I came here in '83 and the line was here," she said pointing to the taller bar on the graph. "So my tombstone will not be, 'She died holding the line,' because you have brought [the line] down."

"But," she concluded, "you need to do more." ■

States join forces to save disappearing Allegheny woodrat

Declining for years, forest-dwelling rodent now vanishing from many former haunts

By Ad Crable

Wildlife managers throughout Chesapeake Bay states have joined forces in perhaps a last-ditch effort to save the Allegheny woodrat. Name notwithstanding, the squirrel-sized rodent is more closely related to mice and hamsters than to the infamous brown or Norway rat. Often described as "cute," it is an impish and secretive, but inquisitive, animal important to forest ecosystems.

Populations of the Allegheny woodrat *(Neotoma magister)* mostly live in burrows in mountaintop boulder fields, caves and rock outcroppings in forested settings. They have been declining for decades in the Bay states — and have been disappearing altogether in some places. They may be completely gone in the highlands of New York state.

The accelerating collapse is believed to have been hastened by new perils, including a deadly parasite spread by raccoons to woodrats that gather their berry-filled scat.

Add to that genetic infirmities from inbreeding and the increasing defoliation of oak trees by spongy moths (also known as gypsy moths) — which deprives woodrats of acorns, a key food source.

In Virginia, there are an estimated 160 woodrats at 75 documented locations, but at least 100 former sites are now empty. Mountain lairs in the state's Appalachian region hold most of the population.

Recent camera-aided trapping of woodrats in Pennsylvania shows that of more than 500 historic colony sites, 68% are now empty. One 29-member group vanished in a single year. Some say the statewide population has dipped to a couple thousand at most.

In Maryland, about half of the 108 occupied sites documented between 1990 and 1992 are now devoid of woodrats. Woodrats were found in western Maryland high country but are no longer found in Frederick County or near Great Falls on the Potomac River in Montgomery County.

"In West Virginia and Virginia, we're just seeing sites winking out," said Richard Reynolds, a wildlife biologist with the Virginia Department of Wildlife Resources.

"We're trying to … put a finger in the dike," said Justin Vreeland, a wildlife management supervisor with the Pennsylvania Game Commission, summarizing the new collaboration between 13 states to try to bring the woodrat back from the brink.

Above: A captured Allegheny woodrat is released back into its rocky home in Maryland's Savage River State Forest. (Dan Feller)

Right: Ecologist Dan Feller weights an Allegheny woodrat before its release. (Sunshine Brosi)

Many see it as a yardstick of a wider ecological problem.

"I think they're a really good indicator of forest health," said Greg Turner, the Pennsylvania Game Commission's nongame mammal section supervisor. "[Their decline suggests] that things aren't at all well out there."

Woodrats are believed to be important cogs in dispersing tree and plant species beneficial to forests and animals.

"I just think they're a part of the ecosystem and an indication of how stable your environment is and the diversity out there," Reynolds said.

The nocturnal woodrats are native to the United States, from Georgia in the south, north to Connecticut (where no woodrats have been found for decades) and as far west as Indiana.

Chestnuts were long their main food source, so the disappearance of American chestnut trees from blight in the early 1900s was a major blow. Acorns have been a lifeline, but because of deer over-browsing and other factors, including spongy moths, oak regeneration is suffering.

The challenges don't end there. Even though woodrats don't venture far from their colonies, forest fragmentation inhibits the establishment of new colonies elsewhere. Stuck in islands of rocks and caves, their health suffers because of inbreeding and a resulting lack of genetic diversity.

Invasive plants are crowding out berry-bearing native plants and mushrooms that also are a part of the woodrat's diet. And woodrats themselves are a favorite prey of snakes, coyotes, bobcats, foxes, weasels, owls, fishers and other carnivores.

Still, in the last two years, 13 states have launched unprecedented efforts, focused not just on stabilizing woodrat numbers but increasing them. They are sharing successes, failures and even woodrats themselves.

All of the Bay states have elevated woodrats to a species of greatest concern and developed action plans to help them.

Pennsylvania is a leader in the effort. Current or planned steps include planting crossbred versions of American chestnut trees near colony sites, putting out supplemental feeding of acorns and chestnuts, and doctoring forest sites to encourage oak tree growth. Actions also include spreading deworming vaccines in fishmeal bait piles to inoculate raccoons against roundworm, moving woodrats to other colonies, and creating rocky sites to serve as paths of emigration.

"We've been able to show we can stabilize a few sites by our actions. We want to figure out which of our tools are working and then scale up," said Turner of the Pennsylvania Game Commission.

On a limited scale, Pennsylvania, Maryland, Virginia and West Virginia have captured some of their woodrats and swapped with other states to increase genetic diversity.

Bay states also hope to share in a captive-breeding effort proposed for the Maryland Zoo in Baltimore and Toledo Zoo in Ohio.

"We want to be on the receiving end. We have a lot of open habitat for woodrats that is unoccupied," said Dan Feller, who has studied woodrats for more than 30 years as a regional ecologist for Maryland's Wildlife and Heritage Service.

Why save a species many people don't even know exists?

Feller, discarding his scientific detachment for a moment, revealed his affection for the woodrat. "They all have an amazing view," he noted of their high-elevation choice of homes. "They are not as standoffish as a lot of wild animals are. I've had them come back after releasing them from a trap and crawl up my pant leg and chew my shoelaces. They're one of my favorite animals, for sure."

Many scientists studying the woodrat are amused at the animal's pack rat habits (species of the genus *Neotoma* are generally referred to as "pack rats"). Their nests are often decorated with such human artifacts as bottle caps, shotgun shells and stolen bits of flagstone.

Wildlife managers find hope in the collaborative rescue efforts.

"They are tough little buggers," said Mario Giazzon, a wildlife diversity biologist with the Pennsylvania Game Commission. "When you talk about all the impacts this rat has faced, the fact that it still persists at all is pretty amazing.

"I think its recovery potential is pretty good. We just need to act pretty quickly and effectively." ■

Clean Water Act delivers progress but problems remain

Federal law that helped propel Bay cleanup marks 50th anniversary

By Timothy B. Wheeler

Growing up in the Washington, DC, area in the late 1960s, Eric Schaeffer remembers that back then the Potomac River was a place to avoid.

"Man, the river stank, really bad," said Schaeffer, now director of the nonprofit Environmental Integrity Project. "It was nothing to drive by the Tidal Basin and see a mat of dead fish."

The Potomac — the "nation's river" — was so fouled by raw sewage and industrial waste that by the early 1960s it had become a national disgrace. Along with the burning Cuyahoga River in Ohio, conditions in the Potomac helped spur public clamor nationwide to clean up pollution in rivers, streams, lakes and estuaries.

Congress responded on Oct. 18, 1972, by passing the Clean Water Act, with Republicans joining Democrats to override President Richard M. Nixon's veto of the sweeping environmental law.

In the weeks leading up to this year's 50th anniversary of the act, federal and state regulators, politicians and environmental advocates mostly hailed its impact.

"It truly has led to transformational change," said Radhika Fox, the U.S. Environmental Protection Agency's assistant administrator for water, at a celebratory event on the shore of the Chesapeake Bay near Annapolis in September.

The law also helped to inspire the federal-state effort to restore the Chesapeake Bay, a cause that Congress has since formally written into the law.

"It's the model globally of what to do in a multi-jurisdictional watershed," said U.S. Sen. Ben Cardin (D-MD).

The act helped funnel more than $1 trillion nationwide over the last 50 years into upgrading wastewater treatment plants. By many accounts, great progress has been made in reducing direct discharges of untreated sewage and chemical wastes, and many waters appear visibly cleaner.

But improvements in water quality have slowed in recent decades, according to a report by the Environmental Integrity Project, and the law's ambitious original goals of restoring fishable, swimmable waters by 1983 and eliminating pollution by 1985 remain far from reach. Nationwide, about half of the assessed river, stream and creek miles are still impaired by pollution, as are 55% of lake acres and a quarter of bay and estuary miles, according to data reported by states to the EPA.

Massive investments in upgrading wastewater plants like the Blue Plains facility on the Potomac River in the District of Columbia have improved water quality in the Chesapeake Bay region, but there has been less success curbing runoff from farms and development. (Dave Harp)

The story's the same with the Chesapeake Bay. Progress has also been made in reducing nutrient and sediment pollution, but to date efforts have fallen far short of the cleanup goals. Only about 30% of the Bay's tidal waters met water quality standards in the most recent 2018–2020 assessment.

The Bay's condition is inextricably tied to water quality in its 64,000-square-mile watershed, which includes parts of six states and the entire District of Columbia. Pollution impairs 30% of river and stream miles in Pennsylvania and 73% in Virginia, according to state assessments. In Maryland, 80% of 5,315 river and stream miles examined by the state contain so much fecal bacteria that they are unsafe for recreation, according to state figures. In Delaware, 97% of rivers and streams are impaired for one use or another.

Part of the cleanup shortfall stems from gaps in the Clean Water Act itself, advocates say. The law regulates pollution piped into waterways from sewage treatment plants and factories but doesn't control dispersed runoff from farm fields, lawns, paved surfaces and other "nonpoint" sources. Agriculture is the largest source of nutrient and sediment pollution getting into the Bay, according to the state-federal Chesapeake Bay Program.

The EPA has developed a partial workaround to that limitation by requiring runoff prevention measures from large-scale livestock and poultry farming operations, which are treated as if they are factories piping waste into waterways.

In passing the Clean Water Act, Congress also authorized citizens and nongovernmental organizations to go to court to punish polluters or prod regulators to crack down. That provision has been used repeatedly over the years, as the Chesapeake Bay Foundation did in a landmark lawsuit against the Virginia-based pork producer Gwaltney of Smithfield in the 1980s.

More recently, environmental groups joined in suing Valley Proteins, a poultry rendering plant on Maryland's Eastern Shore. Blue Water Baltimore sued the city of Baltimore for chronic discharge violations at the state's two largest sewage treatment plants.

Citizen suits also played a role in getting the EPA to develop a Baywide total maximum daily load or "pollution diet," which set nutrient and sediment pollution reduction targets for each of the Bay states and District of Columbia. It remains the largest TMDL cleanup plan the EPA has produced under the law, one that survived legal challenges from agriculture and home-building interests.

But ambiguities and gaps remain, fueling continuing legal and political controversies over what the law can and cannot require. It remains unclear, for instance, whether TMDLs can be enforced. Jon Mueller, the Bay Foundation's vice president for litigation, noted that the law doesn't specifically say those cleanup plans have to be carried out or by a certain date.

Even so, the foundation and four Bay jurisdictions — Maryland, Virginia, Delaware and the District — sued the EPA in 2020, alleging it wasn't doing enough to enforce the Bay TMDL. They contended that the agency was shirking its duty under the law by not pushing Pennsylvania and New York to do more to reduce pollution reaching the Bay from their rivers and streams. The case is pending.

The U.S. Supreme Court also heard arguments earlier this month in a long-running controversy over which wetlands are considered "waters of the United States" and therefore protected by the Clean Water Act from disturbance. And Congress is mulling environmental permitting changes that could limit the ability of states and tribes to block projects that might degrade their water quality.

Notwithstanding those disputes, advocates say the Clean Water Act still gives federal and state regulators plenty of tools for cleaning up pollution, if they have the resources and political will to use them. Several nonprofit groups and Maryland elected leaders held a press conference on the act's Oct. 18 anniversary to demand that the state's Department of the Environment reverse a decline in its enforcement by hiring more staff, increasing inspections of chronic violators and eliminating a backlog of expired discharge permits.

Given the partisan split in Congress, Schaeffer of the Environmental Integrity Project said it's not realistic to look for any real strengthening of the Clean Water Act on its 50th anniversary. But the law already has powerful tools to help clean up waterways, he said. Federal and state regulators just need the courage and imagination to use them.

In the meantime, he added, "it's good to remember how it was and how much worse it could be. ... If you fell into the Potomac [in the 1960s], your first concern wasn't drowning. It was that the Potomac had touched you." ■

On a 'knife's edge' of survival

Scientists work to document, preserve Bay's sturgeon

By Jeremy Cox

A buoy marks the location of a sensor used to detect sturgeon in Maryland's Marshyhope Creek. (Dave Harp)

Top photo: This sturgeon was caught in Maryland's Nanticoke River in 2006. (Dave Harp)

If you're trying to catch a living dinosaur, you'd better use a big net. In this case, that would be a net long enough to stretch nearly the entire 400-foot width of Marshyhope Creek. Even then, you're likely to come up empty.

"There aren't many up here," said Matt Baldwin, a fisheries biologist with the Maryland Department of Natural Resources. He and his small team of researchers on a late-September morning had just finished unfurling four nets across the creek at intervals several hundred yards apart. "So, it's exciting when we catch one."

For several years, Baldwin and other scientists operated largely in obscurity, their tedium broken only by the occasional appearance of an Atlantic sturgeon in their nets. Then came a Norwegian company's proposal in 2020 to build a $300 million indoor salmon farm that would discharge millions of gallons of wastewater into the Marshyhope.

Suddenly, those scientists found themselves at the center of an increasingly pitched battle over the future of the waterway on Maryland's Eastern Shore. Some chose to wade in.

They warned state regulators and officials in the town of Federalsburg that the fish factory could wipe out the small population of sturgeon in the Marshyhope. And if those fish were lost, so too would be the state's only suspected breeding population of the ancient — and federally endangered — fish species.

Concerned neighbors and environmentalists took up the message themselves. Then, it found its way into an Oct. 14 press release from AquaCon, the plant's would-be developer: "Public comments … drew attention to Atlantic sturgeons' use of Marshyhope Creek, which warrants further consideration and evaluation."

In the same announcement, AquaCon said it was pulling its request for a state discharge permit, effectively shelving the massive project until further notice. (See *Salmon farm developer withdraws discharge permit request* on page 11.)

It remains unclear if the company will resurrect its Federalsburg plans or pour its energy instead into one or two separate locations it has been pursuing elsewhere on the Shore, both outside the Marshyhope's drainage area.

AquaCon's proposal may have been destined for the wrong place at the wrong time. If it had materialized a decade or so earlier, the project almost certainly would have faced fewer obstacles.

But once a strange-looking fish leapt into a fisherman's boat, everything changed.

Big creatures, big problems

Atlantic sturgeon co-existed with dinosaurs and still bear a passing resemblance. Instead of scales, their backs are covered in bony plates called scutes. They are the largest fish native to the Chesapeake Bay, growing to as long as a Volkswagen Beetle (about 14 feet) and weighing nearly as much as a horse (about 800 pounds).

The bony fish species once abounded in the Bay, numbering in the hundreds of thousands. But its population plummeted from overfishing, loss of habitat and worsening water quality, experts say. By the late 1990s, researchers began publishing scientific epitaphs of the Chesapeake population, declaring it to be "functionally extirpated."

One of those researchers was Dave Secor. "Clearly, I was wrong about that," said Secor, a longtime scientist with the University of Maryland Center for Environmental Science. "Thankfully."

Sightings began cropping up across the Bay watershed. In the Marshyhope, a 40-mile-long tributary of the Nanticoke River that traverses the Maryland-Delaware border, reports of sturgeon leaping into the air were on the upswing. But concrete proof didn't arrive until one jumped into a small fishing boat, and its occupants, a pair of retired U.S. Department of Agriculture scientists, managed to snap a photograph.

"We would have never known about it," said Chuck Stence, a Maryland DNR fisheries biologist.

Despite recent sightings, the Baywide estimated sturgeon population remains at a fraction of its historic size. The overall East Coast population of sturgeon, ranging from Canada to Florida, has struggled to recover, and the National Marine Fisheries Service declared it an endangered species in 2012.

By then, researchers on the Western Shore of the Bay had confirmed the presence of a breeding population in Virginia's James River. Another was verified later in the Pamunkey River.

But could the Marshyhope and Nanticoke also be locations where sturgeon reproduce? That's one of the main questions that Secor, Stence and several other researchers have been trying to answer for nearly the past decade.

All indications point to yes. In 2014, Stence led a crew in the Marshyhope that hauled out two sturgeon — in the same net — that were "ripe," or ready to spawn.

But conclusive proof of spawning would require finding "young of year" fish in the river, Secor said.

Scientists are inching closer to that evidence. In September, a fisheries biologist with the Delaware Division of Fish and Wildlife captured a juvenile sturgeon in the Nanticoke River just upstream of Seaford in that state. It was the first young sturgeon caught by scientists in the Nanticoke-Marshyhope system.

Its presence in the Nanticoke is an encouraging sign that sturgeon are breeding there, Stence said. That's because young sturgeon spend

Fishery biologists with the Maryland Department of Natural Resources search Marshyhope Creek for spawning sturgeon. (Dave Harp)

between a few months to two years in their native waters. So, a place where one is found is likely to be the waterway where it grew up. They are anadromous fish, meaning that, after their juvenile years, they spend most of their lives in salty seas, returning to their native rivers only to breed.

Genetic sampling will be needed to pin down whether the young Delaware fish, believed to be 1 or 2 years old, is part of the local population of sturgeon and not from another group in the Chesapeake, Stence said.

Challenges to recovery

One of the biggest challenges that scientists face with saving the Atlantic sturgeon is the species' drawn-out spawning habits. They take a long time by fish standards to reach sexual maturity — about 10 years for males and nearly 20 years for females. And they can hold out for up to five years between spawning sessions.

Even then, the conditions must be just right. Water temperatures must be 55–79 degrees Fahrenheit. The water can't be too salty or fresh. There must be plenty of oxygen, ruling out many streams plagued by oxygen-starved "dead zones."

Perhaps most importantly, the waterway's bottom material must be firm — candidates include cobble, hard clay or bedrock — so the fertilized eggs can stick to something instead of floating away. The Marshyhope's bottom is almost ideally suited to host a sturgeon nursery, Secor said.

"If you go to other systems, you won't find this level of gravel," he said.

The landscape along the creek also helps ensure its effectiveness as spawning habitat. There are a few small towns along its length, interspersed by corn and soybean fields. But much of its shoreline remains covered with forests, reducing the amount of silt that might wash into the creek and smother the bottom, Secor said.

He and his fellow scientists have thrown the scientific kitchen sink at understanding the Marshyhope's sturgeon. They have deployed egg mats on the river bottom in the hope of capturing eggs or larvae, but those efforts so far have failed. They also have used sonar to map the most suitable potential habitat on the bottom.

But the centerpiece of their efforts involves the long nets used by Baldwin and others. Since 2014, research boats have routinely patrolled the Marshyhope during the August–October spawning season. The Nanticoke has been sampled since 2015.

A team will hoist one end of a 100-yard-long net out of the water and hand-pull the glistening mesh across the deck of their boat until reaching the opposite end. Success is rare. From 2015 to 2018, they averaged six catches of new fish per year and four recaptures between both waterways, despite spending hundreds of hours on the water.

But if they are lucky enough to land a sturgeon, the real work begins. A quick bit of surgery leaves each fish with an acoustic transmitter in its belly. Its pings enable researchers to track their movements from a phalanx of underwater receivers in both waterways.

That work allowed researchers to estimate the size of the system's population adult sturgeon. At 29 individuals, it was dangerously low, Secor said.

"When you get to 50 and lower, your chances of extinction go up," he said. "They really are on the edge of vulnerability."

Researcher Dave Secor with the University of Maryland Center for Environmental Science launches an acoustical sensor in hope of detecting sturgeon in Maryland's Marshyhope Creek. (Dave Harp)

Sturgeon win, for now

In Secor's eyes, the AquaCon fish factory put the survival of that slim assemblage at risk. The company's permit, which had garnered tentative approval from the Maryland Department of the Environment, would have allowed the release of up to 2.3 million gallons a day of treated "purge" water into the Marshyhope.

Secor and other opponents' primary sticking point was that the discharged water would contain large amounts of a bacteria-derived substance called geosmin, which they argued could upend the fragile aquatic ecosystem.

At an MDE-hosted community meeting in August, Secor publicly vented his concerns. He also penned a caustic guest commentary for *The Baltimore Sun*.

Stence, for his part, made no secret of his opposition. Days before AquaCon yanked the permit, he told the *Bay Journal* that he shared others' concerns that the proposed facility's chilly discharges would lower the creek's ambient water temperature, potentially disrupting the sturgeons' spawning schedule. "In our mind that could create a thermal barrier," he said. "The [creek's] water just can't absorb that much cold water."

Yonathan Zohar, director of the Aquaculture Research Center at the University System of Maryland's Institute of Marine and Environmental Technology and an adviser to the company, said he recommended that AquaCon drop its pursuit of the site because of the potential risks to sturgeon — and they agreed.

A sensitive fish

Even if the salmon factory proposal never resurfaces, another threat remains, Secor said.

The U.S. Environmental Protection Agency's seasonal rules, which set minimum dissolved oxygen levels to protect migratory and spawning fish around the Bay, apply to the wrong season for its sturgeon, Secor said.

The protections run Feb. 1–May 31. But the Nanticoke-Marshyhope telemetry research shows that, unlike other East Coast anadromous fish species — which spawn in the spring — sturgeon in the Nanticoke system spawn in the late summer and early fall. The same is true for sturgeon in the James and Pamunkey rivers.

Secor said that he has been pressing officials for years to expand the regulations into those months. Doing so is likely to draw opposition from the landowners who would have to comply with the more-stringent standards. But it's worth trying, as he sees it, to boost the sturgeon's chances of remaining in the creek. "They are the most sensitive fish in the Chesapeake Bay for water quality," he said. "It's the world's smallest Atlantic sturgeon population and exists really on a knife's edge of vulnerability."

Meanwhile, back on the water that fall morning, Baldwin was not having any luck netting a sturgeon. It turns out that a big net only gets you so far. Catching a sturgeon also takes patience.

"They're out here," Baldwin said after another fruitless examination of a gill net. "We just have to be at the right place at the right time." ■

Video online at BayJournal.com

James Island: a photographic farewell

Erosion, sea level rise take their toll as restoration plans form

By Jeremy Cox

The photographs on this page bear witness to a changing landscape. For decades, *Bay Journal* photographer Dave Harp has been documenting the withering of James Island in the Chesapeake Bay.

When first settled by the English in the 1660s, the island is believed to have boasted about 1,350 acres of dry land off Maryland's Eastern Shore, where the Little Choptank River spills into the Bay.

Today, not much remains of the archipelago except a few clumps of mud. Rotting stumps and a fallen trunk or two are all that remain of the thick stands of trees that once graced the terrain. A few lie visible beneath the water.

These images, compiled between 1999 and October this year, present a dramatic depiction of the shrinking island, a victim of erosion and a changing climate. Over the past 100 years, they have driven sea level up by about a foot in the Chesapeake region, and it's on track to swell another 4 feet by the end of this century, climate scientists say.

James Island offers a preview of the wet future that awaits many low-lying places around the Bay, said Michael Scott, a geography professor at Salisbury University who studies erosion rates across the Eastern Shore. The extra water supercharges the erosion of the island's outer edges and hastens its demise, he said.

Scott estimates that the north end of James Island, which experiences erosional forces from both the Little Choptank and the Bay, ceded land at a pace of 15 inches per year between 1994 and 2016. That amounted to 29 feet of land lost to the water during that span.

"That is an astonishing rate of land loss," Scott said.

The last residents of James Island left long ago. But its demise could still impact people elsewhere, Scott said.

The island acts as a barrier for communities on the mainland, including Madison, Church Creek and many farms and homes in northeast Dorchester County. When the last spit of land finally slips underwater, those places will no longer benefit from its protection, he explained.

Water has eaten away so much of James Island that the U.S. Army Corps of Engineers has stopped tracking its size.

"It looks pretty darn dismal," said Trevor Cyran, a project manager for the agency's Baltimore office.

Help is on the way, though. As part of the Corps' $4 billion Mid-Chesapeake Bay Island Ecosystem Restoration, muck dredged from the shipping channels leading to the Port of Baltimore and the Chesapeake and Delaware Canal will be used to rebuild the island adjacent to the fragment that is currently above water.

It will be much like the restoration of Poplar Island to the north — only bigger. Poplar's final proportions are expected to stretch across about 1,700 acres by its 2032 completion; James is forecast to expand more than 2,000 acres by the project's conclusion in 2067.

Unlike Poplar, where some light recreational activities will be allowed, James will be reserved for nature, Cyran said.

The Army Corps received $80 million from Congress' infrastructure law to complete the design and preconstruction activities for the project. In October, the agency announced it had awarded a $43 million construction contract to Coastal Design & Construction of Gloucester, VA. Officials plan to start work by expanding Barren Island, 12 miles south by 72 acres.

James Island will have to wait until 2030 for the rebuilding to begin.

As these images attest, the fate of the existing fragment is all but sealed. What happens to its regenerated version remains to be seen. ■

Above left: James Island in the Chesapeake Bay was once an inhabited place with more than 1,300 acres. Shown here in Oct. 2022, this fragment is all that remains.

Above, top right: In 2020, James Island had broken into fragments but retained a handful of trees struggling to survive.

Above, bottom right: In 1999, James Island was larger and mostly still forested.

(Photos by Dave Harp)

View the full gallery of James Island images at BayJournal.com

‘Forever chemicals’ found in more than a dozen Bay waterways

Waterkeepers’ sampling finds extensive PFAS contamination

By Timothy B. Wheeler

Sampling by the Waterkeeper Alliance has turned up more waterways laced with toxic “forever chemicals,” including more than a dozen in the Chesapeake Bay watershed.

Per– and polyfluoroalkyl substances, or PFAS, have been found in 83% of waterways sampled in 29 states and Washington, DC, the alliance reported on Oct. 18. Many had detections of up to 35 different compounds.

In the Chesapeake watershed, the group’s sampling identified detectable levels of PFAS in the Anacostia River in DC, 10 rivers and streams in Maryland, three tributaries of the Susquehanna River in Pennsylvania, tributaries of the James and Shenandoah rivers in Virginia and one Potomac River tributary in West Virginia.

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

“When we began testing waterways for PFAS earlier this year, we knew that our country had a significant PFAS problem, but these findings confirm that was an understatement,” said Marc Yaggi, CEO of the Waterkeeper Alliance. “This is a widespread public health and environmental crisis that must be addressed immediately by Congress and the U.S. Environmental Protection Agency.”

The EPA has yet to set an enforceable national limit on any PFAS in drinking water, though it has recommended limiting the two most frequently detected compounds, known as PFOA and PFOS. In June, it updated those advisory levels dramatically downward, essentially declaring any detectable level of each a health risk if consumed over a lifetime.

The EPA also has proposed but not finalized limits on PFOA and PFOS in freshwater to protect fish and aquatic life.

PFAS have been previously reported in several Bay watershed streams, including Antietam and Piscataway creeks in Maryland and Opequon Creek in West Virginia.

Lower Susquehanna Riverkeeper Ted Evgeniadis holds a sampling container used to check water quality in Kreutz Creek near York, PA. (Courtesy of Lower Susquehanna Riverkeeper)

The waterkeeper report said the highest levels of PFOS and one other PFAS compound detected nationwide came from a branch of Kreutz Creek, which flows into the Susquehanna River. The Lower Susquehanna Riverkeeper group sampled the creek near a pipe discharging leachate from Modern Landfill, a sanitary landfill near York, PA. Levels detected just downstream were many times higher than those upstream. Lab analysis of downstream samples measured 374.3 parts per trillion PFOS and 847 ppt PFOA and detected 18 other PFAS compounds as well. The group called the lab results “catastrophically high.”

A spokesperson for Republic Services, which owns Modern Landfill, said the company “cannot speak to the quality or accuracy of the sampling data provided by the alliance, nor to the methodology it used.”

The landfill has been permitted to discharge treated wastewater into the creek since 1988, the spokesperson noted. According to an EPA database, the facility in the past three years has reported excessive discharges of boron, fecal coliform and nitrogen.

The company agreed in a 2020 consent decree with the state Department of Environmental Protection to upgrade its wastewater treatment system and is fully compliant with the terms of that agreement, the company spokesperson said. The new $23 million treatment plant, which is expected to be finished by mid-2023, will be capable of treating PFAS as well, the spokesperson added.

“Modern Landfill has taken away the constitutional right for residents and the public to safely recreate and fish around Kreutz Creek,” said Ted Evgeniadis, Lower Susquehanna Riverkeeper. “The owners of the landfill must be held accountable to the highest standards in effectively treating their wastewater to remove PFAS and other harmful pollutants.”

Evgeniadis said his group is sampling the creek water monthly and testing for PFAS in individual residents’ wells in nearby Lower Windsor Township.

The Environmental Working Group, another nonprofit, reported in October that the EPA and Department of Defense have largely followed through on steps promised during the Biden administration to reduce or clean up PFAS pollution, but other federal agencies have not done as much.

The EPA has proposed to designate PFOA and PFOS as hazardous substances and is expected to propose a federal drinking water standard for those compounds this fall, the group said. The Pentagon is also expected to issue a congressionally mandated schedule for cleaning up PFAS contamination at military bases, stemming from the longtime use of PFAS-laden firefighting foams.

In all, the EPA has pledged nearly 50 regulatory measures dealing with PFAS, and the DOD has committed to or is required by Congress to take nearly 25 steps. But the Environmental Working Group said that the Food and Drug Administration and Department of Agriculture have each proposed just three actions, even though food is a major suspected source of PFAS exposure.

Not wanting to wait for federal action, some states have begun setting their own regulatory curbs on PFAS. New York, Pennsylvania and Delaware have moved to impose drinking water limits for PFOA and PFOS. In 2021, the Maryland Department of the Environment issued the first PFAS-related fish consumption advisory in the Bay watershed after high levels of PFOS and PFOA were detected in Piscataway Creek and in some fish downstream of Joint Base Andrews, the airfield where Air Force One, the president’s plane, is kept.

After high levels of PFAS were detected in unnamed streams flowing to the Chesapeake Bay from the Naval Research Laboratory in Chesapeake Beach, MDE pressed the Navy to act while it continues to study groundwater and soil contamination on the facility. The Navy is planning to install water treatment systems to remove the PFAS, with completion expected in mid-2023, according to MDE spokesman Jay Apperson. The Air Force plans similar action to deal with PFAS getting into Piscataway Creek from Joint Base Andrews, he added. ■

Leaders say 2025 Bay cleanup goals are likely out of reach

Partnership pledges to step up efforts while rethinking strategies, timeline

By Whitney Pipkin

The Chesapeake Executive Council discusses the progress and shortcomings of the regional Bay restoration effort at an Oct. 11 meeting in Washington, DC. Left to right are Sec. Cindy Dunn of the Pennsylvania Department of Conservation and Natural Resources, representing Gov. Tom Wolf; Maryland State Sen. Sarah Elfreth, chair of the Chair of the Chesapeake Bay Commission; Gov. Glenn Youngkin of Virginia; Administrator Michael Regan of the U.S. Environmental Protection Agency; and Gov. Larry Hogan of Maryland. Not in attendance were the mayor of the District of Columbia and the governors of Delaware, New York, Pennsylvania and West Virginia. (Will Parson/Chesapeake Bay Program)

Federal and state leaders currently steering a nearly 40-year effort to clean up the Chesapeake Bay acknowledged last month that they will likely fall short of their long-standing 2025 cleanup deadline, now just a little more than three years away.

During an Oct. 11 meeting of the Chesapeake Executive Council, a senior policy-making body for the cleanup effort, some members concentrated on the progress that has been made since the first Chesapeake Bay agreement was penned by the partners in 1983. Others were frank about where things stand.

Attending his first Executive Council meeting since being elected last year, Virginia Gov. Glenn Youngkin (R) stated plainly that his state would not meet its 2025 pollution reduction targets, despite a recent flurry of additional state funding.

"We have a clear commitment to meet those goals. Unfortunately, we won't meet those by 2025," he said. "We've made considerable progress on many of them. But unfortunately, I inherited a plan that didn't have Virginia on a path to meet them all on time."

The council includes the administrator of the U.S. Environmental Protection Agency; the governors of Maryland, Virginia, Pennsylvania, Delaware, West Virginia and New York; the mayor of the District of Columbia; and the chair of the Chesapeake Bay Commission, which represents state legislatures. Only members from the EPA, Maryland, Virginia and the commission attended the meeting. Pennsylvania Gov. Tom Wolf (D) sent a representative.

Council members meet annually to discuss the progress of the Chesapeake Bay cleanup, with this year's meeting taking place at EPA headquarters in Washington, DC. Much of the discussion takes place before and during a private lunch, followed by a public meeting and press conference.

EPA Administrator Michael Regan said that, during their private meeting, the members agreed to ask the council's Principals' Staff Committee, which includes senior state and federal officials, to "rethink how we accelerate" momentum "through 2025 and beyond" and to report back by next year's meeting with a plan for doing so. Regan currently chairs the council and was re-elected by its members to serve a second term as chair.

"We need a clearer path forward that prioritizes and outlines the next steps for achieving our goals," Regan said, and then repeated for emphasis "*achieving* our goals."

Confronting the challenge

Staff within the state-federal Bay Program partnership have acknowledged for months that many of the Chesapeake restoration goals would not be met.

Besides the cornerstone effort to reduce nutrient pollution, many other goals tied to 2025 are far behind schedule, such as those for planting streamside trees, restoring wetlands, increasing urban tree canopy and restoring brook trout habitat.

Officials until recently were reticent to say as much publicly. But a recent EPA review shows that Pennsylvania, Maryland, Virginia, Delaware and New York failed to meet the nutrient reduction goals they had set for the 2020–21 milestone period.

None were on track to meet 2025 goals for reducing pollution from agriculture. The District of Columbia and West Virginia have met their goals.

"Historically, people hesitated saying that 2025 isn't going to be met as we envisioned," said Adam Ortiz, administrator of the EPA's Mid-Atlantic region, at a press briefing. "But we're really interested in keeping it real … the sooner that we speak the truth and plan accordingly, the more successful we'll be."

Bay Program officials, he said, are now "engaged in that conversation about recalibrating the timeline for restoration."

After the Executive Council meeting, Ortiz said that "historic resources" and "unprecedented levels of collaboration in leadership" indicate that acceleration toward the deadline is already under way. He and others pointed to recent significant investments in clean water in Pennsylvania, which sends the most water-fouling nutrients to the Bay.

State lawmakers this year approved using $220 million in federal funds to create a Clean Streams Fund to reduce polluted runoff and, after 12 years of failed attempts, passed a law to reduce fertilizer use on home lawns, golf courses, parks, athletic fields and other developed lands.

"I can't overstate what a banner year it was in Pennsylvania," said Maryland Sen. Sarah Elfreth (D), chair of the Chesapeake Bay Commission.

Across the Bay watershed, most of the nutrient reductions achieved since a new cleanup plan was established in 2010 have resulted from wastewater treatment plant upgrades. Now that most of those plants have been upgraded, about 90% of the remaining nutrient reductions must come from agriculture, an area in which all of the lagging states are off track. Pennsylvania, which has the most farms, is the furthest behind, at least according to computer model estimates from the Bay Program.

But, given how far behind Pennsylvania and other states remain in relation to 2025 deadlines, Ortiz said part of the effort over the next year will include discussing what's still doable and when.

Despite shortfalls, Executive Council members indicated continued support for the agreement and touted increased

investments in clean water.

But, in response to a journalist's question at the end of the meeting, Regan acknowledged that "2025 is fleeting in terms of achieving our goal." He said the task for staff now is to answer the question, "What do we need to do to get back on track?"

Accountability

Environmental advocates who attended the meeting said they will be keeping a close eye on that plan as it unfolds over the next year. Many said any changes to the agreement that might alter deadlines or details need to balance the need for both ambition and accountability.

Julie Lawson, chair of the Bay Program's Citizens Advisory Committee to the Executive Council, said she told its members that "they're facing a crisis of credibility" if 2025 deadlines are passed over with little or no consequence.

Choose Clean Water Coalition Director Kristin Reilly also stressed the need for "accountability and sufficient investments" in the forthcoming plan.

Hilary Harp Falk, president of the Chesapeake Bay Foundation, added that, while there is a strong agreement in place, backed by scientific modeling and monitoring, "What has been missing to date is accountability."

The Bay region has previously missed cleanup deadlines set for 2000 and 2010. After missing the 2010 deadline, the EPA and Bay states agreed to an "accountability framework" under which states would submit cleanup plans showing how they would meet new pollution reduction goals. Under that framework, the EPA can take a variety of enforcement actions if states are not making adequate progress.

The Bay Foundation, along with attorneys general of Maryland, Virginia, Delaware and the District, sued the EPA in 2020, accusing the agency of shirking its responsibility under the Clean Water Act by letting Pennsylvania and, at the time New York, fail to adequately identify in their plans how they would meet pollution reduction goals.

EPA lawyers argued in a brief that same year that, while the framework allows the agency to take enforcement action, it does not require it to do so. Plaintiffs have until Nov. 11 to respond to the EPA's motion to dismiss the case.

Other Bay leaders have emphasized the importance of setting pollution goals that strike a balance between being both achievable and aspirational.

"Sometimes strong goals drive innovation," Chesapeake Bay Commission Executive Director Ann Swanson said after the meeting. "So we have to have the guts to set the right goal. We have to go to the outer edge of doable, because doable isn't enough."

Swanson, who will retire this year after 35 years of working on Bay issues, appealed directly to the Executive Council members several times during her presentation to them at the October meeting.

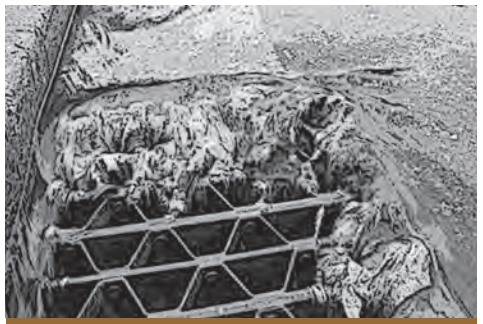
She pointed out that the water quality in the Bay has improved since the early 1980s, even though, as a whole, it is only about a third of the way to where it needs to be. "In the time that we cut the pollution load by a third, the population grew by half," she said.

The issue now, she said, is how close the region can get to its goals in the next three years. Pushing for progress up to and through the 2025 deadline, she said, would prove that "if you set a really difficult goal — one that almost seems not doable — you can get damn close. And that's the challenge now." ■

2025 Reality Check

The 2014 *Chesapeake Bay Watershed Agreement* guides the Bay restoration effort. It spells out 31 desired outcomes in support of 10 broad goals to be met by the close of 2025. This status summary of key outcomes is produced by the *Bay Journal*. The Bay Program's accounting of progress and challenges can be found at chesapeakeprogress.com.

UNLIKELY



Nutrient & sediment pollution

GOAL: Have all practices and controls in place to reach nutrient and sediment reduction targets for the Bay

Forest buffers

GOAL: Seventy percent of stream and river shorelines are forested

Urban tree canopy

GOAL: Expand canopy in the region's most developed areas by 2,400 acres

Toxic pollution

GOAL: Continually lessen and prevent the effects of toxic contaminants on humans and aquatic life

Diversity and inclusion

GOAL: Increase participation by people of color in the Bay Program to 25% and increase their presence in leadership positions to 15%

Brook trout

GOAL: Increase in-stream habitat occupied by wild brook trout by 8%

Wetlands

GOAL: Create or re-establish 85,000 acres of tidal and nontidal wetlands and enhance 150,000 acres of degraded wetlands

Black ducks

GOAL: Restore, enhance and preserve enough wetlands to support 100,000 overwintering black ducks

Progress varies

While seven Bay restoration outcomes are unlikely to be met, the status of other goals vary. Here's a look at some of them.

CHALLENGED

Far below goal, with minimal or negative progress, or lacking data

- Increase underwater grasses
- Improve stream health
- Keep existing healthy watersheds
- Engage more local leaders

ON TRACK

Progress rate and funding levels seem adequate

- Restore oysters in 10 rivers
- Increase fish passage
- Protect more priority lands
- Increase public water access
- Manage a stable blue crab fishery
- Track losses of farmland, forest and wetlands

Photos by Dave Harp except for tree canopy by Donna Morelli; diversity by Will Parson/ Chesapeake Bay Program; brook trout courtesy of U.S. Fish & Wildlife Service; and black duck by Gene Nieminen/U.S. Fish & Wildlife Service.

Salt levels in drinking water could be near tipping point

Virginia professor leads 5-year effort to study problem in Bay states

By Whitney Pipkin

Stanley Grant, a civil and environmental engineering professor at Virginia Tech University, is leading a National Science Foundation-funded research effort from his post as director of the Occoquan Watershed Monitoring Lab in Prince William County, VA. (Whitney Pipkin)

Salt is in the food we eat, on the pavement under our car tires in winter, and in the powdered laundry detergent we use to wash our clothes. And an ever-increasing amount of that salt is ending up in local waters — waters that, by definition, should *not* be salty.

Yet across the world, sodium levels in freshwater rivers, lakes and reservoirs have been trending upward. The causes are difficult to pinpoint and will likely be even harder to reverse.

Recognizing how intractable the problem can be, the National Science Foundation in 2020 awarded a group of Chesapeake Bay area researchers a $3.6 million grant to tackle the issue as one of society's "grand challenges." Funded through the foundation's Growing Convergence Research program, the effort, now in its second of five years, has brought scientists and leaders from a range of backgrounds to the table to solve complex issues.

Freshwater salinization, as it's called, is certainly one of them. There are many sources of salt in a waterbody, ranging from salt and salt brine spread on wintry roads to home water softener systems. Wastewater treatment plants are designed to reduce levels of nitrogen, phosphorous and other pollutants from the water before discharging it, but rarely do they remove salt.

Although there are scientific methods for removing salt from water, such as reverse osmosis, they are energy-intensive and far too expensive for most water authorities to seriously consider using them in treatment plants.

Keeping salt out of the water in the first place, the experts say, is by far the best approach — though it's not an easy one. The Virginia Department of Environmental Quality spent years developing a management strategy to reduce levels of salt that were polluting Accotink Creek in Fairfax County. The effort aims to balance the safety benefits of road de-icing with the harmful impact of excess salt on living resources. It spells out steps that government, businesses and citizens can take to that end.

But winter road salt isn't the only source of the problem. Powdered laundry detergents, from those on supermarket shelves to homemade alternatives, often contain salt, which is then flushed with the wastewater to the nearest treatment plant or through a septic system. Industrial cooling systems, like those used at large data centers, include salt as a disinfectant in water. Wastewater treatment doesn't remove salt, so it eventually makes its way to the nearest creek, river or bay.

From aquatic life to drinking water

Stanley Grant, a civil and environmental engineering professor at Virginia Tech University, is leading the National Science Foundation effort from his post as director of the Occoquan Watershed Monitoring Lab in Prince William County, VA. The lab has been tracking rising sodium levels in the Occoquan Reservoir for decades.

Among the questions Grant hopes to address with the project is not just which methods work to reduce salt, but also which ones policymakers and the broader population will consider both palatable and achievable. And can the various stakeholders agree?

"We are a microcosm," he said from his office in the lab's nondescript building in Manassas, VA. "[But] the solutions that we develop here are absolutely translatable to many other water supplies and watersheds around the country and the world."

Also involved in the project is University of Maryland professor Sujay Kaushal, who first wrote about saltier waters in Maryland in a 2005 paper. He later began referring to the phenomenon, which he saw increasing across the country and the world, as "freshwater salinization syndrome," identifying a range of symptoms that accompany the condition. More have been discovered since.

"It's like a systemic illness the watershed is facing as it is fed a high-salt diet," he said.

Just as too much salt in a human diet can contribute to high blood pressure, heart disease and stroke, too much salt in a waterbody can have similarly damaging effects. Higher salt levels in freshwater can reduce biodiversity, increase the presence of certain salt-loving species and cause infrastructure such as pipes to corrode more quickly, for example.

And in waterbodies that supply drinking water, too much salt poses risks to human health as well as to the environment. While unnatural levels of salt might gradually impact freshwater systems, the impact on drinking water can be immediate. One day the water might not be too salty to drink, but the next day it will be. Researchers say it can be difficult and incredibly costly to return a waterbody to health once it's reached such a tipping point.

In the United States, the U.S. Environmental Protection Agency does not have a

Researchers at Virginia Tech are analyzing soil samples to see if certain plants can absorb salt. (Whitney Pipkin)

regulatory limit on sodium as a pollutant in drinking water. But the agency's guidance documents recommend that drinking water sodium levels remain less than 20 milligrams per liter for people on low-sodium diets and less than 30-60 milligrams per liter as a threshold for taste.

When water exceeds those thresholds, "you wouldn't necessarily call it salty, but it just starts to taste bad," Grant said.

Reservoir research

The Occoquan Reservoir is no stranger to such careful monitoring. It was already a source of drinking water when, in the 1960s and '70s, it became so polluted by development runoff and poor sewage treatment that the state stepped in to address the problems. As a result, several smaller sewage treatment plants in the area were consolidated to create the more advanced Upper Occoquan Service Authority, which could treat the water to a higher degree before discharging it into the waters feeding the reservoir.

"This was one huge experiment," said Tom Faha, director of the Virginia Department of Environmental Quality's Northern Regional Office, at a public meeting in June. "We were taking all of our wastewater for the area and treating it and discharging it into one of our primary water supplies."

To oversee the outcomes of that experiment — which at the time included a suite of new water quality regulations — the state created the Occoquan Watershed Monitoring Lab in 1972, the same year that legislators passed the federal Clean Water Act. The lab has been collecting water quality data ever since, recording the success of the early effort to use wastewater to help recharge a reservoir.

Wastewater treatment and runoff control practices have helped the reservoir maintain water quality over the years. But increased sodium levels have emerged as a threat, steadily rising since the lab's inception.

In recent years, sodium levels in the reservoir have begun to "routinely exceed" the federal drinking water advisory levels for both low-salt diets and occasionally for taste. The Fairfax County Water Authority, which serves more than 2 million people in the region, gets 30–40% of its drinking water from the reservoir.

The authority's other source of drinking water is the Potomac River, which is also getting saltier, though the impact is diluted for now by greater volumes of water. The Washington Suburban Sanitary Commission has recorded a 230% increase in salt levels in the river over the past 30 years.

Above: The Occoquan Reservoir supplies 30–40% of the drinking water to the Fairfax County Water Authority, which serves more than 2 million people. (Stanley Grant)

Right: A truck spreads salt during a winter storm. Road deicing is a major source of salt pollution in waterways, but not the only one. (Dave Harp)

"We have an urbanizing watershed that we're also using as a water supply, and that is inherently a conflicting situation," Grant said during a presentation this summer to the Prince William County Board of Supervisors. "How close are we to getting to the point where we have one more needle on the camel's back, and we have a problem?"

Meanwhile, the county board has been on the cusp of making zoning changes that would allow more intense development on a 2,100-acre swath of the watershed for the Occoquan Reservoir and Bull Run, a tributary of the Potomac. Those changes could pave the way for dozens of warehouse-like data centers where there used to be farmland, forests and widely scattered homes.

Environmental groups have opposed the projects for several reasons, but chief among them is their potential impact on water quality. The correlation between development and saltier waters is well-established.

The more parking lots, buildings and roads, the higher the amount of sodium chloride in the water — and not just in winter, Kaushal said. As a chemical element that can take many forms, sodium can seep with groundwater over time, interacting with other chemicals along the way.

Some of the more promising solutions for removing salt from the environment are natural ones. One of Kaushal's students is publishing a paper on how forests decrease sodium levels in the water as it filters through the ecosystem. This is similar to the way trees absorb nutrients, but the process is more complex, with electrical interactions between certain elements.

Megan Rippy, an assistant professor of civil and environmental engineering at Virginia Tech University and a co-principal investigator on the National Science Foundation salt project, is studying whether certain plants can absorb excess salt in stormwater retention ponds. Based on soil and water samples so far, cattails could be among the best native salt accumulators, she said.

But even environmental functions like these can be negatively impacted if there is too much salt in the system. Just as salty foods make humans thirsty, too much salt can dehydrate some plants, reducing their ability to survive and filter other pollutants. In the water, salt can be detrimental to aquatic organisms that live in systems that are supposed to be either freshwater, saltwater or a mix of both.

Researchers who are still grappling with the issues say there are no simple solutions. The main goal of the Science Foundation project is to learn whether — in the absence of regulations that restrict salt in runoff and wastewater — stakeholders can agree on what constitutes too much and at what point they're willing to do something about it. That includes all the humans who live in a watershed.

"We're salty creatures," Kaushal said. "We require salt when we build things, eat things, dispose of things, so we all play a role in this." ■

For tips on reducing your salty contributions to the environment:

- *Visit the Izaak Walton League at iwla.org/water/stream-monitoring/salt-watch.*
- *Visit the Northern Virginia Regional Commission at novaregion.org/1489/Residential-BMPs.*

Relive history the hard way: Climb Pennsylvania's Thousand Steps trail

By Ad Crable

Think about walking 3 miles from your home, then climbing almost straight up a mountain on irregular stone steps just to begin a 12-hour backbreaking workday of busting rocks with a sledgehammer and loading them into rail cars.

With just a little imagination, reliving the six-day-a-week routines of quarry workers in central Pennsylvania is vividly brought home by hiking the short but arduous Thousand Steps trail. It honors the men, many of them immigrants, who helped make nearby Mount Union, for a time, the silica brick capital of the world.

Nearly lost to private development, this unique and historic rock staircase built in 1936 by the rock gatherers themselves was saved in 1998 by a groundswell of support that raised the money to buy 670 acres. Contributors included local residents, hiking groups, land trusts and the state. The Thousand Steps were restored.

The hike up the steps (it's closer to 1,050 of them) is only about a half-mile. But you gain 843 feet of elevation and have to work for each high footstep on the sandstone slabs.

Along the way, you will cross many abandoned narrow-gauge railbeds that transported broken rock off the mountain. The rock, a quartz-rich sandstone known as ganister, is found in piled slabs on open-face scree slopes — thought to be the remnants of an ancient, shallow seabed. You'll also see picked-over quarries that look just as they did when the workers walked away. And you will come across stone walls erected along the grades and an occasional fragment of iron train track left behind.

Just a few hundred yards beyond the last step is the gutted but still intact Dinkey Shed, handsomely and stoutly made from stones. Here, tiny gasoline-powered locomotives, known as dinkies, were stored and serviced for transporting loads of rocks off Jacks Mountain.

Your burning thighs will be rewarded with several views of distant Appalachian Mountain ridges in Pennsylvania's Ridge and Valley region, as well as Jacks Narrows, where the Juniata River is squeezed between the hillsides, forming the state's deepest gorge. Across centuries, modes of transportation were concentrated in this bottleneck, from the Frankstown Indian Path and Pennsylvania Canal to the Pennsylvania Railroad and today's U.S. Route 22.

Refractory companies had been collecting ganister from Jacks Mountain since 1899. The rocks contain silica, a heat-resistant material greatly valued then as a liner in steel, iron, glass and railroad industry furnaces.

In its heyday from the turn of the 20th century to about 1950, nearby Mount Union and its silica brick or "fire brick" refractories turned Mount Union — tucked into a bend of the Juniata River — into "Brick Town USA." Three factories employed 2,000 people and turned out 500,000 bricks a day.

But the steel industry declined and newer processes for making the bricks developed. A latter-day version of silica brick is still made there. The Hubble Space telescope now floating in space contains silica mined from Jacks Narrows.

The St. Patrick's Day Flood of 1936 took out a bridge across the Juniata that carried mine carts from factory to mountain. Rather than lay off employees, the brick company put them to work building the rock stairway that is now the Thousand Steps trail — providing more access up the mountain to the ever-expanding quarry sites.

Until then, quarry workers had to walk 3 miles every day to the base of Jacks Mountain.

Photo: The Thousand Steps trail, built with rocks on Jacks Mountain in Pennsylvania, rises above morning mist and fall colors. (Ad Crable)

Top left photo: This is one of several overlooks earned by climbing the Thousand Steps trail in Pennsylvania. (Ad Crable)

Top right photo: The steps in the trail were wedged into place by quarry workers in 1936. (Ad Crable)

Bottom photo: A family ascends the trail. (Ad Crable)

From there they would trudge like worker ants up the steep dinkey inclines or sometimes surreptitiously hitch a ride in the pulled steel dump cars — a dangerous ride-share that killed at least two workers.

The precipitous stairway was used until the last of the steep-slope rock piles were quarried in the late 1950s.

After the first few steps, a hiker soon realizes this is no ordinary stairway. The stone treads, made from the very rocks the workers were mining, are irregular and often slanted. The vertical distance from one step to the next varies greatly; you have to pay attention to each lift. Some climbers compare the ascent to a 90-minute workout on a StairMaster fitness machine.

When I started up the trail, I was at first a little annoyed that each 100th step is marked. But I soon realized that they serve as little milestones of accomplishment, buoys of encouragement to keep going.

One climber I encountered, Army veteran Zach Irwin, was more dismayed than encouraged when he found that he had only climbed 200 steps so far. His mother, a pastor in Mount Union, had told her son, visiting from Fort Bragg, NC, that he just had to hike the Thousand Steps. Visibly out of breath in shorts, a T-shirt and sneakers, Irwin was not exuding affection for mom.

In contrast, I came across Jason Graney of Mount Union, who was fairly gliding up the steps with his dog. The 46-year-old scales the steps several times a week for fitness. This day, though, was one of his "leisurely" trips to enjoy the views and fall colors.

Graney's dad worked in one of the brickyards in Mount Union but he was laid off when the steel industry declined. His father never had to gather stone from the mountain, but Graney imagines the sweat and grit of those who did.

"I've often thought, boy, what would it be like to climb up this mountain and then have to bust rocks all day, just to get them over to the brickyard. It's crazy stuff," he said.

As an early present for her 25th birthday, Skye Fedkenheru came with her partner, Chris Domkowski of Pittston, PA, and their three dogs to hike the steps. "It's kind of been one of those bucket list items," she said. "It's not something you see every day."

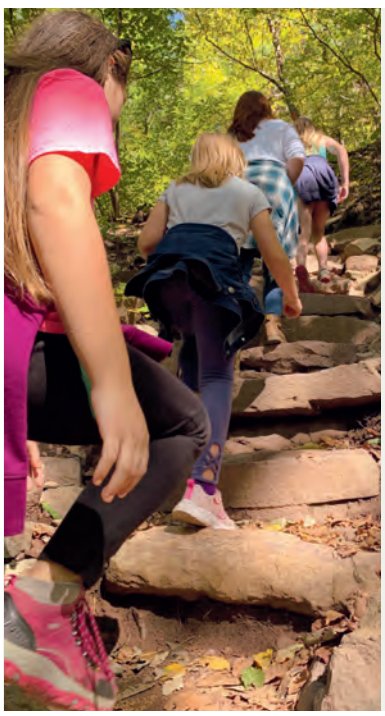
Not long after that exchange, I was dumfounded to see Jessica Tenley of Saxton, PA, and all six of her children, ages 3–15, ascending the staircase with alacrity.

The 35-year-old mom estimated that this was the seventh time her family had made the climb. The first time, she was pregnant and lifted her 1-year-old daughter onto the bigger steps.

Denuded of trees more than a century ago, Jacks Mountain was for a time a bare-sided slope of bleached rocks. But time has healed nature's wounds and the Thousand Steps path climbs through groves of rhododendron shaded by beech trees and jack pines.

The allure of the Thousand Steps has only grown with time. During the COVID pandemic in 2020, trail counters showed that more than 42,000 people hiked the trail — double the typical numbers of pre-COVID years.

"The appeal of the Thousand Steps for a lot of people — number one, it's a challenge. But I think there's also nostalgia," George Conrad, president of the Standing Stone Trail Club, was quoted as saying in a newspaper story. "It's the nostalgia of putting yourself in the shoes of quarrymen going to work every day." ■



Planning for the Thousand Steps challenge

The Thousand Steps section of the Standing Stone Trail is only a half-mile long but very steep. It's thigh-busting on the way up and knee-pounding on the way down. Trail managers strongly caution against climbing when it's icy or wet. The most popular times to hike it are early spring for the clearest views and in the fall for colors. Dogs are allowed on leashes. There is no camping in State Game Lands, where the trail is located.

Access the trail from a parking area on the north side of U.S. Route 22, 1.3 miles west of Mount Union. From there, walk toward a creek and bridge and follow a blue-blazed trail to the start of the orange-blazed Thousand Steps. The trail crosses many railbed switchbacks that provide places to rest.

At the top of the steps, you can turn right and follow a blue-blazed trail for 0.3 mile to a vista of Mount Union and the Juniata River. Or go left on an orange-blazed trail for 0.2 mile to the 1938 Dinkey Shed used for small trains. From there, you can climb another 95 steps and follow the Standing Stone Trail for 0.5 mile to the Ledge Quarry Lookout with views of Jacks Narrows, the town of Mapleton and surrounding mountains.

If you climb the Thousand Steps and walk to both overlooks, the total distance roundtrip is about 3 miles.

For an overlook near the summit of Jacks Mountain, continue beyond Ledge Quarry for 2.5 miles to the Mill Creek Quarry Vista.

For a good review of the Thousand Steps trail, visit pabucketlist.com/hiking-the-1000-steps-in-huntingdon-county.

Travel

Timber! Museum chronicles the decline and return of forests

By Karl Blankenship

One early Pennsylvania settler from England was dismayed by his newfound home. It was "not a land of prospects," he declared. "There is too much wood." At the top of a hill, he elaborated, the view "generally is nothing but an undulating surface of impenetrable forest."

That such vast woodlands could be transformed to a wildfire-plagued wasteland seemed unimaginable. Yet it happened. And the story of that transformation — and subsequent recovery — is told at the Pennsylvania Lumber Museum, nestled in the second-growth forest of Potter County in the northcentral portion of the state that was ground zero for the timber boom.

The museum, administered by the state Historical & Museum Commission, allows visitors to experience a reconstructed lumber camp, complete with a sawmill, support buildings and a logging era steam locomotive.

But exhibits inside the visitor center put those into context. "We're really looking at human beings and our relationship with the forest over time, and how that has changed," said Joshua Roth, the museum administrator.

Human intervention began with Native Americans, who used the woodlands for food, fuel and building materials. They managed forests, using fire, to promote the growth of desired trees and clear the land for agriculture. But their impact was small, and an estimated 90% of the state was forested when William Penn arrived in 1692.

New settlers saw forests as a source of fuel and building materials but also as an obstacle to farming. Yet Penn recognized their value, at least to a point, urging settlers to "leave one acre of trees for every five acres cleared."

Nonetheless, the era of deforestation began shortly after settlement. The museum largely focuses on the lumber boom that started in the mid-1800s.

That was made possible, in part, by the state's large rivers — the Susquehanna, Allegheny and Delaware — which provided ready transportation routes to get logs to the market. Initially, large rafts moved logs downstream. But that method gave way to log "drives," putting the logs directly into the water and floating them en masse downstream. Booms built across waterways at sawmill towns would catch the logs.

Managing the drives was dangerous. Men would walk atop floating log piles that would occasionally become jammed on the rivers — hence the word logjam. They would look for logs causing the blockage and use hand tools to free them — along with the mass of backed-up logs waiting to rush downriver. "I'm sure you had to be brave and skillful in order to accomplish that and make it out alive," Roth said.

Through photos, hands-on exhibits, dioramas, displays of tools and accessories, the museum reveals stories of the people and places that thrived, and sometimes died, during the height of the logging era.

Williamsport, on the West Branch of the Susquehanna, was one that thrived. It had its first sawmill in 1834 and its first log boom in 1851. For a time, it had more millionaires per capita than anywhere else in the country. In 1875 alone, it produced 190 million board feet of white pine.

The museum shows how technology shaped the lumber industry. At first, boards were cut by two-man teams using a saw pit, with one man in the pit and one on top working a saw. The man at the bottom was fated to a day of sawdust falling on his face. "That's where the expression 'it's the pits' comes from," Roth said.

The pits were replaced by steam-powered, up-and-down saws, then circular saws. Each technological improvement allowed more wood to be cut and sold, driving more harvest. As woods near rivers were cleared, timbering operations moved upstream, empowered by new specialized steam engines that could haul heavy loads along narrow, steep tracks in the mountains.

As white pine diminished, attention gradually turned to hemlocks, valued in part because their bark was rich in the tannin used to tan leather hides. By 1880, Pennsylvania had nearly 900 tanneries, the world's largest concentration.

Other uses were developed for the smaller

Ephraim Shay, a lumberman, invented a gear-driven locomotive that could climb steep slopes and haul logs over crude mountainous rail lines. (Courtesy of the Pennsylvania Lumber Museum)

Photo: Lumber camps during the late 1800s, like this one reconstructed at the Pennsylvania Lumber Museum, typically supported about 60 men, including lumberjacks, cooks, blacksmiths and other support positions. (Karl Blankenship)

hardwood trees left behind, such as the production of wood alcohol, charcoal, fertilizer, firewood and other products.

There was little regard for the impact of widespread forest clearing and related industries. Huge photos on the museum walls drive home the extent of the devastation. "The best [swimming] holes — those in the Cedar Run below the tannery — were unfit for bathing on account of the waste from the tannery," lamented one resident of the tiny town of Leetonia.

Bigger impacts became evident as clearcut wastelands became tinder for massive and frequent wildfires. "There's an account from Theodore Roosevelt where he was taking a train from Washington, DC, back up to New York state and wrote that he couldn't sleep at night because it was as bright as day outside with all of the fires that were burning all across Pennsylvania," Roth said.

That gave a boost to the fledgling conservation movement and for fresh thinking about forests. At the forefront was Joseph T. Rothrock, commissioner of the newly created Pennsylvania Bureau of Forestry from 1895 to 1904.

Forests were in such poor condition they often couldn't regenerate on their own, so Rothrock created a system of nurseries to help replant trees. During his tenure, the state acquired 600,000 acres of degraded woodlands — 30% of today's state-owned forest — sometimes for as little as $2 an acre. The Mont Alto Academy was created to educate a new generation of foresters, one of the country's first such schools.

Depleted forests took an economic toll. Once-booming lumber towns disappeared as the industry moved on. By the 1920s, 75% of the wood needed by Pennsylvania paper pulp mills had to be imported from other states.

"By the time we get to the depleted forest era, we're down to about 30% forest cover," Roth said. "However, that 30% is largely homogenous in terms of the type of species, and in terms of age, and not really useful for lumber production, or any other type of forest product production."

Restoration efforts got a boost from the Civilian Conservation Corps — President Franklin D. Roosevelt's "tree army." Enrollees earning $25 a month fought fires, planted 50 million trees in the state, erected 86 forest fire towers, built and repaired 6,300 miles of roads and trails, constructed 98 small dams and helped to control the spread of tree diseases.

Moving to the present, exhibits show that today's forests, occupying about 60% of the state, face continuing challenges from nonnative insects, disease, wildlife overpopulation such as deer, and lack of regeneration.

Modern forests are also different from those seen by settlers. No longer dominated by conifers, they are largely hardwoods. Pennsylvania exports nearly $1.2 billion in hardwood lumber and wood products each year, much of it produced from industrial forest lands which, unlike the past, are managed to sustain production over time. Plus, the industry employs about 80,000 people. On the 2.2 million acres of state-owned forest lands, management considerations include not just harvest, but recreation and wildlife.

After learning the history, museum visitors step outside to experience a bit of the boom era through a reconstructed logging camp. There is the shack of the "filer" who maintained sharp saws, the blacksmith shop, the laundry shed (Sunday was laundry day), the bunkhouse and the mess hall. And, of course, there's a sawmill featuring a steam-powered circular saw.

A highlight is the 1880s Shay locomotive, a specially geared engine designed to climb steep mountain grades and haul harvested trees.

Outdoor exhibits also showcase the work of those who sought to restore the state's woodlands. In addition to a CCC cabin, there's the primitive cabin that was home to forester and outdoor enthusiast Bob Webber and his wife, Dotty, now set up to tell the story of their contributions to the state's forests.

The journey puts a focus on those changing perspectives. From settlers, who thought forests were as inconvenient as they were inexhaustible, to industrial-scale destruction, and finally to recovery.

"We can't cut every tree down and use it, and we can't leave every tree standing," Roth said. "We've got to balance both of those aspects to make sure that we have a forest that is meeting all those different needs in perpetuity." ■

Top left photo: Logs placed in rivers as part of "drives" to downstream sawmills were stamped with identifying marks so sawed lumber could be credited to the proper logging operation. (Karl Blankenship)

Top right photo: A diorama shows a lumber raft used in the early days of the timbering industry to transport logs downstream. (Karl Blankenship)

Bottom photo: Lumbermen, or "woodhicks," were expected to do their laundry once a week, usually on Sunday, so all camps had a shed for washing clothes. (Karl Blankenship)

IF YOU GO

The Pennsylvania Lumber Museum is located on U.S. Route 6 midway between Galeton and Coudersport.

Winter hours (Dec. 1–March 31): 10 a.m.–4 p.m. Friday–Sunday.

Summer hours (April 1–Nov. 30): 9 a.m.–5 p.m. Wednesday–Sunday.

Admission: $8/adults; $7/ages 65+; $5/ages 4–11; free/active-duty military & their families.

The museum hosts special events, including Winter in the Lumber Camp (Jan. 28). Its biggest event is the Bark Peelers' Festival (July 1–2), with demonstrations, contests, food, crafts and live music.

For more events and information, visit lumbermuseum.org.

Kayakers take advantage of calm water on the Choptank River on Maryland's Eastern Shore. (Dave Harp)

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Raccoon tracks appear along the bank of the Rocky Gorge Reservoir on the Patuxent River in Laurel, MD. (Michele A. Danoff)

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Pondering the journey of 'X' ... the journey of us

By Tom Horton

Ashes have been on my mind of late — the scattering of them, farewells to loved ones, both electing cremation.

In our Chesapeake Bay-centric, water-rich landscape with tens of thousands of miles of magical land-water edges, the default idea seems to be spreading one's remains in or near the water.

That is technically illegal under the federal Clean Water Act, though I'm unaware of any arrests or fines. Nor does our murky and eutrophic estuary really need more nutrients, though I'm intrigued by a suggestion novelist John Barth, born in Cambridge, MD, on the Bay's Eastern Shore, made for himself years ago. Feed him to the crabs, Barth mused. It was only fair payback because he'd had many a go at consuming those beautiful swimmers.

I've been rethinking cremation, which I'd always thought I'd opt for. While it saves space and bucks, and forgoes chemicals used in embalming, it uses roughly the same amount of energy it takes to power a U.S. household for a month, something to consider in this era of struggling to minimize carbon emissions.

Better alternatives might be composting one's body in special chambers, now operating successfully in Washington state. You end up as rich soil. We're already doing as much with poultry remains around the Chesapeake.

There's also the "green" burial, where your body, sans chemicals or caskets or tombstones, is placed in wild natural landscapes, whose preservation is enabled by your interment fees. These operate in Georgia and California — but none I'm aware of in the Chesapeake states.

But if I end up ashes, I'm directing my scatterers to go high, not low — go upslope, on the ridgeline, anywhere but down by the water.

My thinking is ecological, not sentimental, cued by a remarkable essay, *Odyssey*, written nearly a century ago by Aldo Leopold and published in *Sand County Almanac*. (Still in print. Read it!)

Leopold, a forester by training, was one of the first to articulate the need for humans to develop an ethical relationship with land. "Quit thinking about decent land-use as solely an economic problem," he wrote. "[Also] think in terms of what is ethically and esthetically right. … A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community. It is wrong when it tends otherwise."

Odyssey lyrically and scientifically traces the many paths of one atom of matter through the author's native Midwestern prairie ecosystem, showing how the original prairie evolved to fiercely retain its minerals and nutrients and soils against the inexorable push of gravity — of water always flowing downslope, seeking the sea, eroding away the wealth of the land if unchecked.

A sampling: The atom, dubbed 'X' in *Odyssey*, is pulled from a crack in a rock, pried open in the "flash of a century" by the persistent roots of an oak. Freed from its prison, X "helped build a flower, which became an acorn, which fattened a deer, which fed an Indian, all in a single year."

From human bones, X decays to live again "on a second trip through the bloodstream of the land. [This time] a rootlet of bluestem sucked him up and lodged him in a leaf that rode the green billows of the prairie June … hoarding sunlight."

And then, so enchanting: "To this leaf also fell an uncommon task, flicking shadows across a plover's eggs. The ecstatic plover hovering overhead poured praises on something perfect, perhaps the eggs, perhaps the shadows, or perhaps the haze of pink phlox that lay on the prairie."

Imagining a more local journey of X, I like to think of him being sucked up by a rootlet of eelgrass, lodged in a leaf that shades and sequesters copulating blue crabs, olive and ivory conjoined.

A lone bur marigold grows out of the muck along Big Creek, a tributary of the Nanticoke River on Maryland's Eastern Shore. (Dave Harp)

But almighty gravity, and water's way — always seaward, downslope — inexorably move X closer to the sea, where a bit of the watershed's fertility would be lost for all meaningful time.

But life rebels: "living plants retarded the wash by impounding atoms; dead plants by locking them to their decayed tissues. Animals ate the plants and carried them briefly uphill or downhill.… *no animal was aware that the altitude of his death was more important than his manner of dying.*"

What a magnificently humbling notion! And even better:

"An Indian, having inherited an eagle's plumes [X's latest lodging], with them propitiated the Fates, whom he assumed had a special interest in Indians. … It did not occur to him they might be busy casting dice against gravity, that mice and men, soils and songs, might be merely ways to retard the march of atoms to the sea."

We Bay dwellers have been drawn to the water's edge forever: for seafood, transportation, drinking water, diluting our sewage, cooling our nuclear plants; for admiring birds and killing ducks, for kick-ass sunsets, progging for oysters, watching ospreys swoop on fish; for making love at the dark end of the dock.

So maybe take a half-pinch of ashes and sprinkle it on the ebb tide, among the marshes and the meanders of the creeks. But the bulk, take it high, up gradient, to where the watershed can essay more odysseys, where the marvelous predilection of nature in all of its diversity can resist gravity and water's way, greenly, boisterously, resolutely shouting "LIFE!" ■

This piece is in memory of Niamh Shortt and Anne Horton Kelly, and inspired by Nick and Margaret Carter.

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.

For the Bay's sake, nonnavigable waters need protection

By Jon Mueller

The Supreme Court has once again waded into the debate over the reach of the Clean Water Act. How the courts rule could determine the fate of thousands of acres of wetlands and tens of thousands of miles of small streams critical to the health of the Chesapeake Bay and its tributaries.

The high court heard oral arguments in Sackett v. EPA on Oct. 3. The long-running case involves an Idaho couple whom the U.S. Environmental Protection Agency sanctioned for filling in wetlands on their property without a permit. At issue broadly is how the agency determines which waters are protected by the federal Clean Water Act — and which aren't.

This is important because the federal government can only safeguard waters covered by the landmark law, which aims to protect and restore water quality across the country. But the 50-year-old statute does not explicitly say which "waters of the United States" it empowered the government to regulate.

The Sacketts and their supporters insist that the EPA may only oversee "navigable" waterbodies connected by surface water. This view ignores the scientific fact that all waters in a drainage basin are connected, even if only underground (a point the Chesapeake Bay Foundation and other environmental groups made in a joint amicus brief they filed in the case).

The narrower interpretation by the Sacketts would also leave vulnerable to destruction several categories of "nonnavigable" waters that are nonetheless critical to restoring and protecting the Bay ecosystem. Among them are pocosins and isolated freshwater wetlands unique to the watershed: Delmarva bays (also called Delmarva potholes).

Delmarva bays are shallow, oval-shaped depressions scattered over the Delmarva Peninsula, most of them clustered on the Delaware-Maryland border. The 5,000 or so known Delmarva bays, covering 34,560 acres, contain forested wetlands, according to a 2014 report in the journal *Wetlands.* Pocosins, which in the Bay watershed are found only in Virginia, are isolated bogs with sandy, peat soils.

A view of Dorchester Pond, a Delmarva bay on property owned by The Nature Conservancy in Dorchester County on Maryland's Eastern Shore. (Dave Harp)

Wetlands, in general, are critical to restoring the Bay because they trap pollutants running off farmland, parking lots and city streets before they can reach the estimated 111,000 miles of local streams, creeks and rivers that empty into the Bay.

Wetlands also provide essential habitat for fish and wildlife that support the region's multibillion-dollar seafood industry and thriving outdoor recreation and tourism sectors.

By absorbing storm surges and floodwaters like sponges, wetlands protect coastal communities from climate change effects like sea-level rise and "sunny day" flooding that threaten lives, businesses and property.

Another category of nonnavigable waters at risk — and important to Bay restoration — is streams that only run at certain times of the year (known as "intermittent" streams) or after it rains or snows ("ephemeral" streams).

While you can't navigate a boat on them, the science is clear that they are connected to downstream rivers. This hydrological connection means they can affect water quality downstream, just like streams connected above ground that run year-round.

Virginia and Pennsylvania have the most miles of intermittent and ephemeral streams. A staggering 59% of linear stream miles in Virginia (55,589 miles out of 94,914 miles) are intermittent or ephemeral streams, according to the EPA. In Pennsylvania, 41% of linear stream miles (30,148 miles out of 74,247 miles) only run seasonally or after rain or snow, according to a 2013 EPA report.

If the Supreme Court decides that the Clean Water Act doesn't protect Delmarva bays, pocosins or intermittent and ephemeral streams, Maryland, Pennsylvania and Virginia have state regulations that could offer some protection. But loopholes, waivers and limited enforcement by state officials would leave many of these wetlands and waterways at risk.

The danger is greatest in Delaware, which follows the federal definition of covered waters. Delaware estimates that approximately 30,000 acres of its isolated wetlands, including 1,500 acres of Delmarva bays, are unregulated and therefore could be destroyed. Nor does the First State regulate activities in ephemeral streams, according to its Department of Natural Resources and Environmental Control.

Although the Supreme Court heard oral arguments in the Sackett case on Oct. 3, it is not expected to issue a ruling for several months, perhaps as late as next June.

In the meantime, the Biden administration is drafting another rule to define wetlands and other waterbodies protected by the Clean Water Act. The move has drawn strong criticism from the Sacketts' supporters in Congress, who want the Supreme Court to weigh in first. In addition to its amicus brief to the high court, the Chesapeake Bay Foundation and a host of water-quality groups earlier this year submitted comments on the rule to the EPA, urging the agency to protect isolated wetlands, including Delmarva bays, pocosins and seasonal streams.

It's unclear if the new rule or the court's decision will finally settle this question or start a new round of time-consuming litigation that only prolongs the uncertainty for both regulators and the regulated community. What is clear are the significant stakes for the Bay, its tributaries and the more than 18 million people who live, work and play in its watershed. Without federal protections for all waterbodies critical to the cleanup, our ability to save the Bay is also at risk. ■

Jon Mueller is vice president for litigation 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.

Action needed to curb 'spills' of menhaden from fishing nets

By Mike Leonard & David Sikorski

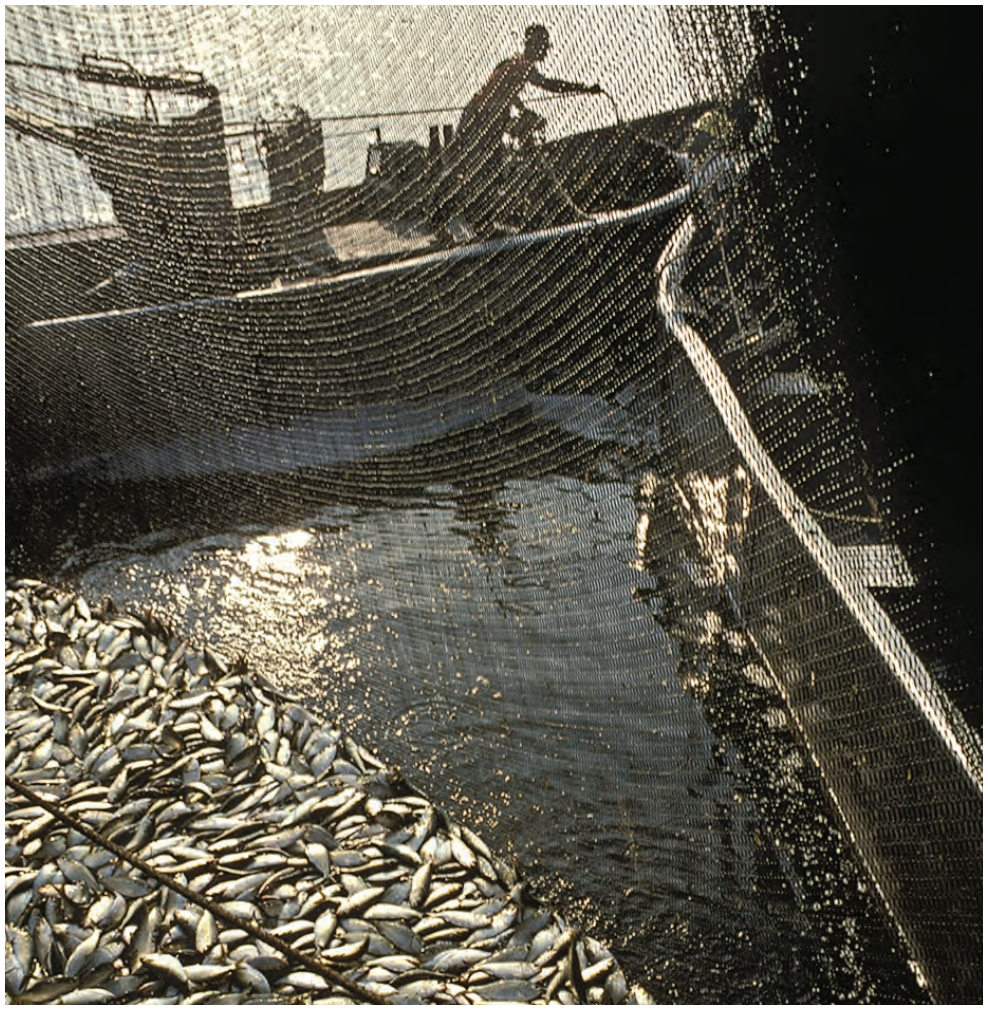
At least twice this summer, industrial menhaden harvester Omega Protein littered the beaches along Virginia's Eastern Shore with Atlantic menhaden, wasting thousands of this important forage fish. The Canadian-owned company acknowledged that its contractor, Ocean Harvesters, based in Reedville, VA, was responsible for both mishaps.

The first net failure occurred on July 5, spilling thousands of dead menhaden along Silver Beach, VA, located on the Chesapeake Bay's shoreline. A second spill, on July 25, occurred about 15 miles to the south and resulted in several thousand dead fish washing up on the beaches of Pickett Harbor, Kiptopeke State Park and Sunset Beach.

Among the fish killed in the second incident were hundreds of large red drum that were caught as bycatch in the operation's net. Official counts reported to the Virginia Marine Resources Commission (VMRC) by Omega Protein revealed that at least 12,000 pounds of red drum — most of them in the 30– to 50-pound range — were casualties of this single calamity. Given that popular sport fish's biology, it is highly likely those big, mature reds were in the Bay to feed on menhaden schools, converting the protein-packed forage into the energy needed to spawn the next generation.

These latest net spills aren't the only times Omega Protein has shown itself to be a bad corporate neighbor in the Chesapeake Bay. In a single week in 2021, the company's nets tore on two separate incidents, forcing them to dump what the VMRC estimated to be 400,000 dead menhaden into Hampton Roads waters.

In December 2019, Virginia was found to be out of compliance by the U.S. Department of Commerce after Omega Protein knowingly violated the 51,000-metric ton Chesapeake menhaden harvest cap, a limit agreed to by coastwide fishery managers. Moreover, Cooke Inc., the parent company of Omega Protein, has paid nearly $13 million in penalties for violations related to the environment, safety, government contracting and finances, according to Good Jobs First, an organization that tracks corporate violations.



A commercial fishing operation harvests menhaden using a purse seine net. (Dave Harp)

In response to the 2021 net spills, the VMRC's menhaden advisory committee considered the development of an offshore buffer — or area closure — to minimize the possibility of the large menhaden purse seine nets snagging on the bottom in nearshore shallow waters. Such a buffer would also provide protection for recreational species that frequent vibrant nearshore habitats.

Unfortunately, the proposal did not move forward because it was opposed by the committee's Omega Protein representative, who claimed net spills are rare events not in need of a remedy. The two most recent significant spills this summer, though, have clearly shown these occurrences are not as rare as the company claims.

Often called the most important fish in the sea, menhaden are primary food for popular and valuable game fish such as striped bass (rockfish), red drum, bluefish, cobia and sea trout.

Stripers are the largest saltwater recreational fishery in the U.S. and generate hundreds of millions of dollars in economic activity in the Chesapeake region alone. They are especially dependent on protein-rich menhaden, but this game fish is clearly overfished. Moreover, reproductive success of stripers in the Bay — the fish's most important nursery ground — has dropped below the long-term average several times in recent years. As a result, coastal fishery managers have implemented a plan to rebuild the striped bass population.

It is also important to note there has never been a bona fide stock assessment to estimate the number of menhaden in the Bay. Additionally, because the overall menhaden harvest, particularly in New England, has greatly increased, the Atlantic States Marine Fisheries Commission is considering changes to its current management plan.

Several options are on the table, including reallocating a percentage of the harvest to northern states, which would likely reduce Virginia's quota and impact Omega Protein's bottom line. (According to the ASMFC and other sources, Omega Protein harvests more than 70% of all menhaden caught on the East Coast.)

Simply put, menhaden are far too valuable to the Chesapeake's ecology and recreational economy to allow a single, foreign-owned industrialized harvester to grind up the lion's share of menhaden into animal feed and fertilizer. This inequity is especially troublesome given that Bay and coastal anglers are doing their part to conserve stripers and improve marine habitats.

Taken together, this is precisely why the Coastal Conservation Association and American Sportfishing Association are part of a broad coalition of recreational fishing and boating groups that have asked Virginia Gov. Glenn Youngkin to stop the use of industrial purse seine gear in a major portion of the Chesapeake Bay "until science demonstrates" that it does not negatively alter the estuary's ecosystem.

The Chesapeake's marine resources belong to all of us. Additionally, the Bay is an important driver for robust sportfishing, boating and tourism economies. We deserve more than empty promises from an international fisheries juggernaut. All eyes are on Virginia's fisheries managers and leadership in Richmond to curb this wasteful action. ■

Mike Leonard is vice president of government affairs for the American Sportfishing Association and a member of the VMRC Menhaden Advisory Committee. David Sikorski is executive director of the Coastal Conservation Association Maryland and chair of Maryland Sport Fisheries Advisory Commission.

BULLETIN BOARD

VOLUNTEER OPPORTUNITIES

WATERSHEDWIDE

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

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

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

PENNSYLVANIA

Glen Rock tree plantings
Join the Alliance for the Chesapeake Bay's Pennsylvania Forests Team for a tree planting 9 am Nov. 19 in Glen Rock. Participants will be emailed details closer to the date about parking locations and other important details. Info/registration: Rebecca Lauver at rlauver@allianceforthebay.org.

York County Parks
York County Parks volunteer opportunities at Nixon Park in Jacobus. Preregistration required: 717-428-1961, NixonCountyPark@YorkCountyPA.gov.
- *Front Desk Greeter:* Ages 18+ can work alone. Families can work as team.
- *Project Feederwatch:* 9 am–4 pm (Participants sign up for 1-hour shift every other week) Nov. 15, 16, 22, 23, 29, 30 & Dec. 6, 7, 13, 14, 20, 21, 27, 28. Beginners welcome. This citizen science program, which is 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. Visitors are welcome to drop in any time.

Answers to CHESAPEAKE CHALLENGE on page 37

A. Chestnut oak
B. White oak
C. Northern red oak
D. Pin oak
E. Blackjack oak

VIRGINIA

Reedville Fishermen's Museum
The Reedville Fishermen's Museum needs volunteers for docents and in the gift shop, boat shop, research collections/library. Click on "About us" at rfmuseum.org, office@rfmuseum.org.

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

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

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

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@pwswcd.org, pwswcd.org.

VA Master Naturalists
VA Master Naturalists is a corps of volunteers who help manage, 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

Frederick forest buffer
The Forest Buffers in Frederick County initiative is looking for volunteers. Info/registration: www.streamlinkeducation.org/volunteer.
- *Nursery Teams:* Dec. 3 & 10. Help grow native trees at outdoor nurseries.
- *Tree Teams:* Nov. 19 and Dec. 3 & 10. Help maintain young forests.

Become a water quality monitor
The Izaak Walton League Gaithersburg office invites people of all ages to join one of its monitoring programs. Info: SOS@iwla.org or 301-548-0150 x229.
- *Clean Water Hub:* Explore water quality data in your community, around the country.
- *Salt Watch:* Test for excessive road salt in a stream.
- *Check the Chemistry:* Spend 30 minutes at a waterway with 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.

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

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

Anita Leight Estuary Center
Remove invasive plants, install native species 1–3 pm Nov. 20 at the Anita C. Leight Estuary Center in Abingdon. Volunteers, ages 14+, learn about problem plants, removal & restoration strategies. Wear sturdy shoes, long sleeves, work gloves. Weather permitting. Preregistration required: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

Coastal Bays cleanups
Maryland Coastal Bays Program invites volunteers of all ages for restoration events. Info: 410-213-2297, Liz Wist at lwist@mdcoastalbays.org
- *Showell Property:* 9:30 am–12 pm Nov. 19 in Showell. Clean up items such as tires and tree tubes, remove invasive species.
- *Lizard Hill Wetland Restoration Site:* 10 am–12 pm Dec. 7 in Bishopville. Invasive species removal.

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

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

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

Submission Guidelines

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

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

DOES YOUR EVENT OCCUR IN MID-JANUARY THROUGH MID-MARCH?

This is to remind organizations and centers with events or deadlines that take place between mid-January and mid-March that announcements for these items must reach the *Bay Journal* office no later than Dec. 11 if they are to run in the combined January-February 2023 issue. Please e-mail news about upcoming events to this address: kgaskell@bayjournal.com.

BULLETIN BOARD

BULLETIN BOARD *from page 35*

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 November, December and January 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: 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.

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.

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.

FORUMS / WORKSHOPS

WATERSHEDWIDE

Stormwater webcasts
The Center for Watershed Protection invites the public to its *Watershed and Stormwater Webcast Series*. The fee for each webcast is $159. Can't view the webcast live? Purchase, view it online within 60 days of its original airing. Episodes cannot be downloaded.

- *Behavior Change for Watershed & Stormwater Management*, 1–2:30 pm Nov. 16. Jiaying Zhao from the University of British Columbia will describe a series of experiments on behavioral interventions on water conservation, waste reduction, climate change mitigation designed and tested to provide new insights on how to create effective behavior change He will also discuss the design and implementation of environmental policy. Register: cwp.org/events/webcast-9-behavior-change-for-watershed-stormwater-management.
- *Stormwater Retrofitting:* 1–2:30 pm Dec. 7. David R. Hanny of Barton & Loguidice will focus on the restoration of urban and suburban watersheds through practices such as permeable pavement and bioretention to intercept and treat runoff to reduce pollutant loads or reduce runoff volume. Register: cwp.org/events/webcast-10-stormwater-retrofitting.

EVENTS/PROGRAMS

PENNSYLVANIA

York County Parks
- *Pre-Colonial PA Natural History/Nixon Park in Jacobus:* 2–3:30 pm Nov. 27. Learn about the history, ecology of the state before European colonization. Preregistration required: 717-428-1961, NixonCountyPark@YorkCountyPA.gov.
- *Indoor Nature Play Drop In /Nixon Park in Jacobus:* 8:30 am–4:30 pm Tuesday through Saturday & 12–4 pm Sundays Dec. 1–29. Drop in any time to visit stations featuring puppets, dress-up play, scavenger hunts, touch & feel natural objects. No registration.
- *Christmas Magic/Festival of Lights/Rocky Ridge Park in York:* Nov. 25–Dec. 30 (closed 12/24, 12/25. Walk through woods lit up with more than 1 million lights. Pavilions feature nature displays, miniature train set up, food. No walk-ins. Timed entry tickets must be purchased online: ChristmasMagicYork.com.

VIRGINIA

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

MARYLAND

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

- *Family Feed:* Participant chooses time, Nov. 17. Go behind the scenes, help feed animals. Free. Register at least 24 hours ahead.
- *Nature Discovery Tots:* 10:30 am Nov. 12. Ages 0–6 w/adult. Explore Nature Discovery Area. Each session focuses on a new seasonal theme. Free. Register by Nov. 11.
- *Treasure Box Scavenger Hunt:* 1–2 pm Nov. 13. Ages 6+ Use craft items to decorate an egg carton, then explore forests, fields for items to fill it. Bring a carton. $10/family. Register by Nov. 9.
- *Owl Prowl:* 5:30–7 pm Nov. 18. Meet at Bosely Conservancy. Ages 8+ Look, listen for owls on walk. $8. Registration required.
- *Critter Dinner Time:* 10:30–11:30 am Nov. 19. All ages. Learn about turtles, fish, snakes while watching them eat. Free. Register by Nov. 18.
- *Saturday Trail Running:* 9–10 am Nov. 26. Ages 8+ 16 & younger w/adult. All skill levels/paces welcome. Out & back, single track, 2-mile course. Free.
- *Natural Bird Feeders:* 10:30–11:30 am Nov. 26. Ages 5+ Learn about winter birds, use natural materials to build a feeder. $10/family. Register by Nov. 23.
- *Herp Hibernation:* 1–2 pm Nov. 27. Ages 5+ Learn where reptiles, amphibians go for the winter. Up-close encounter with a snake, turtle. Look for herps in wetland areas. $10/family. Register by Nov. 26.

Work in CBMM's shipyard
The Chesapeake Bay Maritime Museum in St. Michaels invites guests to its working shipyard 10 am–4 pm Dec. 3 to hone their woodworking skills while helping on various construction and restoration projects under the guidance of professional shipwrights. $60. Register: bit.ly/ShipyardWorkdays.

A Ladew Christmas
Visit a Ladew Christmas 2–7 pm Dec. 8–10 at the Ladew Topiary Gardens in Monkton. Tour of the historic manor house adorned in festive holiday splendor, each room decorated by floral designers and garden clubs. The event also includes a holidays greens sale, outdoor light display, holiday treats, music. Details will be updated closer to the dates. Web search "Ladew Christmas 2022."

Mount Harmon Yule festival
The Yuletide Festival & Holiday Marketplace at Mount Harmon in Earleville takes place 11 am–3 pm Dec. 3 & 4. The event includes a decorations & greens sale, tours of the manor house, historic buildings and grounds, artisan marketplace & gift shops, hearth cooking demonstrations, live tree & plant sale. Refreshments will be sold at a festival food court and open air tavern. Tickets which can be purchased online (mountharmon.org/product/ yuletide-decorations-holiday-market/) or upon entry are $10; free for ages 12 & younger. Info: 410-275-8819, info@mountharmon.org.

Piney Point Lighthouse
The Piney Point Lighthouse Museum in Piney Point invites people of all ages to explore nature through hands-on activities. Included with museum admission. Registration encouraged. Rain or shine barring unsafe weather conditions. Info: 301-994-1471, Facebook.com/1836Light. Upcoming programs:
- *Piney Point Lighthouse/Outdoor Autumn Play Skills & Forest Stories:* 12–3 pm Nov. 12.
- *Piney Point Lighthouse/Outdoor Play for the Holidays:* 12–2 pm Dec. 10.

RESOURCES

WATERSHEDWIDE

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

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

MARYLAND

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

DNR educational resources
The Maryland Department of Natural Resources produces a variety of at-home learning resources on topics ranging from aquatic life and estuaries to fishing tips ways to "green" your lifestyle. Visit: dnr.maryland.gov/ccs/Pages/ At-Home-Learning.aspx.

— Kathleen A. Gaskell

All about acorns

Great oaks may grow from small acorns, but only from acorns that have overcome great odds. According to the University of California, only one acorn in 10,000 survives to be an oak tree. Here are more facts.

It's alive! Inside each acorn is a living and growing embryo of an oak tree.

Seed feed: To nourish that baby tree, an acorn contains high amounts of protein, carbohydrates and fats, plus calcium, phosphorus, potassium and niacin.

Kidney killer: As a deterrent to those who would eat it, an acorn contains tannin, a toxic polyphenol that interferes with many animals' ability to metabolize protein, which in some cases can cause kidney damage and even death.

Hard nut to crack: To get at the fatty protein in an acorn while reducing the risk from tannins, some animals have devised work-arounds. Some choose acorns that contain fewer tannins, such as white oak. Others "cure" them. When jays and squirrels bury acorns, it's not just for winter fodder; they don't eat them until groundwater has had enough time to leach out the tannins. Other animals can consume tannins with fewer harmful effects.

Mast-ive! Every four to 10 years, an oak tree produces five to 10 times its normal annual acorn yield. During this "mast" year, one mature oak may produce 1,000 pounds of acorns. This crop exceeds what animals can eat, ensuring that some of the acorns will have a chance to become trees.

Seed the future: Druids consumed acorns, which were thought to have prophetic qualities. "Druid" is derived from the Celtic word for acorn.

Title graphic: *The oblong white oak acorn takes one year to mature. (Steve Hurst/USDA-NRCS PLANTS Database)*

A *Pin oak acorns take two years to mature. (Ron Burkert/CC BY 4.0)*

B *Chestnut oak acorns mature in one year. (Bruce Kirchoff/CC BY 2.0)*

Nuts about acorns? You should do oakie-dokie on this quiz

Because the Norse god of thunder, Thor, was said to have once taken refuge under an oak tree, believers thought that putting an acorn on a windowsill would prevent lightning strikes. My question is, what do I put on my windowsill to prevent the loud thunder of acorns raining down on my roof every fall? I confess that I thought all acorns looked alike until I wrote this quiz. Answers on page 35.

Blackjack oak (*Quercus marilandica*)
Chestnut oak (*Quercus montana*)
Northern red oak (*Quercus rubra*)
Pin oak (*Quercus palustris*)
White oak (*Quercus alba*)

A. This 1.25–1.5 inch acorn is one of the largest in native North American oaks, although not as large as that of the bur oak. Its thin, bowl-shaped cap, or cupule, covers about half of the nut and is downy and light brown on the inside with a rough, reddish-brown exterior. When ripe, the oval nut is a shiny, chestnut brown.

B. This acorn's oblong nut, when ripe, is glossy greenish-brown and 0.75–1 inch long with a pointed tip at its uncovered end. Its woody, knobby cap covers about a fourth of the nut. Tannin, a chemical that makes acorns bitter and their proteins harder to digest, is less concentrated in this acorn, making it desirable for many animals.

C. This plump, medium-brown, barrel-shaped acorn is 0.75–1 inch long. Its flat cap consists of closely pressed scales and covers about a fourth of the nut.

D. This acorn's thin, light brown cap covers less than a third of its 0.375–0.5 inch globelike nut. The green-striped nut turns pale brown as it matures.

E. The scales of this acorn's reddish-brown, turban-shaped cap have short downy hairs that are often found on its inner surface. It covers one– to two-thirds of the 0.5–0.75 inch, faintly striped, elliptical nut that ends with a stout, pointed tip.

Giving the gift of time: the dos and don'ts of volunteering

By Cathleen Anthony

Above and left: A group of volunteers works with the Alliance for the Chesapeake Bay to plant a streamside buffer in Lancaster County, PA. (Eric Braker/Alliance for the Chesapeake Bay)

For me, and of course countless other people, March 2020 was unprecedented. My workplace shut down; my job was put on hold. At the time, I was living with my parents, who had their hands full as essential workers. I sat at home and felt useless, lost and scared. So I did what I now realize I have always done when my life situation seems uncharted: I volunteered.

After checking in with my family on how safe it would be (or not), I strapped on a homemade mask and joined a community food drive. I spent weeks sanitizing, organizing and distributing food to everyone who came through the doors. As time went on, our little volunteer group became a well-oiled machine, skilled at everything from turning cash donations into grocery gift cards to recognizing just how much pasta a family of eight can eat.

As the uncertainty about COVID swirled around us, I was able to focus on the here and now, on what I could do in my own little corner of the world.

From Girl Scouts to AmeriCorps, volunteering has been a part of my life for nearly as long as I've been alive. I am by no means an expert, but I've been around the block a few times and have learned quite a few things about what it means to give back. At the Alliance for the Chesapeake Bay, I am responsible for recruiting, coordinating and supporting volunteers. So allow me to share here what I consider some of the most important dos and don'ts of volunteering.

■ ***Do*** **find your passion and people.** ***Don't*** **force yourself to volunteer because you feel obligated.**

Free time is a valuable commodity. Choosing to volunteer is a wonderful use of that time. As such, make sure what you're getting involved with is something that matters to you. Make sure the people already involved are the kind of people you want to know and work alongside. If you are excited and passionate about something, you are better engaged and invested in it.

If your volunteering gig is a constant energy-sapping grind, it will affect the quality of your work. It will also drain you — and that is the opposite of what you should get from using your free time.

■ ***Do*** **communicate with your organization.** ***Don't*** **feel like you're on your own.**

If you're volunteering through an organization, stay in touch with them — and make it as easy as possible for them to stay in touch with you. If you feel they need to be more forthcoming and communicative, tell them that.

Make sure they know what you can bring to the table in terms of skills and experience. Because it is your free time, willingly donated, it is important to your well-being that you know how valued you are. Don't feel left out in the cold; the projects you are working on are bigger than yourself, and you should have the opportunity to experience that connection.

■ ***Do*** **build your volunteering into your plans and lifestyle.** ***Don't*** **make volunteering an afterthought.**

If you're going to do something, do it right. Organizations need volunteers because they need to get stuff done! If you agree to do something, hold yourself accountable. I know, getting up at 8 a.m. on a Saturday to go plant trees in the pouring rain doesn't sound like great fun, but you promised to go! The time volunteers donate can sometimes be a very real make-or-break aspect of a project's success. Organizations are counting on you; make sure you plan for them.

■ ***Do*** **know when to take a step back.** ***Don't*** **pour from an empty cup.**

Sometimes volunteering is a luxury you can't afford, and self-care is important. If your life has gotten hectic, if your health isn't great, etc., let your organization know, and then take a step back. Volunteerism is a balance between helping an organization and doing something that enhances your own life. If it is no longer benefiting you — or even worse, wearing you out — it's time to take a break.

■ ***Do*** **offer insight and constructive criticism.** ***Don't*** **think you have to operate with mediocre standards.**

Volunteers get into the real grit of a project, and they see how the efforts of an organization are executed and implemented. In many situations, they are the majority of boots on the ground.

If you see something or have ideas, let your organizers know. The staff of organizations tend to be preoccupied with big-picture planning. Your perspective is important when it comes to the effectiveness of what you are doing. Speak up!

■ ***Do*** **let volunteering change the way you see the world.** ***Don't*** **think it's not making a difference.**

Sometimes volunteering feels disappointing because you might not see an immediate difference being made. But I am here to tell you that's never true. At the most basic level, volunteering will affect who *you* are. If your volunteer experience offers insight into yourself and what you care about, then it is a success. If everyone volunteers, then everyone will gain insight as well. It's OK if you only save one person, and it's OK if that one person is you.

If you see a situation that seems hopeless, then you are the hope. Your very existence and involvement in your community matters. Margaret Mead said, "Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it is the only thing that ever has."

To volunteer is to put yourself out there because you care, because things matter, and because the way things are isn't the way things should be. At least, not yet. And not without you. ■

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Green-winged teal: Here for winter, gone by March

By Mike Burke

A male (left) and female green-winged teal rest on a rotting timber alongside a pond. (Richard Griffin/CC BY-SA 2.0)

A light wind came out of the south, and the November sun shone brightly. The days were getting much shorter, but this one was a beauty. We were at the Blackwater National Wildlife Refuge, south of Cambridge, MD. The day was gorgeous: perfect for watching the Chesapeake Bay's fabled winter waterfowl.

Acres of flooded fields were alive with migrating ducks. They came from Canada or Alaska, some from near the Arctic Circle. As the waters there began to freeze, the ducks headed south, seeking food and shelter for winter. At Blackwater, they found what they were looking for.

My wife, Pat, and I were focused on flocks of green-winged teal *(Anas crecca)*. These diminutive ducks were in shallow water, where they could move about freely. The food was plentiful.

Green-winged teal are a little more than a foot long from their short bills to the end of their tails, about half the length of a mallard. The breeding male packs a handsome palette of colors onto his small frame. He has a chestnut head that is distinguished by large iridescent green patches that encircle the eyes and taper to a crest on the back of his neck. A speckled pinkish-yellow breast sits below a black chin strap and mahogany neck, and a dense pattern of slightly curved silver lines covers the chunky body. A striking vertical white stripe sits in front of the folded wing. The speculum, a panel of wing feathers near the body, is bright green. At the rear, a yellow and white panel of undertail coverts adds a final element of color.

The female needs to be well-camouflaged when sitting on the nest and tending to young birds. She is dark brown with black speckles throughout, except for a matching green speculum. Her bill is blue-black. Young birds of both sexes share the same cryptic coloring as their mother. When the male molts his fancy breeding plumage, he, too, will look remarkably like his mate.

Pintails, gadwalls and northern shovelers seem to be in every Blackwater pond. The green-winged teal favor the ponds flooded to less than a foot. These teal are known as dabbler ducks, just like the mallards that dwarf them. They "tip-up" to feed on bottom-dwelling invertebrates.

Adjacent fields are easily traversed on webbed feet. Seeds and other vegetation are everywhere. The birds can eat to their fill, replenishing energy stores used up on their long migratory flights: They will repeat their route in reverse in just a few months.

Teal often leave Blackwater in March to start their migration. Movement is contingent on finding thawed ponds as they fly farther north. Because some teal nest at the edge of the tundra and have long incubation/nesting times, breeding periods can be highly compressed. In spring, males push ahead, looking to establish their breeding territory early enough to allow for a successful brood before the northern waters begin to freeze over again.

Nesting begins in May with the female selecting the site. She scrapes out a hollow on the ground, but additional work on the nest doesn't occur until she lays her first egg. It is then that she pulls nearby vegetation into a circle around herself and the egg. She continues to construct the nest as she lays six or seven more eggs over the next week.

Only the mother has a brood patch, so she spends most of the next month incubating the clutch. The male provides her with food. But before the eggs have hatched, the father will abandon the nest to begin his migration south. Luckily, just-hatched chicks can immediately leave the nest and start foraging for food.

Predation of the newly hatched birds is quite high. Many more succumb to the cold. But the species is a prolific breeder. The worldwide green-winged teal population is healthy —about 6.7 million birds, according to Partners in Flight.

There are two subspecies of green-winged teal. At Blackwater and throughout North America, we have the American subspecies. The Eurasian subspecies includes all of the green-wings native to Europe and Asia. These ducks winter in southern Europe, the Middle East and Central and Southeast Asia. They are plentiful in China and southern Japan. Some of the birds from northern Europe will fly as far as northern Africa for winter. Many explore deep into the Nile River valley.

Visually, the main difference between the two subspecies is minimal. The vertical white stripe in front of the wing in the American subspecies is replaced with a horizontal white stripe on the wing of their Eurasian cousins. That's it.

As I stood watching the teal, I considered the considerable hardships endured by these diminutive waterfowl: capricious weather, food scarcity and inadequate shelter to protect them from predators.

Thankfully, many Americans happily support the nation's 588 National Wildlife Refuges. Everywhere in the Northern Hemisphere, protected natural resource lands are essential for teal survival. Globally, green-winged teal cross scores of political borders on four continents, always searching for a sustainable life.

Climate-enhanced superstorms and intensifying droughts are driving birds — and humans — to new lands. It's wonderful that many people support the needs of green-winged teal on their migrations, and it's good to remember that people often need refuge, too. ■

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

Playing possum and other tricks of our lone marsupial

By Kathy Reshetiloff

Above: Opossums are adept at climbing trees. Contrary to popular myth, though, they don't hang from their tails when sleeping. (Cody Pope/CC BY-SA 2.5)

Right: When "fight or flight" won't work as a defense tactic, the opossum does a convincing job of playing dead. (Tony Alter/CC BY 2.0)

Chances are, you've seen an opossum — known by many as a "possum" — in the headlights of your car or at the edge of your yard, startled by the motion-activated floodlight on your back porch. Maybe it stared at you for a moment, its reflective eyes glowing, then skittered away. It's a fairly common critter in these parts, but it's anything but ordinary.

For starters, the animal has a well-known defensive strategy. For most small mammals, the choices are "fight or flight." But somewhere along the evolutionary path, the opposum came upon a third and often effective option: playing dead. Of course, it's not a conscious decision on the animal's part; it's entirely involuntary, a shocklike state that can last for hours. It often fools would-be predators, particularly those that don't fancy dead prey.

Playing dead isn't the animal's only defense. In some circumstances, it will bare its many sharp teeth when threatened. And the opossum, *Didelphis virginiana,* is not the only animal to employ what scientists call thanatosis or, more commonly, tonic immobility. The strategy is found throughout the animal kingdom — mammals, insects, amphibians, birds, fish — but the opossum is the best known, hence the expression "playing possum."

North America has only one oppossum species: Didelphis virginiana. (Joy Van Buhler/ CC BY-NC-ND 2.0)

About the size of a large house cat, the opossum is white to gray in color, with a long, round, hairless tail. It has small, round, thin ears, wide jaws with 50 teeth, small black eyes and a long, pointed nose.

Unlike most other animals, opossums have opposable toes, essentially thumbs, on their hind feet. This feature, along with a tail adapted to seizing or grasping, allows them to easily navigate tree branches. Contrary to popular belief, opossums never hang from their tails while sleeping. They are too heavy. Occasionally, a youngster may hang from its tail, but never to sleep.

Oppossums are North America's only native marsupials. Marsupials are mammals, and in nearly all species the females have a fur-lined abdominal pouch — where, after birth, the young are carried and nourished. Probably the most well-known marsupials are Australia's kangaroos.

Oppossums are solitary critters, except when breeding. They are nocturnal, wandering at night and sleeping during the day.

Adult females average about two litters a year, with five to 13 babies per litter. Gestation is very brief, only 12–13 days. When born, the tiny young weigh about 2 grams each (well under a tenth of an ounce!) and are only a half-inch long. They are blind, deaf and hairless. The forepaws of the young are well-developed.

Right before birth, the mother prepares a pathway of saliva leading to the pouch. Using their strong forepaws, the young climb from the womb into the mother's pouch, where they will attach to a nipple and continue to develop, remaining for about two months. In large litters, the babies that do not find an available attachment site will die of starvation.

When fully developed, they emerge from the pouch but remain with their mother until they are 4 months old. Baby possums sometimes ride on their mother's back, clinging to her fur. The young are preyed upon by owls, coyotes and dogs.

They range from the central states to the East Coast, from the Great Lakes and New England and south from Mexico through Florida. Opossums are also found along the Pacific Coast states. There are other species of *Didelphis* in Central and South America, but *D. virginiana* (known as the Virginia or North American possum) is the only one found in the U.S. and Canada.

Highly adaptable creatures, they eat just about anything, including mice, rats, birds, insects, snakes, frogs, vegetables, fruits, worms, slugs, snails, carrion and garbage. Some people refer to them as nature's little sanitary workers because they consume so many pests and dead animals.

Opossums are also not very particular about where they live. They inhabit woodlands, farmlands and suburbs. They seek shelter in old dens of other animals, outbuildings, barns, hollow trees, logs, culverts and brush piles. So, keep your eyes peeled, especially at night. You never know when you'll run into North America's one and only marsupial. ■

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