CHESAPEAKE
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A Sea Change of Climate Action *The Alex Haley statue installation at Annapolis City Dock experienced tidal flooding during a nor'easter September 2010. Storms are expected to occur more often and with greater intensity as the climate changes. Read how the Bay states are planning to cope with future climate challenges beginning on page 16. (Dave Harp)*

MD threatens to sue EPA, PA over lack of action as regional tensions rise

≈ Debate ensues over whether Bay cleanup goals are 'aspirational' or enforceable

By Karl Blankenship

The year 2010 closed with the unveiling of a new Chesapeake Bay cleanup plan lauded by states, federal officials and environmentalists as the rigorous, concrete and enforceable plan that would finally deliver on the promise of a clean and healthy Bay.

Ten years later, a new decade has opened with the restoration effort unlikely to meet its deadline, the regional partnership mired in acrimony and threats of lawsuits — topped with questions about the U.S. Environmental Protection Agency's willingness and ability to enforce its own cleanup plan.

"This has come to a boil now," summed up Sen. Chris Van Hollen, D-MD, at a Senate hearing on Jan. 8. "This is a moment we need absolute clarity and an enforceable program to hit the targets in 2025."

Hours later, Maryland Gov. Larry Hogan said he was directing state Attorney General Brian Frosh to initiate legal actions against Pennsylvania, citing the "obvious inadequacy" of its Bay cleanup plan, and against the EPA, which he said has "no intention" of forcing Maryland's northern neighbor to do more.

Environmental groups are considering their own legal options.

And Van Hollen, joined by 19 other members of Congress, fired off a detailed letter to EPA Administrator Andrew Wheeler demanding "immediate steps to demonstrate EPA's commitment and accountability to the restoration of the Chesapeake Bay."

The boiling point came after the EPA released a review at the end of December acknowledging that Pennsylvania — the largest source of water-fouling nutrients in the Bay — had submitted a plan that fell far short of its cleanup goal. Nonetheless, the EPA declined to take any of the actions it had repeatedly threatened to impose to prod greater progress from the state.

Then, at a Jan. 3 meeting of the legislative Chesapeake Bay Commission, EPA Bay Program Director Dana Aunkst described the region's 2025 cleanup deadline as "aspirational" and said that the Chesapeake Bay Total Maximum Daily Load is "not an enforceable document."

The environmental community widely saw Aunkst's comments as stepping away from the EPA's commitment to provide a backstop for Bay goals, even as their frustration over Pennsylvania was mounting.

The Choose Clean Water Coalition, a network of more than 200 organizations, said it was "stunned" by the remarks. The Maryland League of Conservation

Cleanup continues on page 20

VA data centers: computing the costs

≈ Is the environment paying the price for boon to state's economy?

By Whitney Pipkin

Take VA Route 267 west from the nation's capital and you'll head straight into a different sort of traffic — of the internet variety. About 70% of all online activity flows through this pocket of Northern Virginia, home to the world's largest concentration of data centers.

Across a Loudoun County landscape that was once farmland and forests, sprawling clusters of gray, flat-topped buildings quietly enable the technological machinations — from bank transactions to YouTube videos — that are central to modern life. If you have ever wondered what "The Cloud" looks like, this is it. Local officials call this "Data Center Alley," or, as one book put it, "the bull's-eye of America's internet."

It makes sense to bunch these data centers along established highways of fiber optic cables in the county. There, companies and agencies needing huge amounts of data storage can achieve economies of scale and energy efficiencies while tapping high-speed internet connections.

But big congregations of data centers, taken as a whole, could also bring environmental consequences.

The most widely recognized issue is their massive cumulative energy consumption. Private cloud companies such as Amazon tend to keep total energy consumption close to the vest. But a 2019 report by Greenpeace estimated that electricity demand from existing Virginia data centers and those under development is approaching 4.5 gigawatts, or roughly the amount of power it would take nine, large (500-megawatt) coal power plants to produce.

It's a "substantial" energy demand, as Dominion Energy put it in a 2019 application to build a pair of new substations in Loudoun County. A typical data center consumes "about the same amount of power

Centers continues on page 14

CHESAPEAKE BAY JOURNAL

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Editor's Note

Climate change is not in the future – it is here now

There's one thing that's fairly certain for the region's long-term forecast. "The mid-Atlantic is in store for hotter, wetter wilder and wackier weather," Ben Grumbles, Maryland's environment secretary, summed up in a recent talk at a water monitoring conference.

Climate change is no longer a future problem. It's increasingly evident that the climate of the Chesapeake region has been changing for decades: The Bay's water is getting warmer, water levels are rising, marshes are disappearing, intense storms are more frequent and severe — and the pace of change is accelerating.

Starting with this issue, we're making climate change in the Bay region a greater part of our coverage. It's a topic many readers, in our recent survey, asked us to give more attention. It's also getting more focus in the Bay restoration effort, as states begin to factor the impacts of climate into cleanup plans.

While the immediate outlook for action at the federal level is poor, Grumbles told conference participants not to be discouraged as states are stepping up to the challenge. In this issue we look at climate plans from Maryland, Virginia and Pennsylvania. Coverage starts on page 16.

Harp recognized for stewardship

Bay Journal photographer and Dorchester County resident Dave Harp was recently honored by the Dorchester Citizens for Planned Growth with its 2020 Environmental Stewardship Award.

The award recognizes a county resident whose life and work represents the principles of good stewardship of the Eastern Shore county's unique and fragile resources.

"With his eye for natural beauty and his amazing technical skill as a photographer, Dave has enriched the lives of countless people, including native Eastern Shoremen and visitors from all over the world," said Fred Pomeroy, the organization's president.

Dave has worked as the *Bay Journal*'s photographer for a decade and more recently branched out into making films, along with writer Tom Horton and producer Sandy Cannon Brown. Their *Bay Journal* productions include *Beautiful Swimmers Revisited*, *High Tide in Dorchester*, *An Island Out of Time* and the latest, *Nassawango Legacy*. To view them, visit bayjournal.com/films.

Congratulations, Dave!

You helped us make our match!

Thank you, *Bay Journal* readers, for helping to make our end-of-year fundraising a success.

We exceeded the $20,000 we needed to raise for the annual NewMatch campaign sponsored by the Institute for Nonprofit News. And we were pleasantly surprised to learn that we were selected by the Rita Allen Foundation for an additional $4,000 match for our work in science journalism.

Your donations helped us finish 2019 on a strong note, and we hope we will earn your continued support in the New Year.

— Karl Blankenship

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Clockwise from left:

The rising sea level is creating "ghost forests" on Maryland's Eastern Shore. The Bay states are in the throes of making plans to grapple with climate change. See articles on page 16. (Dave Harp)

The Virginia Capital Trail is a scenic, historic and mostly flat route between Richmond and Jamestown, popular with cyclists and pedestrians alike. See article on page 22. (VA Department of Transportation)

Snow covers Pennsylvania's Loyalsock State Forest. An environmental group is suing the state's Department of Natural Resources to protect these forests for future generations. See article on page 8. (Ad Crable)

WHAT'S INSIDE

Bay States Plan for Future Climate

Coverage begins on page 16

- Political shift in VA has advocates hopeful for long-awaited action
- PA sets lofty goals, but does it have the political will to achieve them?
- An early climate leader, MD now at odds over how to address worsening threats

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Smallmouth woes range from contaminants to more stress at spawning sites

≈ Biologists are also looking at high flows that wash away eggs and bass fingerlings and competition from invasive species

By Ad Crable

Pennsylvania guide Joe Raymond holds a healthy adult smallmouth bass from the Susquehanna. (Ad Crable)

Smallmouth bass, a leaping delight for anglers, continue to be hounded by mysterious disappearances, low survival rates, gaudy open sores and flood-challenged spawning seasons in the Chesapeake Bay region.

At a recent summit, fisheries biologists, anglers and fishing guides from Maryland, Virginia, West Virginia and Pennsylvania came together to assess the health of smallmouths and offer theories on the elusive search for causes.

Specifically, reports were presented on the upper Potomac River in Maryland, South Fork of the Shenandoah River in Virginia, South Branch of the Potomac River in West Virginia and lower Susquehanna River in Pennsylvania.

Smallmouths, along with their cousin, largemouth bass, are the most popular game fish in North America, even more so than trout and striped bass.

Though more studies are needed, summit participants generally agreed that suppressed immune systems are harming smallmouth bass in a variety of ways. Contaminants from two main sources are compromising their ability to fend off disease: pharmaceuticals running through sewage plants as well as chemicals from pesticides, herbicides and fertilizers running off the land.

But those were far from the only concerns. There were common fears that high river flows in the spring could be the new norm, devastating bass reproduction. Flooding and strong currents can wash away spawning beds, eggs and fingerlings.

Other worries included invasive fish such as flathead catfish and snakeheads that eat and crowd out bass and forage fish, blue-green algae outbreaks and increased fishing pressure from anglers using kayaks and other small watercraft that can access more shallow areas.

Anglers and bass guides were invited to the summit to share what they have seen on the water in the various areas. For the most part, their observations meshed with what scientists have recorded.

Some had strong words. "We have a major problem on the river. It's absolutely in decline," said David Neuman, a bass guide from York County, PA, speaking of the Susquehanna.

"I think our rivers are being quietly polluted," said Mark Frondorf, the Shenandoah Riverkeeper who organized the meeting. "In many respects, I just think the smallmouth bass population is sensitive to clean water. They're kind of the canary in the coal mine in the entire mid-Atlantic."

Vicki Blazer, a fish ecologist with the U.S. Geological Survey who has been studying the demise of smallmouth bass in the Bay region longer than anyone else, said getting to the bottom of the 15-year-old problem will not be easy.

"There are a lot of things fish are being exposed to and they might get sick from if they are immune-suppressed," Blazer said. "We want a smoking gun so we can say we want to do something about it or not do something about it and move on, but we need to move past that and take a bigger look at what is going on in the environment."

Like many other fish now swimming in Bay waters, smallmouth bass, also known as bronzebacks and smallies among other affectionate monikers, are not native to the region. The member of the sunfish family was originally only found in upper and middle parts of the Mississippi River basin and in the Great Lakes-Saint Lawrence River system.

But as logging, mining and industrial growth polluted rivers, native brook trout disappeared. Water temperature increased and smallmouths, which live in warmer water, became the game fish of choice. Many rivers were stocked with smallmouth bass carried by trains on newly laid tracks along the shoreline.

The rivers in the Bay region were stocked just before the Civil War. Since then, anglers have targeted smallmouths for their acrobatic leaps when hooked. They also make fine table fare, though most anglers today tend to practice catch-and-release.

Here is a summary of the state of smallmouth bass on the various rivers:

≈ *Upper Potomac River, MD:* From Cumberland in Western Maryland to Great Falls near Washington, DC, the upper Potomac flows for 80 miles, straddling the boundaries of Pennsylvania and Virginia and West Virginia.

The number of juvenile smallmouths has been consistently low there the last 10 years, especially the last three springs with high flows.

"The problem is, we have good adults in the population but they are not being replaced in the numbers that we'd like to see," said Michael Kashiwagi a regional fisheries manager with the Maryland Department of Natural Resources. "That's a deciding factor."

Kashiwagi agrees with studies that find a toxic soup of chemicals from medicines and agriculture are depressing immune systems in bass, making them more susceptible to other stressors, such as viruses, bacterial diseases and parasites. Warmer water, combined with low depths, can create conditions that increase these threats.

"In the last 30 years, the watershed has increased by more than 1 million people and that's a huge factor also," he said, referring to added pollution and habitat problems.

Nonnative flathead catfish are spreading throughout the river, likely eating both bass fingerlings and prey fish that bass depend on, he said.

These two healthy smallmouth bass were caught and released on the Susquehanna River in Pennsylvania. (Ad Crable)

BASS CONTINUES ON PAGE 5

Bass from page 4

Bass guides who use the river now split trips with other bass rivers such as the Susquehanna and Shenandoah depending on river conditions and catch rates.

To boost the river's flagging bass numbers, the state last spring caught about 30 adult bass by lightly shocking fish from a section of the river and from willing anglers at a bass tournament for use in a hatchery.

Unfortunately, the bass did not like languid hatchery ponds and did not reproduce. The agency ended up buying 2,000 juvenile bass from a private hatchery in the Midwest to stock the upper Potomac. The experiment will be tried again in 2020 using different hatcheries.

South Fork Shenandoah River, VA: The South Fork of the Shenandoah has long been known to anglers for its high numbers of bass that could bend rods many times an outing. But that was before a fish kill in 2004 turned hundreds of bass belly up. There have been three other, less-destructive fish kills since then.

Highs and lows in the spawning classes have not helped. To protect the most productive spawners, anglers are not allowed to keep bass 11–14 inches long.

The emerging pattern of high water during spawns is a major concern for Brad Fink, a fisheries biologist with the Virginia Department of Game and Inland Fisheries. "We could have to try to spawn fish in a hatchery if it happens each year," he said.

But he said he is hopeful that very favorable conditions for reproduction last spring should result in one of the best classes of juvenile bass in 22 years. And, he stressed the river still has fishable numbers. "I'd go float the river," he said.

Most of all, Fink would like to see more focus on agricultural practices that reduce the runoff of harmful chemicals as well as a statewide emphasis on improving waterways in general.

"We know there's stuff that's affecting fish populations and just better water quality would fight that. And we need to clean it up for ourselves, too, not just the fish. I feel we're not going backward anymore. [But] we need to work on getting it better, not just the status quo."

Susquehanna River, PA: Once one of the meccas for smallmouth fishing on the East Coast, the Susquehanna River has been beset by the most publicized and alarming health problems for smallmouth bass, including die-offs, open sores and ugly black splotches. "Intersex" fish — male fish found with female egg cells growing in their testes — have appeared, too. Mysterious fish kills in the early 2000s set off a near-collapse of the famed smallmouth fishery. A moratorium on keeping bass has been in effect for nine years.

In the South Branch of the Potomac, up to 85% of bass disappear after reaching about 3 years of age. (Dave Harp)

The problems with Susquehanna smallmouths have been intensely studied and debated. The former executive director of the Pennsylvania Fish and Boat Commission unsuccessfully battled to get the state's Department of Environmental Protection to declare the river impaired, which would have required the state to address the problems.

In June, DEP declared the lower and middle portions of the river impaired for aquatic life, after finding low numbers of aquatic insects, along with high pH levels. The report did not list causes of the impairments, but noted that high pH levels are often tied to algae growth from concentrations of nutrients that have run off the land.

Now, after several years of encouraging bass numbers, fish surveys by the state and angler observations again reveal a sudden drop in the number of adult bass.

"Abundance is down," conceded Geoff Smith, the Fish and Boat Commission's Susquehanna River biologist.

Smith said the drop-off is worrisome and that fish managers are scratching their heads over the cause. He wonders if high flows at the end of the spring stressed fish. Sudden drops in water temperatures, resulting from heavy rain, can kill fish, and high water can stress adult females that don't eat when guarding nests.

The decline contrasts with several years of encouraging juvenile reproduction. Spring surveys showed the highest presence of juvenile bass in 15 years.

"If the abundance is down [in adults], we're in a different set of scenarios now," Smith said. "Ten years ago, we weren't getting new fish. Recruitment is not our problem anymore."

South Branch of the Potomac River, WV: "On the South Branch, a lot of people are frustrated," said Brandon Keplinger, a fisheries biologist with the West Virginia Division of Natural Resources. "We have a super concentration of 2– and 3-year-old fish. But when you have poor recruitment, fish 7–10 inches are not there and people freak out."

The river has seen a number of fish kills since the late 1990s and up to 85% of bass disappear after reaching about 3 years of age.

Keplinger thinks the same factors believed to be affecting the health of bass in other rivers — nutrients and chemicals washing off the land — applies to the South Branch of the Potomac.

But he also is concerned that high river flows in the spawning period could become an annual problem. "We've had four straight years with high water over the spawn," he said. And six of the highest flows on the river in the last 100 years have occurred in the last decade.

Keplinger would like to see studies to check, as he suspects, if blooms of blue-green algae might be killing or stressing bass. He said such algae produce some of the same neurotoxins and endocrine-disrupting compounds found in pharmaceuticals and pesticides.

He also worries about increased fishing pressure on already stressed bass from the emergence of fishing kayaks. The simple movement of kayaks through more shallow areas, unreachable by larger bass boats, scares fish from preferred habitat and possibly from spawning beds in the spring.

"When I float the South Branch, I displace fish. Kayaks can affect fishability," he said.

But like his colleagues in other states, Keplinger is excited about last spring's spawn — the best on the river in 15 years. "The good thing is, with a couple good young-of-the-year classes, the river can rebound really quickly," he said.

An angler casts for smallmouth bass at sunset on the Susquehanna River in Pennsylvania. (Dan Nephin)

Results of crab pot placement research too close to call it either way

≈ Harvest in traps placed close together the same as those placed far apart

By Jeremy Cox

Kyle Wood hauled the metal cage up from its resting place at the bottom of the Patuxent River in Maryland.

There was no telling how many blue crabs it held until the crab pot broke the surface. Wood shook the cage over a black plastic tray until the nine crabs inside finished tumbling out.

He picked them up one by one with a gloved hand and called out their gender to his two crewmates. Then, he used a metal ruler to measure them from one far tip of the shell to the other.

Eight were big enough for keeping, perhaps to be boiled and eaten over a paper tablecloth at a seafood joint in Baltimore or beyond. But that was not to be these crabs' destiny.

Wood is an undergraduate student at the College of Southern Maryland, but his work on this overcast November morning was part of a study led by Morgan State University. Along with two veteran Chesapeake Bay researchers, he is hoping to inject some science into what heretofore has been an art: determining how far apart crab pots should be placed from one another.

That is, if the crabs were willing to give up their secrets. And that was anything but assured.

Crab pots are end-table-size traps with a funnel that allows the catch to enter but not escape. They are the backbone of the Bay's commercial crabbing industry — some watermen fish several hundred at a time to make a living.

Tom Ihde is a fisheries ecologist at Morgan State as well as Wood's mentor and co-author on the study. He has long wondered if the pots compete for the same crabs if they're placed too close to each other. But placing them too far apart could cause watermen to spend needless time and diesel on the water.

It isn't merely an academic matter, Ihde said. At the height of the Bay's crab season in the summer and early fall, the buoys marking the location of crab pots are often so thick "you have to zigzag around to get your boat through," he said. Solving the aquatic mystery could save untold expenses in a region home to more than one-third of the nation's blue crab catch, he said.

"Every little bit matters on the water," said Ihde, who began studying the Bay as a graduate student in 1997. "The profit margins are small. Every little bit of fuel you can save by not traveling as far, all of that is going to help the bottom line."

Kyle Wood, an undergraduate student at the College of Southern Maryland, dumps crabs out of a pot that was placed in the Patuxent River. He worked with his mentor, Tom Ihde, a fisheries ecologist at Morgan State University, to try to determine what distance between crab pots would provide the optimum harvest. (Jeremy Cox)

Two watermen contacted for this article, though, were skeptical that science can explain something as inscrutable as the whims of blue crabs.

When told about the Morgan State study, Blair Baltus laughed heartily. "Answer me one question: How much grant money did they get to do this?" he asked. "This is about the most entertaining story I've heard of in my whole life."

(Morgan State dipped into its own funds to cover the study, Ihde said. No grants were used.)

A lifelong crabber, the Baltimore County-based Baltus said it costs him $600 a day for bait, fuel and hired help, a figure that doesn't include health insurance, boat maintenance, gear and other costs. But a robust rise in crab abundance — scientists estimate nearly 600 million crabs populated the Bay before last season began and the highest total since 2012 — helped to keep his business afloat.

"I can tell you three things" about crabs, Baltus said. "They swim, they feed every now and then and they taste good. Other than that, everything else about a Chesapeake blue crab is a hypothesis."

Bill Kilinski, a Charles County waterman, called the study an "interesting concept," but he also doubted that it would bear fruit.

For his part, Kilinski keeps things simple on the water. If crabs are plentiful in an area, he makes sure his crab pots are plentiful, too.

"Normally, as a waterman, it kind of takes care of itself," he said.

The crab pot study is a side project of the venerable blue crab population survey conducted annually by Morgan State's Patuxent Environmental and Aquatic Research Laboratory (PEARL). The research, begun in 1968 and supported in recent years by Dominion Energy Solutions, represents one of the longest-running studies of marine populations in the world.

Wood graduated with an associate's degree at the end of the fall semester and plans to enroll in the fisheries and wildlife biology program at Frostburg State University in the fall. He snagged an internship at PEARL last summer.

In Wood, Ihde found a fellow traveler with a curiosity about crab pots. They tried their study in the summer, but the results were fouled because of low dissolved oxygen conditions at one of the pot locations.

So, they tried again from September through November. They used eight crab pots. Four were spaced a half-mile apart from one another, far enough to theoretically simulate harvesting crabs without interference from other pots.

To test the opposite scenario, the team lashed one pot to another, then repeated the process with the two remaining pots. Those "paired" traps were lowered into the water in separate locations.

They conducted the experiment in the Patuxent River, a Chesapeake Bay tributary, about three miles upstream from Maryland Route 4 bridge near the town of Solomons. They didn't have to worry about commercial traps getting in their way because the state prohibits commercial fishermen from using crab pots in Bay tributaries. Using crab pots for research purposes is allowed.

"It's a near-perfect laboratory for us," Ihde said.

The study involved setting the pots by boat nine times over the course of the three months and checking them about 24 hours later for crabs. Wood tossed any crabs they caught back into the water after performing his check.

If the team's research showed a difference between the two types of pot settings, their reward would be getting to do more research. They planned to conduct a second phase, cataloging catches at varying pot distances to determine which yields the most crustaceans.

But the second phase wasn't needed. By early December, the results were in. The watermen appeared to be right. There was no difference between the paired pots and their far-apart cousins, according to Ihde's initial review of the data.

"They're not the results we expected or thought we'd see, but they're results," Ihde said. "From a scientific perspective, though, that's exactly what the process is supposed to do."

Maybe blue crabs don't care whether traps are nestled tightly together or flung widely across the Bay's dusky floor. Because the study was conducted in the fall, when crabs are migrating, the time of year may have affected the results, Ihde said, adding that he might test the question again during a future summer.

But there's another positive outcome from the just-completed study, he noted.

"To me, from the get-go, the real product of the project was Kyle himself and what he got out of it," Ihde said. "He came in here with an interest in science but no real experience. Through his work with us over the last eight months now, he's leaving this as an experienced field biologist."

MD port officials give $500,000 to revive community waterfront

≈ Funds to help restore Turner Station park with sediment dredged from Baltimore harbor

By Timothy B. Wheeler

A novel plan to refurbish an old waterfront park near Baltimore with sand and silt dredged from the harbor has received its first major infusion of the cash needed to make it a reality.

Community leaders in Turner Station, a historically African American neighborhood in Dundalk southeast of the city, cheered the announcement in late November that the Maryland Port Administration would give $500,000 toward their hoped-for revival of Fleming Park.

"We are just so excited about this," said Gloria Nelson, president of the Turner Station Conservation Teams. "This will get us started."

The 16-acre park once drew residents for crabbing, fishing and strolling along a boardwalk overlooking Bear Creek, a tributary of the Patapsco River. But the wooden walkway is almost gone, and the waterfront is walled off by thick stands of invasive wetland plants.

For the last two years, Turner Station community leaders have been seeking help to replace the park's overgrown, rocky shoreline with a marsh of native plants that would draw waterfowl and other wildlife. They'd also like to rebuild the boardwalk to help bring people back to the water.

Larry Bannerman of Turner Station Conservation Teams walks along a shoreline in the summer of 2018 that the community group hopes to see restored and revitalized. (Dave Harp)

They've teamed up with the port administration on a plan that would use dredged material from harbor shipping channels to create the wetlands, build a berm along the waterfront and relandscape the park's playground.

The port has an interest in supporting the Turner Station project because it has faced challenges over the years in finding acceptable places for depositing the sand and silt dredged to maintain deep shipping channels. To have a community welcome it is a major step forward in shifting public perception of what used to be called "dredge spoil."

The MPA funding will pay for an environmental assessment of the project, a necessary first step toward getting regulatory approval to carry out the plan. It will also help with engaging the community, refining the project's design and applying for permits, according to the MPA.

"Turner Station Conservation Teams and our historic community are proud to partner with MPA on this innovative project," said Larry Bannerman, who represents the community on a port administration advisory committee. He said he believes that the Fleming Park makeover could serve as a blueprint for similar uses for dredged material.

Completing the project will require much more funding, with the precise amount still to be determined as planning progresses. But Nelson said she's encouraged by the money received so far and by expressions of support from Baltimore County and state leaders, among others.

"We have been working since 2017 to get support," Bannerman said, "and we are proud to say that our political leaders, local businesses, community leaders and others have given us full support."

Several private businesses and nonprofits also are working with the community to advance the project, including the landscape architecture firm Mahan Rykiel Associates, the Chesapeake Bay Foundation, The Nature Conservancy and Anchor QEA, an environmental and engineering consulting firm that specializes in shoreline and water resource projects.

Group sues PA for violating state's Environmental Rights Amendment

≈ Suit says money from fracking leases should be used on state's resources, not balancing its budget

BY AD CRABLE

In 2017, Pennsylvania's environmental laws were turned upside down when the state Supreme Court ruled that the state, and possibly municipalities, were trustees of public lands and required to protect them for future generations.

Seizing on that broad and still unsettled mandate, the Pennsylvania Environmental Defense Foundation is suing the state agency responsible for 2.2 million acres of state forests, saying it is violating its stewardship obligation by leasing public forestland for the hydraulic fracturing of natural gas.

To date, the state Department of Conservation and Natural Resources has collected more than $1.1 billion in revenue from fracking leases on 139,000 acres. By an act of the state legislature, the revenue has been used to help the state meet its budget and to fund the agency, despite protests from environmental groups.

Both uses of the money are in violation of the Supreme Court ruling and the 1971 Environmental Rights Amendment to the state constitution, argues the defense foundation, the nonprofit that initiated the lawsuit leading to the 2017 blockbuster ruling.

Pennsylvania's Tiadagthon State Forest. A lawsuit by an environmental group charges that the state is violating its constitution's Environmental Rights Amendment by allowing hydraulic fracturing for natural gas in state forests. (Ad Crable)

At that time, the court agreed with the defense foundation that money raised by DCNR through oil and gas leases and used on public natural resources shouldn't be diverted to the state's general fund.

That 4–2 ruling reiterated the wording of the amendment: "The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all people."

This time around, in Pennsylvania Commonwealth Court, the group zeroes in on DCNR's State Forest Plan, adopted in 2016. Until then, the agency had managed oil and gas leases, timber sales and recreational uses of state forestlands with the paramount goal of maintaining the health of forests, according to the defense foundation.

But the new plan gives equal footing to the economic value of such uses and requires the agency to "balance" that value against ecosystem values, the lawsuit contends.

The lawsuit maintains that the agency, under the 2017 ruling, has an obligation to "conserve and maintain" public natural resources for the benefit of the people. "To conserve and maintain means you cannot deplete, diminish or degrade those resources. The 2016 State Forest Plan does not reflect that you have complied with those duties," the defense foundation said in a press release.

Also, the suit charges that the forest guide lacks any plan to repair the degradation and depletion of state forests from fracking.

After leasing for state forests began in 2008, fracking has converted 1,770 acres of that public land to shale gas

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infrastructure, according to DCNR's *2018 Shale Gas Monitoring Report*. That includes the construction of 238 well pads and related structures, 200 miles of new roads and 188 miles of pipeline corridors. As a result, numerous blocks of unbroken forest have become fragmented.

"We're threatening that core forest with this continued oil and natural gas extraction, but we are not putting any of the money back in dealing with the degradation and diminution that's occurring," said John Childe, the defense foundation's attorney, speaking to a forum on Pennsylvania's forests in Harrisburg in October.

Shortly after he became Pennsylvania's Democratic governor in 2015, Tom Wolf issued an executive order placing a moratorium on further oil and gas leases on state forests and state parks. Even so, Republican legislators in the state have introduced a bill to reopen gas drilling in state forests. They say it's needed to fund Wolf's Restore Pennsylvania initiative for flood prevention and stream restoration.

Childe said that continuing to allow funds from public lands to be diverted for other uses could mean "the very heart of our public natural resources would be at the disposal of the General Assembly."

The defense foundation's legal efforts to protect state forests "have met a stonewall of opposition from the General Assembly, the governor, DCNR and Commonwealth Court," he said. "The Supreme Court has made it clear that the people own the property and the government has no other interest in public natural resources other than as a public trustee— and they don't know how to deal with that."

Snow covers Loyalsock State Forest in Pennsylvania. The lawsuit maintains that the state's DCNR, under the Environmental Rights Amendment, has an obligation to "conserve and maintain" public natural resources for the benefit of the people. (Ad Crable)

Asked for comment on the latest lawsuit, a DCNR spokesman said the agency does not comment on legal matters.

The defense foundation suit against DCNR is just the latest in a flurry of lawsuits meant to settle the details of the Supreme Court's broad initial ruling.

An important decision emerged in July in Commonwealth Court on the issue of whether oil and gas funds could be diverted from the agency that maintains state forests and parks.

"The court appears to have decided that the Commonwealth is free to allow use of Pennsylvania's public natural resources and to apply the income however it chooses. Only proceeds from the sale of public natural resources must be returned to the public trust corpus," said David Mandelbaum, who teaches environmental litigation at Temple Law School.

He said the ruling means that the Environmental Rights Amendment "does not impose an obligation of conservation on the Commonwealth. Public natural resources can be used. The use merely has to be reasonable, in light of the right of later generations also to use the same resources."

The defense foundation has appealed the ruling to the state Supreme Court.

Two years after the court's 2017 ruling, many of the implications are still unsettled, said Martin Siegel, an environmental attorney in York.

Other court rulings seem to have held that municipal officials aren't responsible for taking exceptional steps to ensure that public lands in their midst are environmentally protected if the state already has safeguarding regulations, Siegel said.

"But there are bigger unanswered questions right now," he continued. "One big question is, is the state adequately funding environmental protection? Often, these rulings raise more questions than they answer. These things will be percolating through the system for decades."

MD to phase in restrictions for manure application without delay

≈ Ag secretary: State will work with farmers, poultry industry to deal with problems foreseen by study

By Timothy B. Wheeler

Maryland is forging ahead with restrictions on the use of animal manure to fertilize farm fields, despite warnings that there are likely to be problems.

State Agriculture Secretary Joseph Bartenfelder declared in late December that he saw no need to delay phasing in a state regulation that restricts the use of phosphorus-rich animal manure to fertilize farm fields, despite a study finding the state is not prepared to deal with the excess manure that is expected to result.

In a letter to a departmental advisory committee, Bartenfelder said that his decision was based on the committee's recommendation. The 19-member committee — which includes representatives of the poultry industry, farmers, municipalities and environmentalists — voted Dec. 13 to recommend against a one-year delay in the restrictions to be imposed in the coming year on more than 1,300 farms in the state.

The vote came after the panel received a report from Salisbury University's Business Economic and Community Outreach Network (BEACON) saying that the state lacks the funding, trucks and storage facilities likely needed to collect and haul away the animal manure that grain growers would no longer be able to spread on fields.

The Phosphorus Management Tool regulation, adopted in 2015, restricts or bars outright the application of phosphorus on fields where there's a risk that it will wash out of the soil and into nearby streams and drainage ditches when it rains. The restrictions could affect a total of 228,000 acres on 1,600 farms statewide by the time they are fully phased in Jan. 1, 2022.

So far, about 65,000 acres on 350 farms have been regulated. In the coming year, however, nearly 123,000 acres of farm fields are expected to be affected by the rule. Most are on the Eastern Shore, where poultry manure is widely used to fertilize corn and soybeans.

Phosphorus is one of the nutrients contained in animal manure, which farmers have traditionally relied on as a low-cost fertilizer. In some places, manure has been applied to fields so often that phosphorus has built up in the soil and risks running off into local waterways. There, phosphorus feeds algae blooms and worsens the fish-stressing "dead zone" that forms in the Chesapeake Bay.

State officials have said there's ample farm acreage elsewhere in Maryland — and even on the Upper Shore — where more manure could be safely applied to soils without high levels of phosphorus. The state provides $1 million annually to subsidize hauling about 250,000 tons of manure each year to farms where it can be safely spread.

But the Salisbury University study predicts that with so many more fields subject to potential restrictions, the state would have to boost its manure transport subsidy and provide financial incentives to expand the private truck fleet hauling it. Memo Diriker, director of BEACON, projected that $10 million might be needed over the next three years.

Lower Shore growers also have said that they fear restrictions on manure use will hurt them financially by forcing them to buy more expensive commercial fertilizer.

Even so, the panel voted 12 to 5, with two abstentions, to recommend against holding up the regulation for a year. Environmentalists opposed the delay, arguing that the restrictions are needed to improve water quality in the Bay and its rivers. They were joined by representatives of major farming groups, who later issued a joint statement calling for stakeholders to work together on an "action plan" to address the challenges the restrictions pose.

"When we succeed, we can make a case for freedom to operate in a business climate where phosphorus runoff is being properly addressed and managed to benefit the environment and protect water quality," the joint statement said. It was signed by leaders of the Maryland Farm Bureau, Maryland Grain Producers Association and Delmarva Poultry Industry, Inc.

Bartenfelder said that state officials are consulting with all concerned to see that restrictions continue to be phased in smoothly.

'A crappy business': Manure broker speaks out on tighter MD rules

≈ Delmarva hauler doubts enough regional farmers will pay for excess litter under new environmental regs

By Jeremy Cox

Ray Ellis makes a living hauling chicken poop — tons of it, often across state lines.

He owns the largest manure transport company on the Delmarva Peninsula, a region with one of the highest concentrations of meat chickens in the country, with a capacity for 150 million birds.

In other words, if anyone stood to personally gain from a new regulation that would require more chicken farms to ship manure somewhere else, Ellis would be your guy.

An advisory committee gathered last month to recommend whether Maryland's portion of the peninsula — and the rest of the state — should go forward with a measure that would do just that. The other option was to delay it for a year.

The 19-member group included farmers, environmentalists and, yes, Ray Ellis. Twelve members voted to urge the state to move ahead with the regulation. State Agriculture Secretary Joseph Bartenfelder decided to follow the committee's recommendation.

Ellis was one of the five who voted against it. Here is why:

Ray Ellis, owner of the Delmarva Peninsula's largest manure transport business, stands by as poultry manure is cleaned out of a chicken house. He warns it will be "piling up on farms" as a result of tightening state restrictions. (Dave Harp)

Ellis grew up in a small farming community called Willards on the lower Eastern Shore. His father was a carpenter; his mother ran grocery stores. Agriculture wasn't part of his life until he met and married a farmer's daughter.

In those days — the late 1980s and early '90s — it would take a crew of five to seven workers about four hours to clean out a chicken house between flocks. The floor becomes crusted over time with litter — a mixture of bird droppings, feathers and bedding material.

But with a skid loader, which resembles a miniature bulldozer, the job could be done by one worker in about an hour. Ellis decided to buy one, making him one of the few farmers in the region with such equipment at his disposal.

Soon, his phone started ringing with neighboring farmers asking to have their chicken houses cleaned — or "caked out," as they call it. For a time, Ellis spread the manure as fertilizer on his corn and soybean farm in Millsboro, DE. But it didn't take long until he was collecting more nutrients than his crops needed. So, he began selling it to other farmers for $4 per ton.

Like it or not, he was in the business of transporting chicken poop. "It's a crappy business," Ellis said. "Who wants to play in chicken manure every day?"

What began as a side gig slowly evolved into a full-time venture called Ellis Farms, Inc. The agribusiness giant, Perdue, opened a plant in the early 2000s in nearby Blades, DE, where it processed chicken manure into fertilizer pellets. With that, Ellis recalled, "People started asking, 'Well how valuable is this manure I'm getting rid of?'"

Perdue's new operation translated into steady business for Ellis. Reflecting the newfound demand, his price for a ton of manure shot up to $10 within a year. Changes in farming drove his profits higher. In many cases, new poultry operations were constructed without any adjoining cropland. With nowhere to spread their manure, they called on Ellis's services to keep their chicken houses clean.

Farmers who wanted to fertilize their

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crops with manure began paying Ellis $18–$21 per ton to truck it to them. His business quickly expanded. He bought several tractor trailers and hired about 20 employees. Then came new regulations in Maryland limiting how much manure farmers could apply to their fields.

Decades of heavy use had saturated thousands of acres on the Eastern Shore with phosphorus. Multiple studies showed links between nutrients washing off the region's farms and algae blooms growing in the Chesapeake Bay. When they die off, those blooms rob the water of oxygen, creating massive "dead zones" that kill any marine life that can't escape.

Ellis' phone was constantly ringing with farmers looking to offload manure because they could no longer spread it as freely on their own land.

But the biggest game changer was yet to come. In 2015, Maryland adopted the Phosphorus Management Tool, which restricts or bans the application of phosphorus on fields, depending on its existing concentration in the soil and the likelihood it will pollute the Bay.

Regulators phased in the program, starting with the fields with the highest phosphorus concentrations. But it pushed Ellis' business to a tipping point. As more farmers signed on to have their manure trucked away, it strained the supply of those willing to use it on their fields.

Just to find takers, Ellis began hauling manure as far as Pennsylvania, where it was used as fertilizer on mushroom farms. As his customers dwindled last year, he asked the Maryland Department of Agriculture for a list of potential recipients.

Litter is cleared out of a shed to be hauled elsewhere. Ray Ellis says his business has dwindled as fewer farmers are willing to buy poultry manure. He questions where the excess litter will be taken. (Dave Harp)

The state gave him 10 names, he said. But most would only receive shipments in the spring during the planting season or they would take it but not pay for it.

"I'm the largest broker on Delmarva," Ellis said. "No one's calling me" to buy manure. The annual amount of manure handled by his company has plummeted from a peak of 250,000 tons to 100,000 tons, he said. He blames part of that difference on the emergence of competition from other trucking companies in the market, but it's mostly because of the tighter nutrient regulations, Ellis said.

Meanwhile, the state was moving forward with the next phase of the tool's implementation, expanding the phosphorus restrictions from 65,000 acres on 350 farms to 228,000 acres on 1,600 farms.

A state-commissioned study released in December concluded that the state lacks the funding and trucking infrastructure to handle the extra manure.

"There's going to be a need for new equipment and new drivers to transport this," said Salisbury University economics expert Memo Diriker, the study's author. "With that much more manure that's going to have to leave The Shore, or at least that high [phosphorus] value acreage where it cannot be spread, you're going to have to transport it out of the region."

The scenario puts hauling companies in a difficult financial spot, he added. The industry will need to invest in 10–20 trucks at a cost of $80,000-$120,000 per unit, Diriker said. But new alternatives, such as facilities that heat the manure to create electricity, could come online over the next several years, reducing the need for it to be transported.

"People like Ray bought this equipment to take these things all the way up to Pennsylvania and then there's suddenly no need to take them," said Diriker, adding that the state may wish to consider subsidizing the companies for such costs.

Diriker's report also suggests subsidies to cover higher transportation costs because of an expectation that the manure will have to be trucked still farther away to find willing buyers.

For Ellis, the Salisbury report confirmed his fears about the next phase of the phosphorus regulation.

"If anybody should be voting for it, it should be me because I'm going to get paid for moving it," he said.

Ultimately, he didn't. The transportation industry isn't ready to absorb the new supply of manure, especially when demand for the product is so low, he said.

He blames fellow industry members for bowing to political pressure to advance the regulation. The future, as he sees it, isn't pretty and smells worse.

"We're going to have manure running out of the sheds and piling up on the farms," he said, "and that's when you're going to have a nightmare."

Chesapeake cleanup effort gets a boost in federal funding

The Bay Program will get $85 million, the most it has ever received

By Timothy B. Wheeler

Federal funding for Chesapeake Bay restoration efforts is in line for a boost in the big spending package passed in mid-December by Congress and signed by President Trump on Dec. 20.

Increased Bay-related funding was included in a pair of appropriations bills totaling nearly $1.4 trillion that were agreed upon by delegations from the House and Senate to fund most federal agencies through Sept. 30, 2020, the end of this budget year. The U.S. Environmental Protection Agency's Chesapeake Bay Program, which guides the overall restoration work throughout the six-state watershed, will get $85 million, the most it has ever received. That's a 16% increase over what the program received annually from Congress for the last five years. It's also almost $78 million more than the Trump White House had asked for this year. That request would have resulted in a nearly 90% cut to the Bay Program budget.

"We fought hard for this investment, and I'm pleased that this effort succeeded, despite the administration's continued attempts to slash this funding," said Sen. Chris Van Hollen, D-MD.

Kristin Reilly, director of the Choose Clean Water Coalition, which represents more than 240 groups in the Chesapeake watershed, called the increased Bay Program funding "a great victory for clean water."

"As the 2025 deadline approaches to have all programs and practices in place to restore water quality," she said, "continued investment by the federal government in the Bay Program will pay huge dividends not only for the environmental benefits but also to communities and local economies throughout the watershed."

A joint House-Senate report accompanying the spending package specifies the ways in which much of EPA's enlarged Bay Program budget is to be spent. It directs the agency to distribute two $9 million grant programs to states, local governments and nonprofit groups — one for restoration efforts in small Bay tributary watersheds and the other for "innovative" nutrient and sediment reduction projects.

The report also stipulates that watershed states should get another $6 million for targeted pollution prevention or cleanup in places where science indicates it will do the most good.

Congress approved increased spending on the Bay in other agency budgets as well.

The U.S. Army Corps of Engineers saw its budget grow, and at least some of that money could go to projects in the Bay. The Corps got $100 million, double the level in fiscal year 2019, for environmental restoration and protection, including $25 million for programs with a comprehensive restoration plan.

Congress also set aside $5 million in the Corps budget for oyster restoration, with reef reconstruction in the Bay specifically recommended in the conference report. Reef restoration in Maryland's Tred Avon River has been largely on hold after federal funding ran out.

Finally, Corps funding more than doubled, from $8.1 million in fiscal year 2019 to $17.3 million this year, for expanding Poplar Island near Tilghman Island, MD. The Corps is working with the Maryland Port Administration to rebuild the disappearing island using material dredged from Bay shipping lanes leading to Baltimore harbor.

The U.S. Geological Survey also received a $2 million boost, bringing to $14.85 million the funding it's to have for ecosystem science and monitoring work in the Bay watershed.

Finally, the National Park Service got a 50% increase for its Chesapeake Bay Gateways and Watertrails Network, a collection of more than 170 sites around the region where the public can connect with the natural and cultural heritage of the Bay. Joel Dunn, president and CEO of the nonprofit Chesapeake Conservancy, said the $3 million appropriation marks the first time the program has received the full amount authorized by Congress.

> *"It really reflects the national significance of our world-class restoration work. This new infusion of money will let us lead by example."*
>
> — Ann Swanson, Chesapeake Bay Commission

Ann Swanson, executive director of the Chesapeake Bay Commission, called all the spending increases "pretty great news."

"It really reflects the national significance of our world-class restoration work," Swanson said. "This new infusion of money will let us lead by example."

Funding likewise increased for several nationwide federal programs that do some work in the Bay watershed. Among them:

- The operations budget of the U.S. Department of Agriculture's Natural Resources Conservation Service, which assists farmers and ranchers in reducing their environmental impacts, increased by more than $10 million, to $829.6 million.
- The National Oceanic and Atmospheric Administration's Sea Grant College Program saw a $7 million increase from last year, to $87 million for this budget year. The university-based national network supports scientists and other experts working to improve the conservation, management and use of coastal resources.

Also, in a move that could presage even more federal dollars going to Chesapeake restoration in the future, the Senate Environment and Public Works Committee agreed on separate legislation to authorize an increase in Bay Program funding to $92 million a year. Committee member Van Hollen teamed up with fellow member and Maryland senior senator, Democrat Ben Cardin, to push to raise the spending ceiling.

The committee also passed two other Bay-related measures sponsored by the Maryland senators. One, called the Chesapeake WILD Act, would have the U.S. Fish and Wildlife Service award grants to underwrite Bay conservation efforts. The other would reauthorize the Chesapeake Gateways and Watertrails program.

Those measures would require approval from the full Senate and from the House to become law.

President Trump signed into law a pair of appropriations bills that include increased funding for Chesapeake Bay restoration efforts. (Timothy B. Wheeler)

Virginia menhaden fishery threatened with moratorium

≈ Feds act after Omega Protein exceeds Bay harvest cap

By Timothy B. Wheeler

Virginia faces a threatened shutdown of its large commercial fishery for Atlantic menhaden after federal officials found the state had allowed too many of the commercially and ecologically important fish to be taken from the Chesapeake Bay.

In a letter released Dec. 19, the head of the Commerce Department agency that regulates federally managed fisheries declared Virginia out of compliance with an interstate management plan for menhaden.

As a result, a statewide catch moratorium will be imposed June 17 if Virginia does not by then adopt and enforce a 2-year-old cap on Bay harvests of the fish, wrote Chris Oliver, assistant administrator for fisheries with the National Oceanic and Atmospheric Administration. NOAA is a branch of the Commerce Department.

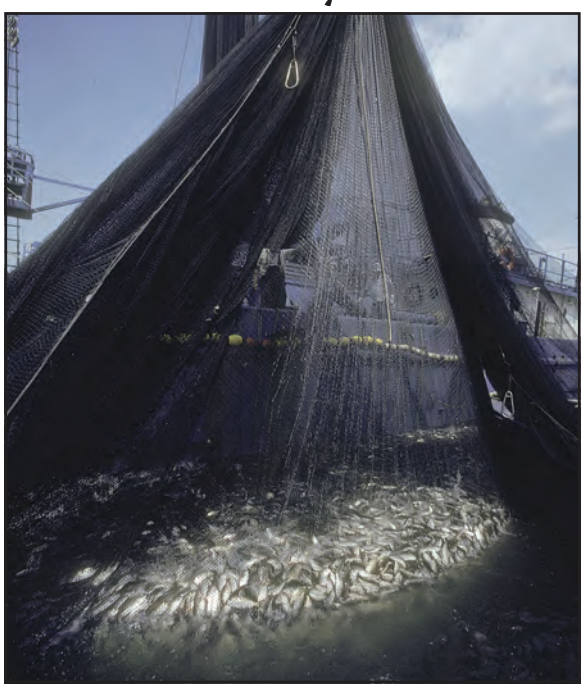
The rare federal action comes after a fishing fleet working for Omega Protein this year netted more menhaden from the Chesapeake than permitted by the Atlantic States Marine Fisheries Commission. The fleet hauled in 67,000 metric tons, more than 30% above the cap.

Conservation and recreational fishing groups applauded the move. So did Virginia officials, who said they were unable to persuade Omega to abide by the 51,000-metric ton annual limit on Bay menhaden harvests.

"It's unfortunate that Omega's actions earlier this year have tarnished the entire commonwealth," said Chris Moore, senior regional ecosystem scientist with the Chesapeake Bay Foundation.

About three-quarters of all the menhaden harvested along the East Coast are caught by the fleet contracted to Omega. The Canada-based company has a processing plant in Reedville, VA, that "reduces" menhaden into animal feed and nutritional supplements.

The small oily fish are also a food source for other fish, including striped bass.



Menhaden are harvested in a purse seine. A statewide moratorium on catching the fish may be imposed June 17 if Virginia does not by then adopt a 2-year-old cap on Bay harvests, as set by the ASMFC. (Dave Harp)

Worried that the company was taking too many menhaden from the Chesapeake, the commission, since 2006, has capped the Bay harvest for the benefit of other species.

Omega has sparred for years with the commission over its coastwide menhaden harvest limits. Tensions increased in November 2017 when the interstate body slashed the allowable catch in the Bay from 87,216 metric tons to the level it is now — which is about what the Chesapeake catch has averaged the last several years.

Virginia has technically been out of compliance for the last two years because it failed to adopt the 51,000 metric ton cap. The state's General Assembly sets fishing rules for menhaden, and Omega successfully lobbied lawmakers not to lower the catch limit. The commission didn't move against Virginia right away, though, because Omega had not exceeded the cap. But in September, the company declared that it would surpass the limit for the first time. It said it was forced to do so by unsafe fishing conditions along the Atlantic coast, but it also challenged the basis for the Bay limit.

"This is the first time that a moratorium has been placed on a fishery that is not overfished and is healthy by every measure," the company said in a statement expressing its disappointment with the federal decision.

A scientific review in 2017 did find that the coastwide menhaden stock is not overfished, and the commission increased the allowable catch in coastal waters in response. But it reduced the Bay catch at the urging of conservationists and recreational anglers, who urged caution because of the important ecological role the fish play in the estuary.

While there's no study confirming menhaden are being depleted in the Bay, commission members say research has suggested links between the abundance of menhaden in the Chesapeake and fish that feed on them.

The Atlantic States commission's technical advisers have been working on guidelines for managing menhaden's ecological role as a forage fish for other species. When finished, that analysis is expected to lead to changes in harvest rules, but for now commission members say they must maintain the current limit as a precaution.

The commission's October vote finding Virginia out of compliance was subject to review by U.S. Commerce Secretary Wilbur Ross, who had to decide whether to impose a moratorium and under what terms. NOAA's Oliver, acting on behalf of Ross, said the harvest ban wouldn't take effect until June 17, to give Virginia time to come into compliance by adopting the mandated Bay harvest cap.

"Upholding the ASMFC's noncompliance finding for Virginia was simply the right thing to do," said David Sikorski, executive director of Coastal Conservation Maryland, a sportfishing group. "We applaud Secretary Ross for defending both the management system and the forage base in the Chesapeake Bay."

Matthew J. Strickler, Virginia's natural resources secretary, thanked Ross and Oliver for their decision, which he said would "protect the Chesapeake Bay and the livelihoods of all those who depend on it, including the workers at Omega Protein.

"We believe strongly that a science-based approach that accounts for all fisheries in the Chesapeake Bay ecosystem is appropriate," Strickler added, "and we look forward to working with the General Assembly to apply such an approach to the menhaden fishery."

The Chesapeake Bay Foundation urged the Virginia General Assembly to go beyond simply changing the harvest cap and transfer responsibility for managing menhaden to the Virginia Marine Resources Commission, which regulates all other saltwater fisheries in the state.

But if the Assembly fails to do either, the moratorium would affect more than Omega. About 189 Virginia watermen harvest menhaden every year to sell as bait to catch other fish, according to the marine resources commission. They account for about 10% of all menhaden caught in the state.

"It's a pretty big fishery," said J.C. Hudgins of Mathews, who is president of the Virginia Waterman's Association.

Hundreds of watermen in Virginia and Maryland also use menhaden as bait to catch crabs, and they could be hurt by a moratorium, as could fishermen in other East Coast states who buy bait fish from Virginia.

Omega, in its statement, said it would work with the Atlantic States Marine Fisheries Commission and Virginia to bring the fishery back into compliance and eventually establish ecosystem-based harvest rules.

Data centers line a section of the Loudoun County Parkway where new buildings are also under construction. The Northern Virginia county has the world's largest concentration of data centers and continues to add the energy-intensive facilities. (Whitney Pipkin)

CENTERS FROM PAGE 1

as 7,500 residential households and requires a more reliable power source," the application stated. By that metric, the 100-plus data centers currently operating in Loudoun County would be using more electricity than 750,000 homes.

"Given the urgent need to transition away from fossil fuels as rapidly as possible to combat the most extreme consequences of climate change, the source of electricity deployed by the local utility in these data center hotspots takes on global significance," the Greenpeace report states.

Virginia regulators also are looking at the cumulative impact of the centers' natural gas– or diesel-powered backup generators, which run periodically to ensure reliability when needed. Should they all fire up at once, in the case of an energy emergency, their emissions would quickly pose air quality concerns in a region that has about seven times as many people living in it than it did in 1980.

Concerns have also been voiced about data centers' big thirst for water to use in cooling systems and about their consumption of land for facilities and parking areas. The conversion of open space and wildlife habitat into hardened surfaces contributes to polluted stormwater runoff in streams flowing to the Bay.

In 2019, Loudoun County had 13.5 million square feet of data centers in operation with another 4.5 million square feet under development, according to the county's Department of Economic Development. Another 10 million square feet of data center space were reportedly in the pipeline. Their combined footprint from these buildings would cover approximately 640 acres, but that's not including the parking lots that accompany them.

The pace of data center growth in Northern Virginia only seems to be accelerating, especially as Crystal City prepares to welcome Amazon's East Coast headquarters and data centers continue to crop up in nearby Prince William and other formerly rural counties.

Data center construction is spreading to other parts of Virginia, too, as Loudoun nears its current zoning capacity for new projects and other counties vie for the economic boost this industry represents. Access to fiberoptic cables and energy transmission lines extends into parts of Fauquier and Culpeper counties, where companies could find less expensive land in rural areas attractive.

Why Northern Virginia?

Northern Virginia's economy has long benefited from its proximity to Washington, DC, and so has the data center industry.

The federal government funded research that led to the internet's precursor, the U.S. Defense Department's ARPANET (Advanced Research Projects Agency Network), in the 1960s. That created the need for data storage near the nation's capital as more branches of the government began to share information electronically. But — though the U.S. government is still a major player in the region's data storage business — many would credit private companies with christening Northern Virginia as the "Silicon Valley of the East," as a 2011 article in *The Atlantic* put it.

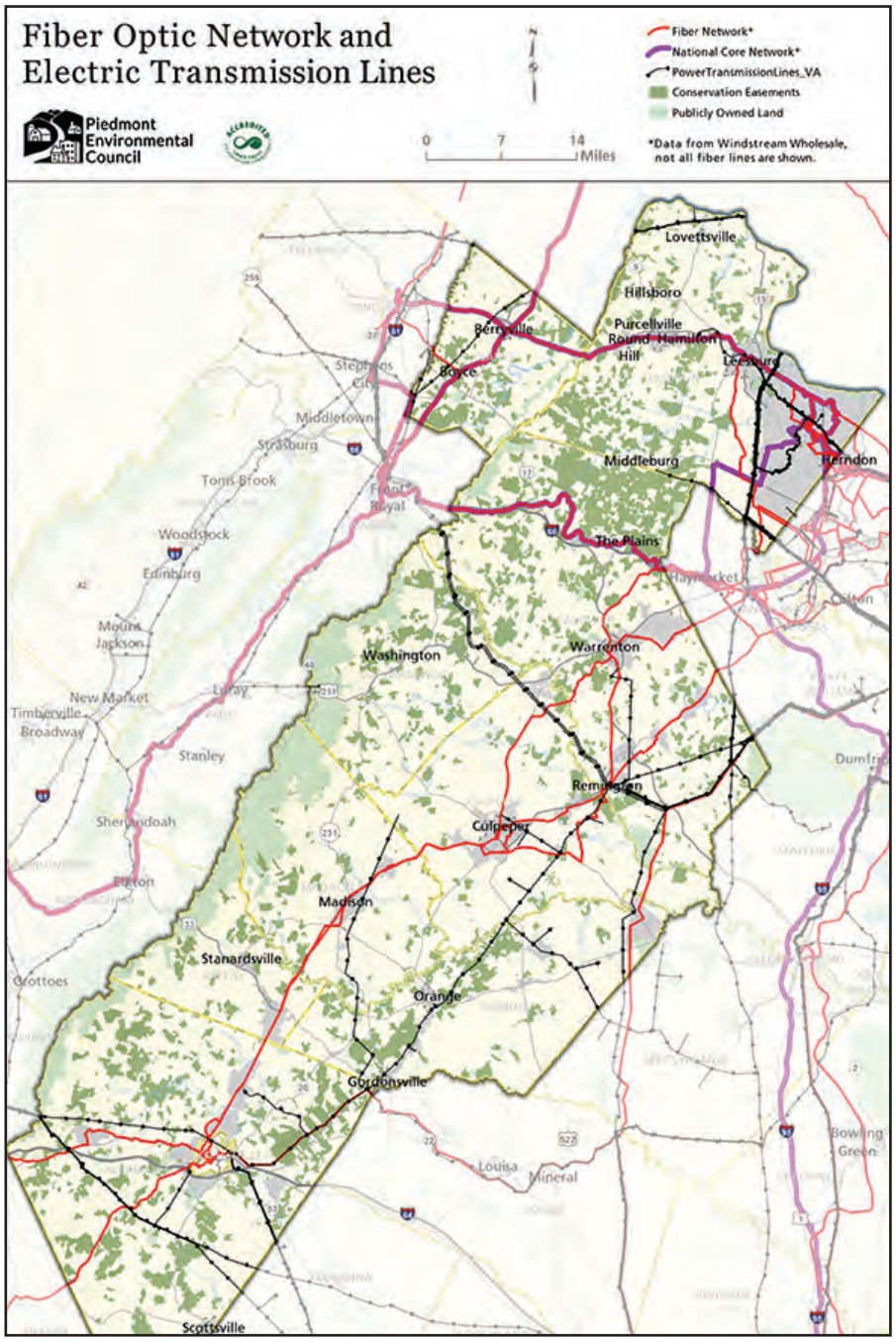
The internet pioneer America Online, later known as AOL, moved its corporate headquarters to Loudoun County in the 1990s, attracting talent to the region that would spin off to start other tech companies as the internet evolved. As Buddy Rizer, executive director of Loudoun County's Department of Economic Development told a tech publication, it wasn't long before "everyone started running their fiber out to AOL, because in those days, AOL was the internet and the internet was AOL for most people."

In the late '90s, internet providers put Loudoun County on the map by running the infrastructure of a major East Coast internet-access point, called MAE-East, through Vienna, Reston and Ashburn.

Soon, environmentalists began to worry about their impact.

Powered up, but how?

Dan Holmes, director of state policy for the Piedmont Environmental Council, said data centers came onto his radar around 2001. The nonprofit group was at the time tracking proposals of new natural gas power plants. Holmes started to see permit applications for natural gas generators as backup power for data centers.



"Even that long ago, I was shocked by their consumptive nature," he said. Now, Northern Virginia "represents the largest

CENTERS CONTINUES ON PAGE 15

Centers from page 14

hub of new data center construction in the world. If you take the next four largest combined, we're still larger than that."

Industry and county officials point out that data centers achieve huge energy efficiencies by co-locating along channels of connectivity and energy transmission such as those in Northern Virginia.

Troy Murphy, director of policy for the Northern Virginia Technology Council, wrote in an email to the *Bay Journal* that "it is no secret that energy usage is a large factor of operating a data center." But, he said, aggregating servers into large data centers uses up to 84% less power than having servers located at each business or agency. The more servers per square foot, for example, the fewer feet in need of cooling as they operate around the clock.

Murphy said the scale of these data centers — most of them funded by internet behemoths that have made renewable energy pledges — has helped to push the state to improve its energy portfolio. Amazon Web Services, Apple, Facebook, Google and Microsoft have each announced a goal to eventually be powered 100% by renewable energy.

"In 2013, renewable energy was hardly a factor in Virginia," Murphy wrote. "But by 2018, Dominion Energy had more than 744 [megawatts] of solar generation capacity operational or under development — 78% of which is directly attributable to partnerships with data center companies."

Even so, data centers' energy demands continue to grow with the global growth in online activity.

"As everyone puts in a real-time digital monitor on their doorbell, that begins to overwhelm whatever efficiencies the [industry's] achieving," said Chris Miller, executive director of the Piedmont Environmental Council.

Even a 100% renewable energy portfolio can be problematic if the increased demand means that more of the state's land must be devoted to energy production.

A growing number of environmental groups have concerns about how solar energy facilities are being sited, especially when photovoltaic panels cover land formerly farmed or forested.

"When you add in a solar array that's big enough to provide clean energy for Microsoft or Amazon, we're talking tens of thousands of acres of land just for solar," Miller said. "There's a need for a larger look by the state as we pursue renewable energy, for offsetting data center construction that will have an additional impact elsewhere."

Maryland regulators denied permits last year for two solar projects that would have cleared 400 acres of woodlands, citing concerns about water quality. Similar concerns have yet to gain much traction in Virginia.

Gem Bingol, a Loudoun County field representative for the Piedmont Environmental Council, stands in front of one of the data centers near the Dulles Greenway. Bingol said the Digital Realty Data Center was one of the first in an area that now includes a metro stop under construction and mixed-use residential units nearby. (Whitney Pipkin)

Residents of mostly rural Spotsylvania County 60 miles south of DC waged an unsuccessful fight last year against a proposal to clear 3,500 acres of private woodlands for the state's largest solar project to date.

While environmental groups consider solar an improvement over coal– or gas-based power generation, they also want the state to weigh the cumulative impact of such projects. If not constructed properly, so-called solar farms could contribute additional stormwater runoff to nearby streams and the Chesapeake Bay. Such was the case with one project constructed during a rainy 2018 in Virginia's Essex County, where the newly turned land contributed muddy runoff to the Rappahannock River.

Thomas Faha, director of the Department of Environmental Quality's Northern Regional Office, said both data centers and solar projects are subject to erosion and stormwater control regulations aimed at protecting local water quality. But the local government authority determines whether projects comply with the regulations. And often, the county also stands to benefit from the tax-boon that accompanies a new data center project.

Air concerns

The DEQ is looking into another emerging concern related to data centers in Northern Virginia: air quality. A report by the state Secretary of Natural Resources in 2019 listed air emissions from data centers' backup generators as a potential risk to air quality.

Every data center has several generators that are intended to be used in an emergency should the conventional power grid go down for any period of time. Faha, whose department issues air permits for the generators, said they kick on periodically for 15– or 30-minute periods to ensure they will work in an emergency.

The DEQ permits restrict when those tests can occur, avoiding hours when commuter traffic isn't also contributing to air pollution, for example.

"But even a minimum amount is an addition to what was there in the past," Faha said. "If the grid were to go down and we had a catastrophic emergency, these units are then allowed to run for longer periods of time."

Burning diesel or natural gas for power releases pollutants such as nitrogen oxides, which combines with volatile organic compounds to form ozone, which is a threat to human health.

That's why the department wants to conduct additional air quality monitoring in places like Loudoun County. There, he said, a confluence of data centers and growing residential population make it necessary to consider the cumulative impact these generators could be having on air quality.

Nitrogen oxides emitted into the air can also contribute nutrient pollution to the Bay when the pollutants fall back to Earth and wash into local waters.

Faha estimated that the number of generators already permitted for data centers in Northern Virginia could run up to 3,000, and the total is growing. The vast majority, he said, are in Loudoun and Prince William counties.

Economic incentives

One data center approved in 2018 despite strong opposition serves as an example of environmentalists' concerns.

In 2017, a Dallas, TX-based company asked the Loudoun County Board of Supervisors to rezone more than 100 acres along Goose Creek so it could build a 760,000-square-foot data center. The Piedmont Environmental Council argued the project didn't belong in the county's "transition zone" between its suburban east and rural west. They said it would encroach on a rare state-designated rocky, mossy area, one of 10 "Northern Piedmont mafic barrens" worldwide, and create additional hardened surfaces just upstream of an intake for public drinking water.

But the project's backers, on the other hand, said it would bring an additional $22 million in annual tax revenue to the county that could be used for education and infrastructure. The data center's futuristic design, they said, would use less than 1% of the water that a similarly-sized center might consume.

In the end, the board narrowly approved the project by a 5–4 vote. The Piedmont council's Holmes said the project shows how hard it can be to get a local government "to focus on environmental impacts when they're having $22 million of revenue waived in front of their face."

Loudoun County currently offers several incentives to data centers considering locating in the pockets of land still available for such commercial development. The county offers tax exemptions to data centers that invest at least $150 million, hire at least 50 employees and pay at least 1.5 times the average local wage. The county also fast-tracks such projects by providing a dedicated project manager for quicker development reviews.

"We'll get about a quarter of a billion dollars in local tax revenue this year alone from the data center industry," Loudoun's Buddy Rizer told *GCN News* in 2018. "Data centers are a really high return on investment for us. For every $1 we spend on services for data centers, we get $9.50 back."

In comparison, it costs the county more to provide services to single-family homes than it gets back, and for every $1 it spends on commercial businesses, it gets about $1.56 back, the article said.

Given the amount of revenue these projects represent, Miller said he'd like to see the county and state hold data centers to a higher standard for reducing their environmental impacts, rather than only offering economic incentives.

"What we would argue," he said, "is that these are the [companies] best positioned in the current economy to recapture the costs of investing in the best stormwater controls on the right pieces of land."

A sea change in action: Bay states plan for future climate

There's little doubt that the Chesapeake region has been feeling the impact of climate change over the last century. The number of days with frost each year has decreased by about 30, annual precipitation has increased by about 10%, and water levels have risen a foot or more. Tidal marshes, inundated by rising water, have decreased dramatically. Bay water temperatures have risen 1.5 degrees in just the last two decades.

These trends will have great implications for Chesapeake water quality and the habitats it supports in the coming decades, especially if greenhouse gas emissions are not reduced.

Even as the region — and the nation — feels the heat, federal leadership on climate change under the Trump administration has largely vanished, as it attempts to roll back Obama era regulations and withdraw from the 2016 Paris Agreement to limit greenhouse gas emissions.

As a result, action has largely shifted to the states, which recognize that climate will create greater challenges for everything from natural resources and the quality of the environment to public health and water supplies.

"We are in a phase right now where there are dark clouds and strong headwinds at the federal level, but states and universities and private sector leaders can make real progress," said Maryland Department of the Environment Secretary Ben Grumbles at a recent water monitoring conference.

Here's a look at the climate plans developed by Maryland, Virginia and Pennsylvania.

Political shift in VA has advocates hopeful for long-awaited action

By Jeremy Cox

Virginia, like many coastal states, has been battling climate change primarily on two fronts: reducing greenhouse gas emissions and preparing coastal communities for rising seas.

The state's formal response to climate change can be traced to then-Gov. Tim Kaine's executive order in December 2007 that formed the Governor's Commission on Climate Change.

Since then, climate action on a state level has been on a rollercoaster. From 2010 to 2014, the issue took a back seat under Republican Gov. Bob McDonnell's administration. But two successive Democratic administrations under Terry McAuliffe and Ralph Northam made some progress amid resistance from a Republican-controlled General Assembly.

The political dynamic shifted again in November as Democrats regained control of the General Assembly for the first time in more than two decades. Now, environmental activists hope that change translates into long-awaited action on their climate agenda.

In his 2007 order, Kaine, now a U.S. senator representing Virginia, urged his climate commission to find ways to cut the state's greenhouse gas emissions 30% by 2025. Assuming the state took no action, officials estimated that total emissions would reach 230 million tons by that year. The governor's plan would reduce emissions to 163 million tons per year.

Critics, including some commission members, argued that the state's target didn't go far enough. In contrast, the most recent United Nations Intergovernmental Panel on Climate Change had urged reductions of 25% by 2020 and 80% by 2050. But others worried that more-aggressive steps would raise

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An aircraft carrier returns to Naval Station Norfolk, the largest naval base on the planet. Rising sea levels threaten operations at the base. (Dave Harp)

PA sets lofty goals, but does it have the political will to achieve them?

By Ad Crable

Pennsylvania, which ranks fourth in the nation in its emissions of climate-altering carbon dioxide, took a much bolder stance in addressing climate change in 2019, at least in words.

Democratic Gov. Tom Wolf unveiled four separate actions aimed at curbing climate change, each bolder than the one before.

Wolf started off in January 2019 by issuing an executive order that set the first statewide goal for greenhouse gas reductions. The target is a 26% reduction by 2025 and an 80% decrease by 2050 from 2005 levels.

The primary means to achieve those scalebacks: more energy-efficient government buildings, switching a quarter of the government fleet of vehicles to electric or hybrid models by 2025, and requiring that at least 40% of the energy used in the state come from renewable sources, listed as natural gas, wind and solar.

Wolf called climate change "the most critical environmental threat facing the world."

The state's temperatures have risen nearly 2 degrees since the early 1900s and nearly 4 degrees in winter, according to state agencies. Officials warn of sea level rise, hotter summer temperatures, increased flooding, more extreme storms and more unhealthy air over the next century if greenhouse gases are not curtailed. Though Pennsylvania is not an oceanfront state, there are concerns about how the tidal Delaware River will affect the vast industrial complex along the river around Philadelphia, including fears that runways at the Philadelphia International Airport will flood.

Pennsylvania is a power plant and industry-heavy state, both main

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An early climate leader, MD now at odds over how to address worsening threats

By Timothy B. Wheeler

In the race to head off the worst impacts of climate change, Maryland has been a leader among states in the Chesapeake Bay watershed — and in the nation, for that matter.

But the Hogan administration and climate activists are now at odds over whether the state is doing enough, given the lack of federal action and increasing urgency with which scientists say bolder actions are needed to avoid dire consequences.

With at least 3,200 miles of Bay and Atlantic Ocean shoreline, Maryland is particularly vulnerable to sea level rise associated with climate change. High-tide flooding, even on sunny days, is occurring with increasing frequency. On low-lying areas of the Eastern Shore, salty water from the Bay is seeping inland below the ground and ruining farm fields. Near-shore woodlands are turning into ghost forests, as trees are poisoned by salty water soaking the ground around their roots.

The state has long recognized the climate threat. A decade ago, the General Assembly passed a law calling for the state to reduce its climate-altering greenhouse gas emissions 25% from 2006 levels by 2020. Officials say Maryland is on track to achieve that by the deadline next year, though some activists aren't so sure.

Much of the progress to date has come from power plants and other industrial energy generators switching from coal to natural gas, which when burned releases about half as much climate-altering carbon dioxide.

But in 2016, with scientists warning that more action is needed, Maryland lawmakers upped the ante. They passed new legislation calling for a 40% greenhouse gas reduction from 2006 levels by 2030 — a goal exceeded at the time by only two other states, California and New York. And they urged starting to work toward an even more aggressive goal to reduce emissions 80–95% by 2050.

In a demonstration of bipartisanship not seen at the national level, Gov. Larry Hogan, a Republican, signed the bill,

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energy costs beyond what residents and businesses could absorb.

The commission ultimately proposed 76 million tons in cuts, which would result in a slightly higher reduction than the 30% that Kaine had sought.

Today, Virginia may be closing in on that goal. In fact, it may have already happened. The source of the uncertainty is a problem that has plagued the state's climate change campaign from the outset: lack of public support.

No comprehensive analysis of emissions has been performed for years because of a lack of funding from state lawmakers, said Meryem Karad, policy and communications adviser to Natural Resources Secretary Matt Strickler.

But state officials estimate the current total is 160 million to 185 million tons per year. Most of the cuts have come from electricity suppliers converting from coal to natural gas to fire their plants, Karad said. The low end of that range surpasses the emissions goal; on the high end, the state would still have a long way to go.

The largest share of that multimillion-ton decrease, representing about one-third of all emission reductions, was projected to come from federally mandated actions, such as increased fuel economy for vehicles and new efficiency standards on certain appliances.

But the state has found itself with less help from Washington, DC, than expected. The long-awaited cap-and-trade legislation was dead on arrival in Congress — and remains so. The system would have set an emissions cap. Companies could then buy and sell allowances on the open market; those that reduce emissions could sell excess allowances to other emitters.

The Obama administration enacted a Clean Power Plan, but the Trump administration replaced it earlier this year with an industry-friendly version that required no specific emission reductions.

Trump also backed out of the 2016 Paris Agreement on climate. In response, under then-Gov. McAuliffe in 2017, Virginia joined a group of states pledging to uphold the Paris accord, including its goal of reducing emissions up to 28% from 2005 levels by 2025. So far, 24 states and Puerto Rico have signed on to the U.S. Climate Alliance's targets.

"Working with a strong coalition of states through the Climate Alliance is important as Virginia develops comprehensive strategies to address the impacts of climate change," said Gov. Northam. "We are focused on reducing our carbon footprint in a way that grows our clean energy economy and creates new business opportunities across the commonwealth."

But Northam, like previous Democratic governors, faced opposition from the state's Republican-controlled legislature on climate issues.

Nine Northeast states have formed a cap-and-trade program for power plants. Northam made joining it a signature campaign issue. State regulators finalized a carbon-trading rule last April. But state Republicans blocked the move, refusing to allocate funding for it in their budget this year.

Activists hopes that the new Democratic majority will nudge the proposal across the finish line. Northam has announced plans to seek the go-ahead from lawmakers during this year's session.

Virginia has twice made sweeping climate action proposals: in 2008 under Kaine and 2015 under McAuliffe. The trouble has been sticking to them.

The Virginia Institute of Marine Science and the Virginia Coastal Policy Clinic at the William and Mary School of Law published a review of the state's progress toward meeting the 2008 goals. The report found that while certain actions had been taken, the state had failed to implement a "comprehensive" program to address the recommendations.

The state's energy-conservation efforts haven't much impressed the American Council for an Energy-Efficient Economy. The energy watchdog ranked Virginia 29th in the nation, just behind Tennessee, in 2019 in overall efficiency. Its total score of 15 points out of the nonprofit's scale of 50 was just 5 points higher than its 2008 sum.

The state also has lagged in renewable energy development. In 2018, Virginia obtained just shy of 7% of its energy from renewables, well below the national average of 17%, according to the federal Energy Information Administration.

The Kaine commission had hoped to wring about 8% of the state's emissions reductions from transportation system upgrades. It was more of a plan to have a plan, though, calling on officials to set numerical goals for initiatives such as improving community designs as well as increasing public transit ridership, the amount of freight carried by rail and the number of people who bicycle or walk to work.

The state has made strides on some of those recommendations. The Virginia Department of Transportation published statewide bicycle and pedestrian plans. The agency also wrote a document to help guide localities toward more-efficient community designs. But transit ridership dipped 8% statewide in 2017 and another 2% in 2018.

Scientists widely agree that coastal Virginia is ground zero for sea level rise and other climate impacts.

Sinking land, a weakening Gulf Stream and rising seas are expected to raise the level of the water surrounding Hampton Roads 4.5 feet by the end of the century. (Worldwide, the average rise is forecast to be 3 feet, according to the United Nations' Intergovernmental Panel on Climate Change.) That incoming tide threatens thousands of residents as well as the largest naval base on the planet, Naval Station Norfolk.

A house is being raised in Norfolk's Larchmont neighborhood, where repetitive flooding is commonplace. (Dave Harp)

Alarmed, many coastal communities have begun taking action, from the Eastern Shore studying potential road-flooding impacts to Norfolk investing $112 million in an elaborate tide-defense system for a pair of low-lying neighborhoods.

For years, though, those efforts unfolded largely in isolation from one another, with little state-level coordination. State lawmakers stepped in last year, creating a cabinet-level position dedicated to coastal adaptation and protection. Northam appointed Ann Phillips, a retired Navy rear admiral and longtime advocate for climate action, to the position.

"Because the localities and the cities have been doing so much already, they're really ahead of the state," Phillips said.

She has spent much of her first year on the job meeting local planners and documenting the resources they need to combat climate change in their communities. The most-cited challenges included a lack of planning staff, funding shortfalls and conflicts with the state's top-down approach to governance.

Virginia adheres to the Dillon Rule, an 1800s legal doctrine that prohibits local governments from wielding any powers beyond those specifically granted by the state. While multiple legal analysts have sided with local governments on their authority to tackle flooding problems, the issue remains far from settled. A 2010 Virginia Supreme Court ruling, for example, overturned on Dillon Rule grounds a Hampton decision to expand a conservation area to protect the Chesapeake Bay.

In 2015, the nonprofit advocacy group Climate Central and its consultant ICF International gave Virginia a C+ grade for its coastal-flooding efforts. Tts neighbor, Maryland, received an A–.

The report card cited Virginia's lack of an updated climate change adaptation plan with detailed resilience policies and a timeline for getting projects done.

Phillips is working on completing a "coastal master plan," by the end of the spring, she said. But her efforts will be constrained, she added, because of her office's lack of a budget and staff.

"I have to stay within my means," she said.

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sources of carbon dioxide. In addition, the state ranks second in the nation in the hydraulic fracturing of natural gas and fifth in dairy cows. Both sources produce methane, an even more potent but less prevalent greenhouse gas.

Wolf backs controversial natural gas production, though, and some environmental groups and legislators criticized the governor for not seeking better controls on emissions from natural gas extraction as part of his climate change package.

But in mid-December, Wolf-backed rules to cut methane emissions from gas wells were approved by the state Environmental Quality Board by an 18–1 vote.

The governor's first executive action was followed up in April with a significant update to the state's Climate Action Plan, which had been in existence for several years. At the same time, Wolf announced he was joining 23 other governors in the U.S. Climate Alliance, a bipartisan coalition of governors pledging to keep the commitments the United States made in the Paris Agreement in 2016 to reduce greenhouse gas emissions. President Donald Trump has begun to withdraw the United States from the worldwide agreement.

"With the federal government turning its back on science and the environment, I am proud to join with states that are leading the way toward new climate solutions and taking concrete action to reduce greenhouse gas emissions," Wolf said.

"States like Pennsylvania must take action to reduce greenhouse gas emissions and protect our communities, economies, infrastructures and environments from the risks of a warming planet."

Pennsylvania's new Climate Action Plan describes more than 100 actions aimed at state and local governments, businesses and citizens. It calls for changes that affect energy, transportation and agriculture.

It also contains dire warnings if action is not taken.

"The impacts of climate change are real and will continue to put Pennsylvanians at risk from increased flooding, higher temperatures and more," the plan stated. Farmers will have to deal with increasing problems with pests, weeds and diseases, the report continued, and "public health will deteriorate because climate change will worsen air quality."

Expect more frequent road washouts and more power outages, the plan added.

One chief strategy in the plan is to update the state's building codes to promote the construction of more energy-efficient buildings and make it easier for the public to install solar-power systems.

In addition to rolling out more electric or hybrid vehicles in the public sector, the plan calls for converting public buses to electric motors and reducing the number of vehicles driven to work containing only one person. More sustainable transportation practices are called for, such as installing electric-vehicle charging stations and encouraging bike sharing.

Addressing climate change in Pennsylvania will place considerable reliance on public forests, like the Michaux State Forest, shown here, to act as carbon sinks. (Dave Harp)

In the energy sector, the state calls for increasing the percentage of electricity that utilities are required to generate from renewables. The list of desired renewables includes solar, wind, low-impact hydro, geothermal, biomass, methane gas, coal-mine methane and fuel cell resources.

Pointedly, the plan called for nuclear power to remain at its current level. It's not clear how that's possible, given that the Three Mile Island nuclear plant shut down on Sept. 20 and the Beaver Valley nuclear plant plans to close in 2021 unless it receives a bailout by the state legislature. Unlike states such as Illinois and New York, Pennsylvania legislators have balked at making $500 million available annually to the state's four remaining nuclear plants.

Changes to agriculture may also help reduce carbon emissions. The plan wants to see more methane gas recovered from manure and used to produce electricity, as well as more no-till farming and other conservation practices. No-till farming allows the soil to soak up more water, reducing runoff and reducing the carbon releases that occur when soil is disturbed.

Addressing climate change in the state will place considerable reliance on public forests to act as "carbon sinks."

In fact, the state Department of Conservation and Natural Resources, which owns 2.2 million acres of forestlands and advises private owners of another 17 million acres, came up with its own "Climate Change Adaptation and Mitigation Plan" in 2018.

Recognizing the importance of trees to capture carbon dioxide out of the air, the agency vowed to allow no net loss of forests in Pennsylvania.

But the projected impacts of climate change will be considerable on forests. Changes in weather will mean a loss of some tree species and the arrival of others, along with more tree-damaging insects and invasive plants. Wildfires and blowdowns from trees killed by insects are expected to increase.

State forest officials expect difficult and costly land-management changes that will affect the use of state forests and parks. With less snow, they may be used less in winter for such activities as snowmobiling. In summer, there may be overflows of visitors seeking refuge from heat, especially those parks with lakes and pools.

Among the proposed changes in forest management: less timbering to maintain the ability of forests to capture carbon; focusing on tree species expected to do well in warmer, wetter conditions; planting more streamside buffers; and protecting key tracts of land so tree species fleeing too-warm conditions can move naturally along tree corridors.

Wolf's proposed four-year, $4.5 billion "Restore PA" infrastructure initiative also touches on climate change. The program would be underwritten by a severance fee on natural gas. One of the program's five major goals is to help flood-prone communities prepare for high water by upgrading flood walls and levees, replacing high-hazard dams and conducting stream-restoration projects.

In October, Wolf took yet another anti-climate change executive action by ordering the state's environmental agency to join the Regional Greenhouse Gas Initiative, a coalition of nine mid-Atlantic and Northeastern states committed to placing limits on carbon emissions from power plants with a cap-and-trade system.

Such a system would make it more expensive to produce and use power from fossil fuels. Large power plants would have to pay for carbon emissions beyond a cap set by 10 member states. The proceeds are to be allocated back to states to be used for investing in energy efficiency and renewable energy.

Expecting pushback from the Republican-controlled legislature, Wolf used an executive order, claiming authority under the federal Clean Air Act.

"Pennsylvania's participation in [the greenhouse gas initiative] has the potential to be the most meaningful step in reducing climate pollution that the Commonwealth has ever taken, and not a moment too soon," responded the Sierra Club.

But Republican legislators are trying to block the state's participation in the initiative. In November, two bills were introduced to require the legislature to approve membership. The bills came from legislators in western Pennsylvania, the heart of the state's coal-mining region. Wolf had sought membership by July 2020.

Wolf's climate change initiatives have generally brought acclaim from environmental groups, many of whom had scolded the governor previously for not doing enough on the issue.

"These are pretty significant steps," said Ezra Thrush of PennFuture. "But [the initiative] is not enough. We need to also push for something that jump-starts the renewable energy in the state."

Late in the year, legislators introduced bills to expand solar energy and to increase charging stations for electric vehicles.

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which had been passed by an overwhelmingly Democratic legislature.

But figuring out how to reach that 40% goal hasn't gone smoothly. Lawmakers directed the Maryland Department of the Environment to draft a plan by the end of 2018 for reaching the target. The plan was to be finalized by the end of 2019, after legislators and the public had ample time to review and comment on it.

MDE missed the first deadline by more than nine months. It released a 244-page draft in mid-October, and there are no plans to finalize it until well into 2020.

"We are focused on getting the most aggressive and achievable plan possible, and it has taken some time. But it's worth it," said MDE Secretary Ben Grumbles.

The draft proposes to reduce the state's greenhouse gas emissions 44% by 2030, surpassing the requirement in state law. It lists more than 100 measures to do that, including a push to get 100% of the state's electricity from "clean and renewable" energy sources by 2040, which state officials say is one of the most ambitious goals in the nation.

But critics say the plan is not only late, it's wildly optimistic on one hand, relying on questionable assumptions and unproven technologies, and insufficiently ambitious on the other. Mike Tidwell, director of the Chesapeake Climate Action Network, said the plan's tardiness and shortcomings "would seem to call into question the governor's seriousness in truly tackling the climate crisis."

The plan proposes a few new state regulatory actions, including restrictions on emissions of hydrofluorocarbons, the climate-warming compounds used in air conditioning and refrigeration. Many others are expansions or extensions of existing federal or state efforts, or participation in multi-state initiatives.

One major new initiative is the Hogan administration's proposal to accelerate development of zero– and low-carbon sources of electricity, while expanding the definition of what those are.

Hogan had vowed in May to develop a Clean and Renewable Energy Standard, that he said would go beyond the goal set by the Clean Energy Jobs Act just passed by the General Assembly. That law, which took effect without his signature, would require 50 percent of electricity used in the state to come from renewable sources by 2030.

The new standard Hogan promised calls for getting 100 percent of the power used in Maryland from clean and renewable sources by 2040. How that would happen is only briefly outlined in the draft plan. Grumbles said it would be fleshed out in legislation to be introduced in early 2020.

This ghost forest near the Little Choptank River on Maryland's Eastern Shore is the result of sea level rise and saltwater intrusion. (Dave Harp)

In broad terms, though, the standard would seek to expand the share of energy supplied by solar projects beyond the 14.5% goal set in 2019 by the legislature. It would also provide credits or financial incentives to other energy sources not generally considered renewable or environmentally benign, including hydropower, nuclear power and natural gas.

Environmentalists object to treating those as clean — particularly natural gas, in large part because the hydraulic fracturing used to extract most of the fuel has led to groundwater contamination, methane emissions and other problems. Moved by those concerns, Maryland lawmakers voted in 2017 to ban "fracking," as the technique is often called, and Hogan signed the ban into law.

Now, though, the plan calls for developing gas-fired cogeneration facilities, which capture the heat generated while producing electricity for use in warming homes and buildings.

Critics argue that promoting more gas use is the wrong approach, and they contend that the draft plan underplays the climate-warming effect of natural gas leaks from fracked wells, pipelines and other sources. Methane or natural gas is many times more potent a greenhouse gas than carbon dioxide, at least in the short term over the next couple decades, they point out.

Instead of planning for more gas use, said David Costello, a former MDE official under Hogan's predecessor, "you really need to ramp up solar, wind and [energy] storage."

The administration's plan also doesn't spell out when or how the state would eliminate the dirtiest of its power sources: its six remaining coal plants, complained David Smedick of the Sierra Club.

Grumbles said environmentalists need to be more realistic. "Some in the environmental community want existing nuclear or existing natural gas plants to be shut down, and that's not on the table for us right now," he said. Rather than regulate facilities out of existence, he said, "we are looking at the marketplace to continue the drive for cleaner energy." In the meantime, he said, the state needs to continue relying on natural gas as a bridge fuel.

To offset the emissions from gas plants, the plan does propose the development of carbon capture and storage, in which carbon dioxide emissions would be collected and pumped deep underground. But critics scoff, pointing out that despite decades of study and pilot projects, that technology has yet to prove feasible.

Critics consider other planks in the plan similarly far-fetched, such as its reliance on a surge in electric vehicle sales to curb transportation-related carbon dioxide emissions. With the state offering tax breaks for electric vehicle purchases and installing more fast-charging stations, the plan projects that the number of these autos will soar from less than 20,000 on state roads in early 2019 to 600,000 by 2030.

"It's not a shift that we dislike … but it's just not well-supported," said Scott Williamson, an analyst with the Center for Climate Strategies, which issued a scathing critique of Maryland's draft plan in December. The center, a nonprofit think tank that helped Maryland with earlier climate planning efforts, concluded the latest draft was unlikely to achieve the greenhouse gas reductions called for by 2030 and didn't put the state on a pathway to make the even deeper cuts needed in the future.

The center also noted that the Maryland plan counts on the Trump administration failing in its moves to weaken or eliminate more than a dozen climate-related regulations, including those on coal-fired power plants and vehicle fuel efficiency.

MDE's Grumbles countered that the center's analysis of Maryland's plan includes "several errors and baseless assumptions … We know we have a very good chance at blocking key federal rollbacks in coordination with other states and ushering in technology game changers on the clean and renewable energy front in the coming years."

But Thomas D. Peterson, the center's president and CEO, warned that Maryland will surrender its leadership role among states in addressing climate change unless its draft plan is revamped. Other states already have set more ambitious goals, he said, and spelled out more far-reaching strategies for achieving them.

Maryland is in somewhat better shape than most states, Peterson said, in preparing to deal with the impacts of climate change that are already happening. The center helped prepare two reports, one in 2008 on how to reduce the state's vulnerability to sea level rise and coastal storms, and the other in 2011 on other threats to agriculture, water supply and even the Bay restoration effort.

The state has created a CoastSmart program to help coastal communities tackle storm surge, flooding and sea-level rise hazards. It offers funding to local governments for planning and training. State agencies also have collaborated on efforts to safeguard buildings and infrastructure from flooding, storms and other climate change impacts. A plan ordered by the legislature for dealing with saltwater intrusion released in December called for more research and study, and in the meantime offer financial and technical help to farmers and other landowners likely to lose croplands and forests.

The state's original climate adaptation plans were "very ambitious at the outset," Peterson said, and they've guided the state's efforts since. But more is known now, both about climate impacts and about what to do about them. It's past time for the state to produce a new, comprehensive plan.

"It's really time for them if I might say so, to get back in the saddle," he said. "It's not like nothing is going on, it's just somebody needs to put it together."

Cleanup from page 1

Voters called it a "profoundly sad and disappointing moment in Bay history," and the Chesapeake Bay Foundation said it "should put fear in the hearts of all who care about clean water."

EPA Region III issued a follow-up statement insisting that it "remains steadfast in its commitment to helping our partners implement the Chesapeake Bay [cleanup plan] to ensure the Bay and local waters are protected and restored."

But within days, Hogan was calling for legal action, and mounting concerns over the EPA's commitment became a hot topic at a U.S. Senate Environment and Public Works Committee hearing.

"We need all the states and the EPA to step up and play their appropriate roles," Maryland Environment Secretary Ben Grumbles told Van Hollen at the hearing. "Pennsylvania, in particular, has woefully fallen short … But the interstate umpire, the EPA [needs] to have the courage to step up and use the regulatory backstops that are available," he added. "It is not an aspirational role. It is an enforceable TMDL."

Years of backsliding

Though the problem has finally "come to a boil," it has been simmering for years.

Starting in 1983, the states and the EPA have been promising to deliver a healthy Chesapeake. But they missed pollution reduction goals set for 2000, and then for 2010, by wide marks.

Recognizing that their largely voluntary efforts had failed, the state-federal Bay Program partnership in 2007 established a new cleanup deadline of 2025. The states and EPA began crafting a new, more enforceable cleanup plan: the Chesapeake Bay Total Maximum Daily Load, often called the Bay's "pollution diet."

The ultimate goal remained unchanged: clearing the Bay's murky water and eliminating its oxygen-starved "dead zone." The TMDL established the maximum amount of nutrients and sediment the Bay could receive from each state and major river and still achieve those clean water goals.

The TMDL also included an "accountability framework" in which states were to write plans showing how they would meet those goals. To keep efforts on track, states set interim two-year cleanup goals, which are evaluated by the EPA and reported to the public.

If states fell short, the agency could take a variety of actions, such as forcing even greater — and more costly — reductions from wastewater plants than states had planned; regulating smaller animal operations than normally covered by federal programs; withholding water grants; taking over state permit programs; or other actions.

Water-polluting nutrients from farms originate in manure that has been applied to fields as fertilizer and from animals with direct access to streams. To meet cleanup goals, Maryland, Virginia and Pennsylvania will need to ramp up ag conservation practices to unprecedented levels. (Dave Harp)

In theory, the threat of those "consequences" — as EPA called them — would spur states to create new programs, provide more funding or establish new regulations to rein in pollution. That was particularly important for agriculture, an area over which the EPA has limited regulatory oversight.

Results have been mixed. Since 2010, the region has slashed discharges from wastewater treatment plans, which have enforceable permits. But, in all of the Bay states, pollution reductions from agriculture — the largest source of nutrients to the Bay — have been small. All states would need to ramp up their agricultural conservation programs to unprecedented levels to reach their goals.

Nowhere is the problem worse than in Pennsylvania, where the vast majority of nutrients come from its more than 30,000 farms. Annual pollution reductions from agriculture there would need to increase 67 times the rate achieved in the last decade.

In an updated cleanup plan released last year, Pennsylvania identified actions that would achieve only 75% of its 2025 goal for reducing nitrogen, the primary nutrient polluting the Bay. Even with that shortfall, the plan identified an annual funding gap of more than $300 million.

Years of budget tightening in the state have left programs without the basic staffing to implement or oversee Bay efforts — in fact, it hasn't been able to spend all of the federal grant money it receives.

Sen. Gene Yaw, the chair of the state Senate Environmental Resources and Energy Committee, told a reporter from the *Pennsylvania Capital-Star* after a Jan. 8 Bay briefing that even if the state had $300 million more, "I don't know that we'd have the wherewithal to spend it."

EPA has been citing the state for lax programs and inadequate progress since 2011. While it has twice temporarily withheld grant funding, the agency has largely avoided using more forceful consequences set forth in its TMDL accountability framework, in part out of concern that it could trigger a backlash.

"The problem with Pennsylvania didn't start with the new administration in Washington," said former EPA Bay Program Director Nick DiPasquale. "It has been long festering, and I have to say that EPA is part of the problem."

At the end of the Obama administration, the agency came close to ordering tighter discharge limits on wastewater treatment plants — a hugely expensive proposition — but ultimately didn't, DiPasquale said. "I personally have thought for a long time that the only way to get Pennsylvania to comply with the TMDL is to sue them," he added.

Enforcement opportunities

Lawyers are examining a number of options to spur greater action.

The most likely action — whether pressed by the EPA or others — is to put more pressure on regulated dischargers, such as wastewater treatment plants, industries and stormwater systems.

Like other TMDLs, the Bay plan limits discharges by permit holders, which is where the EPA has the most direct regulatory authority. For pollution sources without a permit, the TMDL counts on states to come up with plans and program that meet goals.

If that doesn't happen, and downstream clean water standards are not met, the remedy under a TMDL is to further reduce discharges from regulated sources.

Most of Pennsylvania's larger wastewater treatment plants have already been upgraded with technology that reduces nutrient pollution. Forcing them to do even more would be expensive and achieve little in the way of additional reductions.

"It would be inefficient use of those dollars to do that," said Rich Batiuk, former associate director for science with the EPA Bay Program Office. "But it would be intended to prompt the state legislators to set up a state cost-share program to help their farmers achieve millions of pounds of nutrient reductions at a lower cost."

Indeed, an EPA analysis several years ago concluded that further upgrades to wastewater treatment plants in Pennsylvania would cost $1.2 billion but yield only 2.7 million of the more than 30 million pounds of nitrogen reductions needed by the state.

But investing just $80 million in the most cost-effective pollution-control practices on farms would yield a reduction of 5.5 million pounds. Greater investments would accomplish even more.

The hope is that the threat of imposing additional costly regulatory measures would spur the legislature to act by committing to fund more economical farm practices.

"You can start to ratchet down on any point source," said Jon Mueller, vice president for litigation with the Chesapeake Bay Foundation. "And one of the things that you find is when you start to squeeze one source sector hard, there is pushback, and the pushback may come in the form of legislative change."

Instead of increasing funding, the state's Republican-controlled legislature has been cut environmental programs over the years.

The distribution of the state's population complicates the problem even more. Half of Pennsylvania drains into the Bay, primarily through the Susquehanna River, but that portion of the state does not contain anywhere near half of its population. Philadelphia drains into Delaware Bay and Pittsburgh into the Ohio River. Crafting a solution for the Bay means finding a program that also wins political support from other regions of the state.

As a result, of the three major Bay states, Pennsylvania is the only one that lacks a significant cost-share program to help fund conservation practices on farms, even though it has

Cleanup continues on page 21

Can the EPA enforce the Chesapeake Bay's 'pollution diet'?

Is the Chesapeake Bay Total Maximum Daily Load and its cleanup deadline enforceable? The answer is complicated.

TMDLs are required for any "impaired" waterbody — one that does not meet standards set by a state to ensure a waterbody is safe for people and aquatic life.

A TMDL sets the maximum amount of a pollutant that the waterbody can receive and still meet those standards. The Bay TMDL maximum "loads" are established for the pollutants nitrogen, phosphorus and sediment.

The TMDL, often called the Bay's "pollution diet," allocates those loads among the states and major rivers that drain into the Bay. It also establishes specific limits for entities with a discharge permit.

But, in a strict sense, it is not the TMDL that enforces those numbers for individual dischargers. The permits do that job — but they must be consistent with the TMDL.

"TMDLs are not self-implementable," said Mike Haire, who helped manage the U.S. Environmental Protection Agency's TMDL program for years, and now teaches environmental science at Towson University. "But," he added, "the bottom line is you can't write permits that aren't consistent with the TMDLs." And if water quality standards are not being met after those permit limits are in place — possibly because unregulated sources of runoff are not meeting their goals — the limits "might have to become more stringent than the requirements in the TMDL," Haire said.

Likewise, rules governing TMDLs do not establish deadlines, they only state that goals should be achieved in a "timely manner."

But courts have held that water quality standards are to be met "reasonably promptly," and the Bay cleanup could face a court-imposed deadline if the effort continues to fail, said Ridgeway Hall, an environmental attorney who has worked on Bay issues and written about its TMDL.

While the Bay TMDL sets limits as all TMDLs do, it has several unique aspects. It includes an "accountability framework," developed by the EPA and the states in the Bay watershed that goes beyond what TMDLs traditionally require. The framework includes a 2025 cleanup deadline that was agreed upon by the state-federal Bay Program partnership in 2007.

The accountability framework also requires states to write plans showing how they will meet cleanup goals, setting two-year milestones to provide "reasonable assurance" that they will meet their goals. Those milestones were suggested by the states.

The TMDL also outlines steps the EPA can take if states fall short of their goals for reducing pollution, including unregulated discharges from sources such as farms. Those "consequences," such as forcing further reductions from regulated sources, are grounded in the EPA's authority under the Clean Water Act.

"The contingency actions were set up to get people's attention and to recognize that there is a limited set of actions that the agency can take under the Clean Water Act," said Rich Batiuk, retired associate director for science with the EPA Bay Program Office and a key architect of the Bay TMDL. "If states want to control their own destiny, we are saying great, but you need to hold up your end of the bargain or there is a price to be paid," he said.

The Bay TMDL is also unique because its goals were adopted into the 2014 Chesapeake Bay Watershed Agreement signed by the EPA and Bay states.

Section 117g of the Clean Water Act, which creates the state-federal Bay Program, includes a requirement that the EPA administrator "shall ensure that management plans are developed and implementation is begun by signatories to the Chesapeake Bay agreement to achieve and maintain … the nutrient goals of the Chesapeake Bay agreement …"

In terms of TMDL authority, "I think 117g presses EPA into a different place than other TMDLs in other places," said Jon Mueller, vice president for litigation with the Chesapeake Bay Foundation.

— Karl Blankenship

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the largest agricultural sector.

"While Maryland and Virginia have done their fair share, Pennsylvania's legislature has dropped the ball by failing to enact legislation providing annual funding or agricultural conservation measures," said Ridgeway Hall, an environmental attorney with a long history of working on Bay issues.

If the EPA fails to act, states or organizations could take it upon themselves to oppose any new discharge permits — or existing permits when they come up for renewal every five years.

"You could do that across the board in the commonwealth of Pennsylvania within [its part of] the Bay watershed," Mueller said. "It's not the ideal way to do this," he added. "The agency can do this on its own and has said it would do."

Progress or pushback?

Some worry that could spark a backlash and lead to widespread public opposition from sewer rate payers, especially because Pennsylvania doesn't touch the Chesapeake.

Hall said that it's best for the issue to be resolved through "diplomacy" rather than going to court.

"Sometimes you have to file a lawsuit to get people's attention," he said. "But you had better be careful [that] you understand whether it is going to get positive attention or negative attention.

Stormwater, an increasing source of flooding for many communities in the Bay region, carries pollutants into waterways. Reducing pollution from stormwater in developed areas is often a complicated and costly challenge. (Dave Harp)

"Litigation can be costly, time consuming. It diverts resources and, perhaps most importantly, it gets people emotionally inflamed on both sides and burns bridges that sometimes take a long time, if ever, to rebuild."

But he and others also said legal action — or the threat of it — could prompt action by the state without having to go to court.

Ann Swanson, executive director of the Chesapeake Bay Commission, an advisory panel consisting of state legislators from across the Bay region, said movement to address Pennsylvania's shortfalls has begun, albeit slowly, but could be harmed if lawsuits push people into corners.

"We don't need to be distracted by litigation right now," she said. "We need to double down and pursue programs and funding that will deliver clean water. That is what we need, and we need it now."

Further, she said, all of the states — not just Pennsylvania — need to come up with more funding to meet their agricultural goals.

A spokesman for Pennsylvania Gov. Tom Wolf said the governor has been trying to secure more environmental funding, and a lawsuit would not help those efforts.

"Instead of protracted litigation that will take resources away from our efforts to improve water quality in the watershed and undermine the partnership that has helped make progress, Gov. Hogan's time would be better spent convincing his Republican counterparts in Pennsylvania to support Gov. Wolf's plan," said spokesman J. J. Abbott.

And while environmental groups generally supported Hogan's threat of legal action, Waterkeepers Chesapeake and the Lower Susquehanna Riverkeeper issued a statement blasting him for not doing enough. Specifically, they cited the state's recent proposed settlement with Exelon Generation Co. over impacts caused by Conowingo Dam on the Susquehanna, the Bay's main tributary in Pennsylvania.

Originally, the state had sought $172 million a year from the company to reduce upstream nutrient and sediment pollution, but its settlement secured only $19 million over 50 years.

"Why is Gov. Hogan willing to sue Pennsylvania and the EPA to force them to live up to their commitments — but happy to let Exelon, a private utility, off the hook?" asked Betsy Nicholas, executive director of Waterkeepers Chesapeake.

With growing tensions and a looming 2025 deadline, some wonder about the future of the 37-year-old Bay Program partnership.

"The partnership is known for working through very difficult, very passionate and very challenging moments," Swanson said. "And we are in one of those moments right now."

It's a 'capital' trail between Richmond and Jamestown

Cyclists stop to check a map on the Virginial Capital Trail in James City County. (Trevor Wrayton / VA Department of Transportation)

Story By Leslie Middleton

Ephraim Seidman, a cyclist from Richmond, can be found on the Virginal Capital Trail several times a week. He's not there just for fun and exercise. Seidman is one of more than 80 "trail ambassadors" coordinated by the Capital Trail Foundation.

The team of bicycle enthusiasts frequents the trail wearing bright orange vests, ready to answer questions, help cyclists with minor mechanical problems or report safety issues to the foundation.

Seidman is ready with tools for a quick fix or words of encouragement for those — on bicycle or foot — who aren't sure how far it is to the next public bathroom.

"We can also offer points of interest to folks," said Seidman, who often meets people heading out on the trail from Richmond's Great Shiplock Park but aren't sure what's up ahead.

No matter where one enters the trail, there is plenty up ahead. Following what some historians call America's "oldest road," the trail drips with history.

The Capital Trail parallels most of Virginia Route 5, a two-lane scenic byway that traverses the Coastal Plain from Jamestown to Richmond. The trail is named for the first (Jamestown) and current (Richmond) capitals of Virginia. Though the Capital Trail does not extend to Williamsburg, it, too, was once a Virginia capital.

Native Americans used this route along the north side of the James River before English colonists arrived, and settlers continued to use it as an alternative to travel and transport on the river. In the decades after the 1607 settlement of Jamestown, this "Great Road to the West" became a path of colonial expansion connecting large tobacco — and then cotton — plantations along the river.

Eventually, railroads supplanted the river as the most economical means of transport. Today, the first mile from the Richmond trailhead follows an old rail line, which qualifies the trail as a "rail-to-trail" route. All 51.7 miles of the multi-use trail are asphalt, and 10–12 feet wide, with plenty of two-way room for cyclists, parents with strollers, in-line skaters and runners.

On a bright fall morning, I pedaled one section on an electric-assisted bike. I was nursing an injured knee that was probably not up to the day's plan — about 14 miles east to Upper Shirley Plantation and back. Almost immediately, the mechanics of riding the bike took a backseat to the trail and scenery I was rolling through.

The trail is separated from the roadway by a healthy buffer of grass or trees its entire length, giving cyclists freedom from the vigilance required when sharing the road with cars and trucks. While commuters, trucks and tourists whizzed by on one side, I was free to gaze across acres of soybeans and corn passing by at a pedaling-assisted speed averaging 10–12 mph.

It's this sense of safety — and the scenery — that has made the Capital Trail popular. Cat Anthony, executive director of the Capital Trail Foundation, said it appeals to everyone, from children just learning how to ride a bicycle to adults who are trying to log 100 miles or more in a day.

"This past year we had over 900,000 riders," she said, "and that includes many who might be curious about riding on a bike trail, but may feel intimidated by the prospect."

Along the trail there are at least 43 historic markers, with more in the making. And coasting to a stop on the trail is a whole lot easier than trying to read these signs from behind the wheel of a car moving 55 mph.

One Henrico County sign describes the 1799 "Pleasants vs. Pleasants" lawsuit that affirmed the manumission of more than 100 enslaved people once owned by the Quaker, John Pleasants. Many settled together to form the nearby Gravely Hill community.

Another sign tells of early settler John Rolfe, who cultivated tobacco from seeds bred in Varina, Spain, now the name of a nearby town. Rolfe's crop gave the Virginia Company of London confidence in the "New World" venture and ultimately gave rise to a U.S. econo-

The Virginia Capital Trail crosses numerous wetlands and creeks that drain to the James River, giving riders intimate glimpses of the river's watershed. (Al Covey / VA Department of Transportation)

Riders breeze below the overhead tangle of highways on an extension of the Virginia Capital Trail just west of Great Shiplock Park in Richmond. The trail takes its name from its route between Jamestown, the first state capital, and Richmond, the current capital. (VA Department of Transportation)

my dependent on the slave trade.

I also passed a sign marking the nearby site of the Malvern Hill manor house, built in the 1600s and replete with historic happenings. The Marquis de Lafayette camped there in 1871, as did the Virginia militia during the War of 1812. It was also where Lee's Confederate Army forced McClelland's Union troops into retreat in 1862. It later became a federal headquarters.

Though the remains of the Malvern homestead are not open to the public, more than a dozen plantation homes located within a mile or two of the trail open their gates for house tours, strolling the grounds or overnight visitors.

It was a perfect fit for Cindy Westley of Afton, VA, who was looking for a ride she could do with her brother who was visiting from out of state. "I have a cousin in Williamsburg, and a brother who likes to cycle," she said, so they spent two nights at the North Bend Plantation — one after the first day's ride from Richmond, and a second night after returning from cycling on to Williamsburg.

Built in 1801 for Sarah Harrison, wife of the ninth president William Henry Harrison, the house — now a bed and breakfast — has been in the family ever since.

"It's very possible to do the trail in sections like this," said Westley, who didn't have much long-distance cycling experience and was pleased to discover her ability to ride 30 miles a day on the mostly flat Capital Trail.

And the sense of history was a surprise. "I've lived in Virginia for 35 years, but I wasn't really familiar with these James River plantations," she said. They enjoyed the signage and could go online in the evening to learn more about their day's ride through Virginia history.

The endpoints of the trail are of course notable attractions, too. The site of historic Jamestown, which the English established as the colony's first seat of government in 1607, was planted in the middle of a landscape occupied by the Powhatan people and neighboring native communities. In 1699, the Virginia capital moved to Williamsburg.

For almost 100 years, factions of Virginians argued for a different seat of government. But it wasn't until 1780 — when the colonists were in the middle of their revolutionary separation from England — that the capital was moved to Richmond, in part to be less vulnerable to British troops.

While the signs and attractions along the trail illuminate layers of Virginia history, the special black-and-white Route 76 sign at trail's mile marker 36 highlights another more modern route, well-known to cyclists. Here, the Transatlantic Bike Route 76, created to celebrate the nation's bicentennial, meets the Capital Trail.

Every year since the first "bike centennial" in 1976, thousands of riders depart from Astoria, OR, and ride more than 4,000 miles to finally arrive — weeks and sometimes even months later — at the Capital Trail heading toward their destination in Williamsburg.

Trail ambassador Seidman, who has ridden these last miles with some of these racers, said that by the time the riders reach the Capitol Trail, its safety and ease are a huge relief.

The trail's proximity to the river in the Coastal Plain assures a relatively flat ride. There's only a 160-foot elevation change over the 52 miles between Richmond and Jamestown, according to a handy tool on the foundation's website that shows where the "major" hills are located.

But there are really only two: one at mile marker 48 a couple of miles south of Richmond and the other at mile marker 7 on the bridge that rises 52 feet over the Chickahominy River at its confluence with the James. Most cyclists stop here to catch their breath and take in a view of both rivers. It's worth planning at least one trip that includes a climb to the top of this bridge.

For my e-bike experiment on the Capital Trail, I pedaled nonstop to the Upper Shirley Plantation and Vineyard, which was a mile and half off the trail itself, like many of the historic plantations and sites along the trail. The hard-packed sandy road led toward the James River between broad fields dotted white with the remnants of this year's cotton crop. At Shirley, I stretched my legs above the river at the oldest working plantation in the country.

On the way back, I was grateful for the e-bike's electric assist mode, yet watched the battery gauge with some nervousness on the last few miles. I rolled into the parking lot just as the battery went dead, handed over my rental bike, and grinned.

I'd spent four wonderful hours on "the Cap." My knee was doing just fine. It had been a really fun way to be outside, rolling through Virginia history.

Visit these websites for maps, suggested itineraries and resources along the Virginia Capital Trail, including bike rentals, restaurants, campgrounds, parking, restrooms and historic attractions:

- virginiacapitaltrail.org
- route5va.org

The Virginia Capital Trail largely follows a scenic byway and is safely separated from road traffic, making the trail popular with pedestrians and cyclists of all skill levels. (Leslie Middleton)

Birds and birders alike still flocking to Cox Creek

Tim Carney of the Maryland Environmental Service searches for birds at Swan Creek, located near the Cox Creek dredged material placement site on the Patapsco River. (Whitney Pipkin)

By Whitney Pipkin

One of Maryland's top birding sites is not as open to the public as it used to be — but no one told the birds.

From their vantage point, the Cox Creek dredged material placement site just southeast of Baltimore on the Patapsco River offers about 100 acres of shallow, brackish waters with easy eating for wintering ducks. In the summer, it functions as mud flats for shorebirds rarely seen this far from the beach.

The 11-acre wetland along Swan Creek, just a stone's throw away, provides habitat to orchard orioles and Virginia rails. And from the backdrop of a protected forest, eagles regularly swoop in for a feast.

None of them seem to mind the constant beep-beep-boom of construction equipment preparing the site to receive more sediment dredged from Baltimore's shipping channels.

The Maryland Port Administration purchased the Cox Creek site from the U.S. Army Corps of Engineers in the 1990s and opened it for the placement of dredged material in 2006. The process creates flats and shallow water areas that attract a variety of birds. Combined with the creation of the Swan Creek wetlands, the site has taken on a lively secondary role as a destination for birders and school groups.

Ultimately, the site is industrial, said Tim Carney, senior environmental specialist at the Maryland Environmental Service. Carney is the official bird observer for Cox Creek and other dredge material sites in the state.

"In so many decades, it could be an auto terminal," he said. "But, for now, the birds love it because it's easy foraging."

The birders love it, too. Together, Cox Creek and Swan Creek have been ranked among the top Maryland sites on ebird.org for the last three years, with about 280 species spotted on the grounds. Carney, an avid birder himself, said he's completed only two 100-plus-species checklists: one at Cox Creek and the other in Costa Rica.

"Pretty much every habitat is here — except for a freshwater stream," he said.

Public access to the site has been reduced recently because of the flurry of construction activity taking place. A former copper refinery is being demolished to expand the receiving area for dredged material, and crews are working to widen the dikes around the edge of the containment cell where the material is placed.

Still, with a little planning, birders can find their way onto one of Carney's popular guided tours, which are now the only way to visit the site. The next tour takes place on Sat., Jan. 25, and the best way to get on the list is to email him at tcarney@menv.com.

The 3-mile walks take visitors around the perimeter of the watery containment cell that juts into the Patapsco River. A longer stop at a bump-out from a former road takes visitors partly across the cell, close to where birds tend to congregate.

The four-hour tour also includes a guided walk through the Swan Creek wetland.

On a recent morning, a raft of more than 1,200 ducks floated in the waters of the containment cell. Carney got out his scope to identify species in the group, which included mostly greater and lesser scaup and ruddy ducks.

In January, when many of the shallow-water habitats in the area have frozen over, "we'll have ducks by the thousands," he said.

In the warmer months, similar numbers of shorebirds show up at the site, picking through the freshly turned sediment looking for food. Sandpipers and plovers are a rare sight this far from the beaches of Delaware, and Baltimore area residents flock to the site's guided tours to see them up close.

"A lot of the walks we do focus on looking at all the little brown things that look the same, because there could be 30 different species in there," he said. "For birders, those are new birds for their list and a chance to see something they might not normally see around here."

Carney uses a clicker to count birds in groups of 10s or 50s, hoping all the while that a local pair of peregrine falcons doesn't put them to flight when he's in the middle of a tally. Counting birds, especially in the wetland, gives

An American golden plover pays a visit to the Cox Creek dredged material placement site in Baltimore. The variety of birds observed there have made it one of the top birding sites in Maryland. (Tim Carney)

Participants on a tour of the Cox Creek dredged material placement site in Maryland line up to photograph the birds they observe. The adjacent Swan Creek wetlands, right, also draw a wide variety of birds. (Photo left / Tim Carney, right / Maryland Port Administration)

managers a sense of how the environment is changing or improving over time. If a bird shows up one year and breeds the next, that's a good sign.

The Swan Creek wetland was created a couple of decades ago to offset the impact of the Cox Creek facility on river's shoreline. The port administration armored the dikes at the containment facility to make them more stable after purchasing the property, which took up an additional 4 acres of river. The 11-acre wetland was created to mitigate the impact, said Jessica Keicher, lead environmental specialist for the Maryland Environmental Service.

Carney said that the wetland creation began with the aggressive removal of the invasive phragmites plant and continues with ongoing maintenance and plant surveys.

"The birds that are here now probably wouldn't be here if it were a phrag jungle," Carney said as he walked the path winding through the wetlands.

Overhead, a late-migrating osprey flew toward the tree line carrying a breakfast of fish. Nearby, a kingfisher eyed the still water below his perch on a post. The less obvious birds, though, are the ones Carney is always straining to spot.

In the fall, he can almost set his watch by spotting a Nelson's sparrow in this portion of the wetland, a little orange-brown bird similar to a saltmarsh sparrow that gets regulars excited. Virginia rails overwinter in the thick marsh cover here, Carney said. Though they're hard to spot, the chickenlike marsh birds sometimes respond to a recorded call.

Orange-and-black orchard orioles used to nest here every year, before a beaver took down their favorite tree. And a rare black rail was spotted here several years ago, "before my time," Carney said.

Carney counts himself lucky to spend as much time as he does at this and other dredged materials sites in the state, where he monitors bird populations and leads tours. Cox Creek is one of four sites that receives or has received dredged material, creating new habitats in the process. Poplar Island and Hart-Miller Island no longer receive newly dredged sediment but are still well-known for the birds they attract. Masonville, in Baltimore, is still an active placement site. It is also home to the Masonville Cove Environmental Education Center, a popular base for nature walks.

The relationship between birders and these highly used sites is always subject to change, Carney said, but the port "knows how important the birding outreach is."

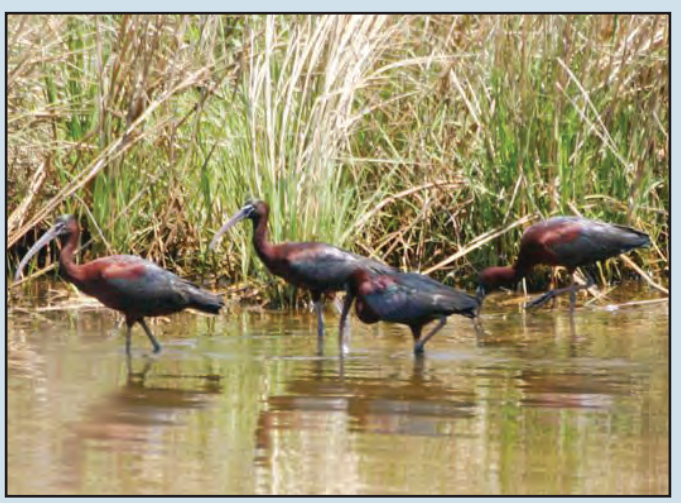
Offering guided walks, even as activity ramps up at Cox Creek, is an olive branch to birders who have long enjoyed the site.

And, Carney said, it's a fresh invitation to those who have not yet visited.

Plan ahead for visits to Maryland's dredged material placement sites

The Cox Creek dredged material site and Swan Creek wetland are located at 1000 Kembo Road in Curtis Bay, MD. For information, visit Marylandports.com/greenport. For information or to register for Cox Creek birding tours (which are free and occur at least once a quarter), email tcarney@menv.com. The next tour takes place Jan. 25. Guided tours will be scheduled at least quarterly throughout the year. Other sites related to dredged material placement are also open to the public:

- Masonville Cove is the most accessible site, established over the last decade as an urban wildlife refuge in Baltimore. The campus is open from 9 a.m. to 4 p.m. Monday through Friday and 9 a.m. to 1 p.m. Saturdays. Visitors must sign in at the education center upon arriving, but admission and parking are free. Visit MasonvilleCove.org.
- Maryland's Hart-Miller Island State Park in the Chesapeake Bay is accessible only by personal boat and open 8 a.m. to sunset, May to September, with options for camping.
- Tours of Poplar Island, which was reconstructed with clean dredge materials, must be scheduled in advance by contacting the tour coordinator. Email poplartours@menv.com.



Ibis wander the shoreline at the Swan Creek wetlands. (Maryland Port Administration)

SNOW WHAT? REALLY COOL FLAKE FACTS!

Snow was reported on the ground of all 50 states for the first time on Feb. 12, 2010. Here are other puzzling points to ponder while shoveling your driveway or walkway. Answers are on page 36.

1. True or false? No two snowflakes are exactly alike.

2. True or false? All snowflakes have six sides.

3. Snowflakes are not white. When light hits a snowflake, instead

of being absorbed and revealing the flake's true color, the light bounces off the flake's faceted surface in many directions, which prevents the true color from being revealed and makes it appear white.

So, what is a snowflake's true color?
A. Pale blue
B. Pale lavender
C. Pale gray
D. Colorless

4. How many water molecules are in a typical snowflake?
A. 18,000
B. 180, 000
C. 180 million
D. 180 billion

5. Visit snowcrystals.com to see at least 35 types of snowflake shapes. (The snowflake shapes we're most familiar with are the dendrite or star shapes.) Which of these are not flake shapes?
A. Columns
B. Needles
C. Plates
D. Spirals

6. According to the National Snow & Ice Data Center, snow is a mineral. Which of these is not one of three criteria that snow had to meet to be classified a mineral?
A. Naturally occurring solid
B. Cold to touch
C. Inorganically formed
D. Definite chemical composition

7. How fast do snowflakes typically fall?
A. 1.1 miles per hour
B. 2.1 miles per hour
C. 3.1 miles per hour
D. 4.1 miles per hour

8. Was that snowstorm a blizzard, snowburst or snow squall? Match each to its description:
A. A strong-winded snowfall that doesn't last very long
B. A storm where snow accumulates very quickly in a very short time
C. A snowfall that lasts three hours or longer with winds of at least 35 mph and less than 0.25 miles of visibility

9. How is snow helpful?
A. It recharges streams, rivers and groundwater.
B. It washes pollutants out of the air.
C. It serves as a thermal insulator by conserving Earth's heat and protecting crops and other plants from subfreezing temperatures.
D. All of the above

10. When snow is forecast, your author worries if she has enough chocolate to ride out the storm. For others, a snowstorm and related situations are a much more serious fear that prevents them from even thinking about going outside or living an ordinary life. Match these phobias with their names.

– Phobia –
cold
severe weather events
snow
wind

– Phobia Name –
ancraophobia
chionophobia
cryophobia
lilapsophobia

— Kathleen A. Gaskell

A light snow the night before creates a perfect setting for a winter walk on Taylors Island in Maryland. (Dave Harp)

Eye want you to be safe!

Visibility is one way to measure a snowfall's intensity (the other is depth). Here is what the forecast means when it states visibility:

- Light: Visibility is greater than 1 kilometer or 0.6 miles
- Moderate: Between 0.5–1.0 of a kilometers or 0.3–0.6 of a mile
- Heavy: Less than 0.5 kilometers or 0.3 of a mile

Consider this information when heading out in your car in a snowstorm.

This quiz could have asked you what the medical name for snow blindness is (photokeratitis). Instead, it will tell you to wear eye protection such as sunglasses or goggles to help absorb the high level of ultraviolet radiation that reflects off snow and could burn your eyes.

There are plenty of winter outdoor activities in the Chesapeake watershed. Here are scrambled names of ways to have fun outside in the winter. Unscramble the words and put them in the spaces. Some of the letter spaces will have a number below them. Place these letters in the blanks with the matching number at the end of the puzzle. When you are finished, the blanks will spell another fun pastime for when you come inside. Answers are on page 36.

1. D S I N G L E D
_ _ _ _ _ _ _ _
9 27 4 4

2. S O R C S C Y N T O U R
_ _ _ _ _ _ _ _ _ _ _ _ _ _
18 1 6 21 9 18 12 13 15 1

K I N G I S
_ _ _ _ _ _
9 26

3. G I N B A N G T O O G
_ _ _ _ _ _ _ _ _ _
14 6 11 12 25

4. A K M E W O N S
_ _ _ _ _ _ _ _
10 26 17 21 7

F R O S T
_ _ _ _ _
7 1 15 21

5. F L E I W I D L
_ _ _ _ _ _ _ _
4 17

W A G C H I N T
_ _ _ _ _ _ _ _
22 14 18 16

6. P A N G P I T S L A P E M
_ _ _ _ _ _ _ _ _ _ _ _ _ _
15 3 23 23 3 23 20 21

O R F P R U S Y
_ _ _ _ _ _ _ _
6 1 9 1 13 23

7. K A S T I N G
_ _ _ _ _ _ _
9 8 10 14

8. B L O W N S A L G I F T H
_ _ _ _ _ _ _ _ _ _
21 7 5 25 19 15

9. C I E S H I G N I F
_ _ _ _ _ _ _ _ _
18 24 9 16

10. W O O S H N I N E G S
_ _ _ _ _ _ _ _ _
9 7 21 16 6 2

Inside activity: _ _ _ _ _ _ _ _ _
1 2 3 4 5 6 7 8 9

_ _ _ _ _ _ _ _
10 11 12 13 14 15 16 17

_ _ _ _ _ _ _ _ _ _
18 19 20 21 22 23 24 25 26 27

— Kathleen A. Gaskell

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A photographer captures the last rays of a setting winter sun on Hoopers Island in Dorchester County, MD. (Dave Harp)

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As it is buried under waves of silent snow, does this whelk dream of quiet tides in warmer waters? (Dave Harp)

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A silent sentinel stands watch in the winter snow. (Dave Harp)

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Commentary • Letters • Perspectives

Of bivalves & beavers: Let's leave our landscapes to these experts

By Tom Horton

They might seem an odd couple, *Crassostrea virginica* and *Castor canadensis* — the Eastern oyster and the North American beaver.

But ecologically, for the Chesapeake Bay, the mollusk and the rodent are a lovely pairing, a compelling linkage of water and watershed.

Both were keystone species, the one's dense reefs and the other's ubiquitous damming and ponding create habitat and enhance water quality to the benefit of a host of other species.

Both have been reduced by overharvesting or pollution to a sliver of their historic abundance. This happened so long ago that today we suffer societal amnesia about how the Chesapeake's bottom and its landscapes looked and functioned for thousands of years before Europeans shattered the natural order.

The oyster part of the story has been emerging, with scientific estimates that the Bay's original stocks filtered and cleansed water equivalent to the estuary's entire volume every several days. Today's remnant oysters take months or more than a year.

But we still scarcely comprehend the immense habitat value for other estuarine life attracted to the countless nooks and crannies of the extensive, vertical reefs that oysters built. That's because in modern times it has seemed natural for oysters to be spread widely and thinly across the Bay's bottom. An 1869 account described a "continuous oyster bed" stretching 140 miles along the Eastern Shore, from Kent Island in Maryland to Cape Henry in Virginia.

But the current "natural" state is an artifact of more than a thousand dredge boats and many thousands of tongers, breaking apart and scattering the natural reefs before science could even understand their nature.

And the new order might have seemed an improvement, as oysters freed from reefs grew faster, shapelier, easier to harvest — never mind the lost habitat and new vulnerability to smothering by sediment.

The beavers' tale is similar. For millennia, they inhabited virtually every stream of the 64,000-square-mile Bay watershed; and they controlled how the land shed water — cleanly, clearly, slowly — in a manner almost unrecognizable today.

We understand how green the pre-colonial Bay watershed was; we seldom realize how wet it was.

Advocates say enlisting the help of beavers will aid streams and the Bay's restoration. (Dave Harp)

Chesapeake Born

I got a glimpse of that well-beavered landscape on a recent foray with stream restoration expert Scott McGill. He wanted to show me his cutting-edge transformation of a half-mile-long, badly eroding gully that flows through Baltimore County into the Big Gunpowder River, a Chesapeake tributary.

This Holy Grail of restored streams looked … well, horrible. It was not the picture-postcard babbling brook that meanders, pools and riffles in an eye-pleasing cascade of sparkling water contained by forested banks. That is the stuff of calendars and posters and is "natural" only in our historical and ecological blindness, McGill said.

Instead, he had just bulldozed the gully's 12-foot banks into the channel, along with all of the surrounding trees, resulting in, its creator said proudly, "a muddy mess."

We could mostly *hear* the water, down there somewhere, gurgling, oozing, glinting occasionally from beneath a morass of mud and decaying logs.

Almost unwalkable, it recalled the landscapes that often caused the 1804 Lewis and Clark expedition to abandon the stream valleys for the slopes. The reason: Beavers had dammed and ponded everywhere, creating broad, shrubby, soggy meadows. The single channel stream that is today's ideal was in fact more the exception than the rule.

On the Chesapeake, it was the same. Rainfall did not rush to the Bay. It oozed and seeped, soaked into the ground, then reappeared, its energy dissipated through multiple flow ways.

Sediment settled out in ponds behind dams that might occur every 50 yards on some streams. Nitrogen, the Bay's prime pollutant today, was digested in the beaver-created wetlands and turned to harmless nitrogen gas. And the ponded landscape was lush with waterfowl and all manner of amphibians, not to mention otter and muskrat.

As with oyster reefs, those landscapes have been gone so long that we've forgotten what they looked like. Also like oysters, the trapping out of beaver — by the mid-1700s on the Chesapeake — likely was seen as beneficial.

Some of the richest farmland was the deep bottom sediments of vanished beaver ponds. Settlers heading west knew the best places to graze their livestock were the fecund oases of grasslands that sprang up where beavers had once dammed.

As your eyes and your brain adjust to what McGill has done to the Baltimore County gully, you begin to notice his "mess" is aflutter with butterflies, hopping with frogs and ablaze with the flowering of asters, daisies, Joe Pye weed and the new growth of willows.

He did this restoration, McGill said, for about a tenth of what a traditional job might have cost. Traditionally, you'd bring in rock, engineer a winding channel with stabilized banks. It would all look quite lovely — until a big storm blew it out.

I saw such blowouts of some of the most pristine streams in Maryland after Tropical Storm Agnes' historic deluge in 1972. I thought at the time it was just nature's way, but that was just my amnesia. I realize now that a beavered landscape would have been more resilient.

McGill said his measure of restoration success may come years after he's done — if beavers move in, "and improve on anything I can do."

A restored Chesapeake could use lots more oysters and beavers. Work on the former is well under way, with Maryland and Virginia creating sanctuaries where reef building can once again occur. Watermen, and to a point the Hogan administration, oppose this as a loss of fishing opportunity.

Beavers, meanwhile, are coming back on their own, though they are frequently trapped and killed as nuisances who chew down trees for food and dams and whose dams cause flooding. New Englanders, Canadians, several western states and even Mongolia are finding ways to peacefully coexist with all of this, having learned that the benefits of beavers far outweigh the costs.

McGill is an apostle for how to share the watershed with beavers, using "beaver deceiver" devices such as pipes placed in their dams to control flooding. He is organizing a major conference on beavers (BEAVERCON 2020) near Baltimore this March to spread the good word.

No doubt there will be limits to re-beavering and re-oystering in a watershed pushing toward 18 million humans; but for now, the main limit is our ecological amnesia.

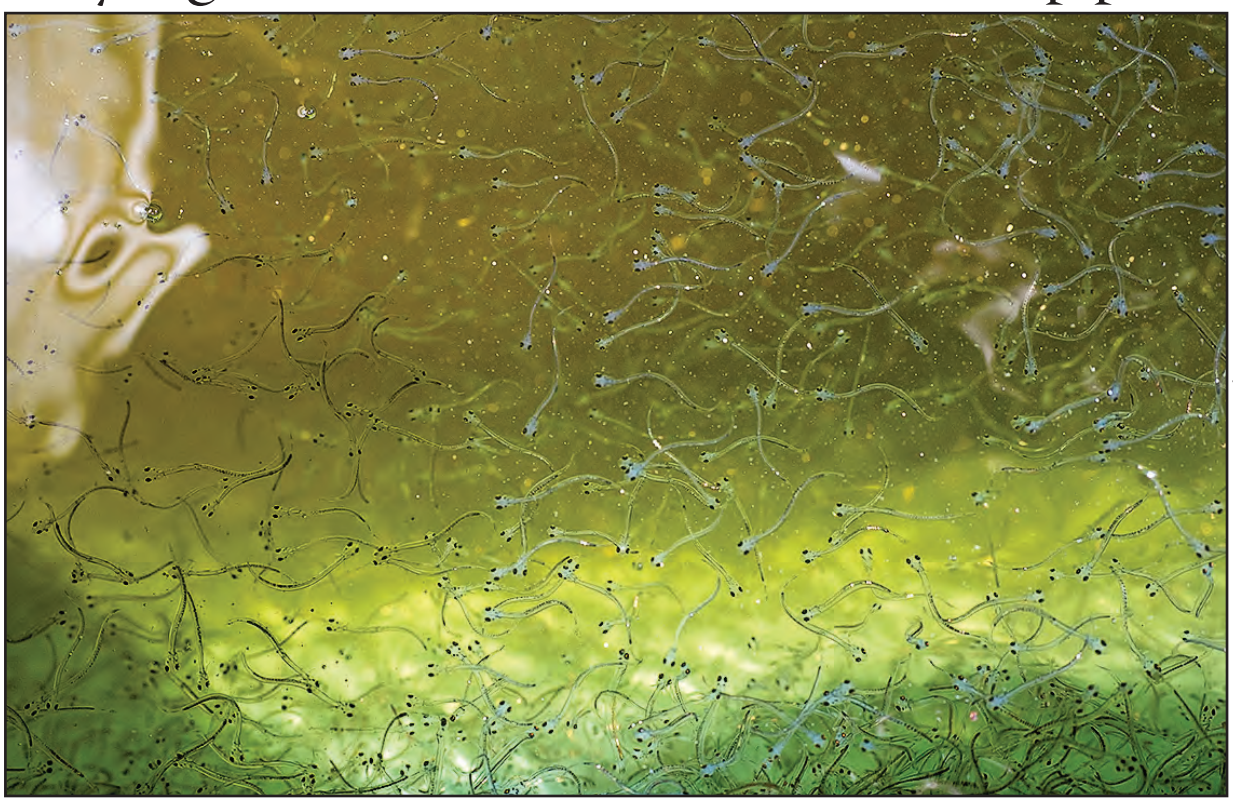
Tom Horton has written about the Chesapeake Bay for more than 40 years, including eight books. He lives in Salisbury, where he is also a professor of environmental studies at Salisbury University.

Forum

Commentary • Letters • Perspectives

36 years after first Bay Agreement, its restoration is still a pipe dream

By Gerald Winegrad



Larval shad swim at the Van Dyke Shad Hatchery in Pennsylvania. In 2019, the hatchery released the smallest number of fish in its history. In Virginia, shad runs on the James were worst ever. Maryland and Delaware fared better, with a record run on the Potomac. (Dave Harp)

December 9 marked the 36th anniversary of the signing of the first Bay Agreement at George Mason University in Virginia.

As a state senator serving on the Chesapeake Bay Commission, I joined 700 Bay enthusiasts as witnesses. The one-page Chesapeake Bay Agreement was signed by Maryland, Virginia and Pennsylvania's governors, DC's mayor, and the head of the U.S. Environmental Protection Agency, all of whom solemnly pledged to restore the Bay. I was also a member of a workgroup that recommended legislative actions for each signer that would aid the Bay's restoration, including a phosphate detergent ban that I sponsored and was enacted in 1985.

All of the attendees — elected federal and state politicians, scientists, administrators and environmental leaders — were optimistic that the herculean task ahead would lead to the Chesapeake's restoration. The optimism was fueled by the display of bipartisanship that led to President Ronald Reagan declaring in his 1984 State of the Union address, "Though this is a time of budget constraints, I have requested for EPA one of the largest percentage budget increases of any agency. We will begin the long, necessary effort to clean up a productive recreational area and a special national resource — the Chesapeake Bay." The formal Bay Program under the EPA was established with $10 million in funding.

In Maryland, under the leadership of Gov. Harry Hughes, 10 major Bay initiatives, were enacted in 1984, including the Critical Area Law, as well as the addition of significant funding and staff to move us forward. Many other laws followed, including those that protect wetlands and forests and ban detergent phosphates.

But looking back to our optimism in 1983, if we were to have created a nightmare scenario for the Bay, it would be the one we are living in 36 years later!

Make no mistake — without the Bay Agreement and the Bay Program, the Chesapeake would be much worse. Reductions in nutrients and sediment have been achieved despite significant population growth, from 13 million watershed residents in 1983 to 18.3 million today.

Still, Bay restoration is floundering and the situation is dire:

- We have so poisoned our waters that reports abound of serious flesh-eating infections in humans who come into contact with Bay waters. My Annapolis car mechanic, an avid fisherman, contracted a serious infection while fishing the South River and was hospitalized with a chronic wasting disease eating his leg away. He died a year later. This is not an isolated case of life-threatening infections around the Bay.
- Most of the Bay's waters remain severely degraded with 58% of its waters so polluted they fail to meet basic Clean Water Act requirements.
- The dead zone in the Chesapeake grew in late July, covering two cubic miles and making it the second-largest late-July dead zone since 1985. The average size for that time period is 1.34 cubic miles. Overall, the summer dead zone was the third largest recorded.
- Collapsed fisheries — oysters, shad and soft clams — are at or near record lows.

Rockfish numbers have seriously declined, leading to a mandate from the Atlantic States Marine Fisheries Commission to reduce harvest.

The moratorium on shad harvest has been in effect for three decades with little recovery. The shad restoration goal, agreed to by the Bay states in 2000, for returning spawning shad at the Conowingo Dam was abandoned when there was near zero recovery.

Adult oysters, the most important keystone Bay species, declined 50% in Maryland from 1999 to 2018 despite public funding for oyster restoration exceeding $50 million. Oysters are at 1% of the historic levels of the 1880s. More than 70% of the oyster bars in Maryland are useless for growing oysters because of excess sediment flows, mostly from agricultural operations, hindering recovery. In 2019, the spat set was so low there were not enough seed oysters to replant baby oysters in key areas of the Chesapeake. Oysters filter the water and its nutrients as well as serve as "coral reefs" in the Bay: a foundation for thick, healthy oyster bars.

Bay states failed to meet their 2010 deadline for increasing oysters tenfold. In 2014, the states responded by eliminating this goal as oyster populations declined. The time for a closure of the wild oyster harvest is now, with a transition period to move watermen to aquaculture.

- Bay grasses, another essential living resource, are at only 56% of the 185,000 acres originally pledged by the states in 2000 to be attained by 2010. The response by the states in 2014: set an interim goal of 100,000 acres in 2017 and declare success when it was met while remaining far from a delayed goal of 185,000 by 2025. Underwater grass acreage will likely end up being significantly lower when results from last year's survey are complete.
- Many toxic hotspots remain.

What happened to our lofty commitments?

The years from 1983 to 2010 were marked by voluntary efforts under new Bay Agreements signed in 1987 and 2000 in which the states committed to take the actions necessary to meet nitrogen and phosphorus reduction goals aimed at restoring water quality. The voluntary efforts resulted in repeated failures to meet these goals with serious consequences for water quality, living resources and humans. But there were no consequences for the elected officials and states that violated their pledges.

In 2010, the EPA was required, in the settlement of a lawsuit, to impose a pollution diet with hard caps on nutrients and sediment called a TMDL (total maximum daily load). The EPA listed potential sanctions — some very consequential — for failure to take the actions to achieve 60% of the pollution reductions by 2017 and 100% by 2025.

Again, the states failed to meet many of these requirements in 2017, especially for nitrogen. The emasculated EPA fecklessly failed to take any action against even the most recalcitrant states such as Pennsylvania.

We have excelled at nutrient reductions from wastewater treatment plants through the expenditure of billions of dollars and tougher federal limits on such dischargers. The reduction from

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these plants is "the" singular success story of the Bay restoration efforts as reductions occurred despite wastewater flows increasing significantly to serve a much greater population. The phosphate detergent ban helped in these efforts.

Federal Clean Air Act restrictions have also resulted in significant reductions of nitrogen from atmospheric deposition, especially with tougher new emission controls and the decline of coal burning for electrical generation. Unfortunately, President Trump is undoing these Clean Air Act regulations and promoting coal burning.

We have done the easier things even though decisions made to achieve the great reductions in nutrient flows from sewerage plants, such as the phosphate detergent ban and later the Flush Tax, were not easy.

But now that these reductions have been achieved, the states are faced with much more difficult requirements to reduce nonpoint pollutants, especially those from farm operations — the number one source of nitrogen pollution — and stormwater from developed lands. The latter is expensive to achieve as is upgrading septic tanks for better nitrogen removal. Clamping down on farm pollutants, especially from manure, is the most cost-effective choice we can make and yet efforts lag.

The states are reluctant to enact better regulatory measures governing agriculture. This is compounded by much more intensive agricultural operations, especially large chicken and other manure-producing operations and the expansion of nitrogen-intensive crops such as corn and soybeans.

Unfortunately, the EPA, elected officials and most of the environmental community believe the answer lies in throwing more money at famers to pay them not to pollute. Fully 40% of farm income this year comes from federal subsidies. Farmers have been given more than $1 billion in the Bay states from state and federal sources to reduce nutrient and sediment flows. This carrot approach must now be augmented with some sharp sticks strictly regulating farm pollutants.

Consider that Pennsylvania must reduce its nitrogen loads by more than 30 million pounds in the next five years to meet its TMDL goal, a staggering increased rate of 67 times previous annual reductions. With no new meaningful initiatives, there is a near zero likelihood of achievement even though Pennsylvania is responsible for 40% of the Bay's nitrogen flows.

Juvenile oysters from UMCES Horn Point Oyster Hatchery are shot into Tred Avon waters using high pressure water. 2019 was a bad year for oyster reproduction due to excessive freshwater in the Bay in spring and early summer. (Dave Harp)

Maryland must reduce nitrogen flows by 2025 by 9 million pounds, including a ramp-up in its annual rate of farm nitrogen reduction of 6.4 times to meet its TMDL requirement. Yet the state's watershed implementation plan lacks any new policies or funding to get the job done.

Since the TMDL was established, 84% of Maryland nitrogen load reductions came from wastewater treatment and those reductions will soon play out and may begin to increase over time. During that same period, only 16% of the state's nitrogen reductions came from agriculture — the cheapest per pound to achieve — but the political will is lacking to better regulate this major pollutant source.

Then there is the problem of increasing pollution loads from new developments and the failure to reduce loads from existing impervious surfaces. Stormwater rates, volume and pollutant flows from new development must not be allowed to exceed the pre-development flows from storm events, including those from increasingly intense storm events. Funding to accomplish the massive multibillion-dollar existing stormwater problem must also be achieved.

Exacerbating these grave problems is the lack of political will to restore the Bay. The Trump administration's first budget proposed eliminating all of the funding for the Bay Program. The U.S. House of Representatives passed riders in 2017 and 2018 to prohibit any enforcement by the EPA of the EPA-imposed limits under the Bay TMDL, though they did not win approval in the Senate. And, the states are not initiating the bold actions needed to address these pollutant flows for agriculture and developed lands.

Now, the situation has grown worse: The hopes that were rekindled when the EPA set the states on a mandatory pollution diet with potential grave consequences for failure to comply have been shattered. Dana Aunkst, the director of the EPA's Chesapeake Bay Program, has now stated that the TMDL with its 2025 pollution caps is "an aspiration" and not an enforceable deadline. Aunkst stated that "The TMDL itself is not enforceable." This seems to make the whole TMDL exercise a house of cards now collapsing. Without a court victory, we are back to voluntary efforts. At no point since 1983 has saving the Bay been at a lower ebb.

We know that reducing nutrients and sediment works to restore water quality. We know the sources of these pollutants. We know what needs to be done to restore our treasured Chesapeake Bay.

What is most needed is strong political leadership that is so sorely lacking. Also needed is a more forceful and politically effective environmental community promoting aggressive changes to better regulate farm pollution, development pollution and forest loss. We can get it done but not with the current attitudes and near-sighted leadership.

Gerald Winegrad served in the Maryland legislature for 16 years and led efforts to restore the Bay. He chaired the Senate Environment and Chesapeake Bay Subcommittee and has taught graduate courses in Bay restoration since 1988. The Washington Post called him "The environmental conscience of the Senate." He can be reached at: gwwabc@comcast.net.

Letter to the Editor

Cutting edge data sharpest tool in cleanup toolkit

We appreciate the *Bay Journal*'s excellent in-depth reporting on the Maryland counties that are working to strengthen their forest conservation laws: Anne Arundel and Howard. (See *Forest conservation bills rippling through Maryland counties,* December 2019) The articles should be mandatory reading for every elected official in the state and in fact, the entire Chesapeake Bay watershed.

There are 18 million people in the watershed, and by 2050, we expect 4 million more.

To contend with these demands and challenges to our ecosystem, Maryland should be leading the way on forest expansion. Howard and Anne Arundel counties are trailblazers. The rest of Maryland must follow.

To do so, our leaders should remember the adage, "information is power," when making decisions about land use.

Recently, through a grant from the U.S. Environmental Protection Agency, the Chesapeake Conservancy's Conservation Innovation Center and partners produced high-resolution land cover data that is 900 times the resolution with a much higher degree of accuracy than the traditional land cover data set.

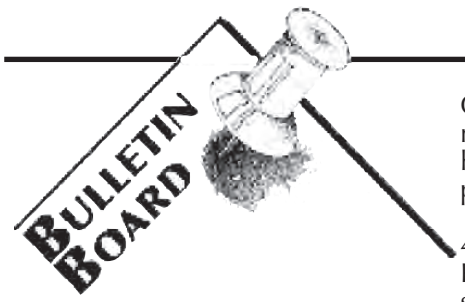
This open source data provides closer to real-time information and should be used for every land use decision. In fact, in Anne Arundel County, the data recently revealed that the county was losing trees faster than almost any other county in the state, informing the recent change in the law.

This cutting-edge data has the potential to change Chesapeake Bay restoration policy in ways that are revolutionary. Just think about how technology changed the healthcare and banking industries and imagine empowering conservation in the same way.

Better data informs better policy.

To truly be a leader, Maryland and the other watershed states should be embracing this cutting-edge data. For information, visit chesapeakeconservancy.org.

Jeffrey Allenby
Director of conservation technology
Chesapeake Conservancy



Volunteer Opportunities

Patuxent Research Refuge

The Wildlife Images Bookstore at the National Wildlife Visitor Center of the U.S. Fish and Wildlife Service's Patuxent Research Refuge in Laurel, MD, is seeking volunteers. Responsibilities include opening and closing the store, helping customers select merchandise, and operating the point of sale register. Training provided. Info: 301-497-5771, lindaleechilds@hotmail.com.

Oregon Ridge Nature Center

Upcoming volunteer opportunities at the Oregon Ridge Nature Center in Cockysville, MD, include:

≋ *Trail Guide Training:* 10 a.m.–1 p.m. Feb. 4–6. Adults. Help to lead school field trips Tuesday through Friday, year-round. No minimum time commitment. Topics include maple sugaring, insects, Chesapeake Bay. Fee of $20 for first-time attendees includes all three sessions. Preregistration required.

≋ *Maryland Master Naturalist Volunteer Training:* 9 a.m.–3:30 p.m. Mondays, March 16–May 18. Adults. Participants complete 60 hours of hands-on learning in natural history, environmental interpretation, conservation stewardship. Final certification awarded after 40 hours of volunteer service at Oregon Ridge. Application are available at the nature center or extension.umd.edu/masternaturalist (Use Piedmont Region link). Applications are accepted until the class is full. Fee is $250 upon acceptance into the program.

To preregister or for info: info@OregonRidgeNatureCenter.org or 410-887-1815.

Paradise Park

Paradise Park in Portsmouth, VA, is seeking volunteers, ages 12 and older (12–16 w/adult), for service days 9–11 a.m. Jan. 18, Feb. 1 & 29 and March 7 & 14. Tasks include weeding, planting, cleaning, pruning and light maintenance. Bring work gloves and a water bottle if possible. Registration required: paradisecreek.elizabethriver.org.

York County, PA, parks

Volunteer opportunities at York County (PA) Parks include:

≋ *Exploration Forest:* The Nature Play Area at Nixon Park Nature Center near Jacobus needs to be monitored on a regular basis for hazards such as thorny plants or poison ivy. Info: 717-428-1961.

≋ *Project FeederWatch:* 9 a.m.–4 p.m. Nixon Park near Jacobus. Project FeederWatch is a citizen science program in which participants identify and count the number of bird species visiting the center's feeders through early April. The data is forwarded to the Cornell Laboratory of Ornithology and becomes part of a nationwide data set tracking winter bird population trends. Beginners are welcome. Volunteers are asked to commit to one hour every other week. Info: 717-428-1961.

Howard County Conservancy

The Howard County Conservancy is looking for volunteers to lead elementary and secondary school hikes. No experience is necessary. Volunteers can choose which hikes they would like to do. There is no minimum or maximum time requirement. Volunteers are also needed for various events. Info: Carole at 410-465-8877, volunteer@hcconservancy.org.

MD Volunteer Angler Survey

Anglers of all ages can become citizen scientists by helping the Maryland Department of Natural Resources collect scientific data through its *Volunteer Angler Survey.* Anglers use their smart pbone to record data from their catch such as species, location and size directly to the survey. Biologists use these data to develop and implement management strategies. The artificial reef initiative, blue crab, freshwater fisheries, muskie, shad and striped bass programs have been upgraded to mobile-friendly methods. Participants are eligible to win quarterly prizes. Info: dnr.maryland.gov/Fisheries/Pages/survey/index.aspx.

Cromwell Valley Park

Cromwell Valley Park in Parkville, MD, is looking for volunteers of all ages (12 & younger w/adult) for its *Habitat Restoration Team / Weed Warrior Days* 2–4 p.m. Jan. 11 & 25 and Feb. 1 & 22. Help to remove invasive species, install native ones and maintain habitat. Service hours are available. Meet at the Sherwood House parking lot. Registration is not required. Info: Ltmitchell4@comcast.net.

CBL Visitor Center

Volunteers, ages 16 & older, are needed at the Chesapeake Biological Laboratory's Visitor Center on Solomons Island, MD. Volunteers must commit to a minimum of two, 3– to 4-hour shifts each month in the spring, summer and fall. Training sessions are required. Info: brzezins@umces.edu.

Volunteer at CBEC

The Chesapeake Bay Environmental Center in Grasonville, MD, has volunteer openings for people who only want to drop in a few times a month as well as those who would like to help out more frequently. Openings include: helping with educational programs; guiding kayak trips or hikes; staffing the front desk; maintaining trails, landscapes and the Pollinator Garden; feeding or handling captive birds of prey; maintaining birds' living quarters; participating in CBEC's team of wood duck box monitors; and other wildlife initiatives. Other opportunities include participating in fundraising events, website development, writing for newsletters and events, developing photo archives and supporting office staff. Volunteers donating more than 100 hours of service per year receive a free one-year family membership to CBEC. Info: volunteercoordinator@bayrestoration.org.

Ruth Swann Park

Help the Maryland Native Plant Society, Sierra Club and Chapman Forest Foundation 10 a.m. to 4 p.m. the second Saturday in January, February and March remove invasive plants at Ruth Swann Park in Bryans Road. Meet at the 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 the Sierra Club MD Chapter office at 9 a.m. and return at 5 p.m. Carpool contact: 301-277-7111.

Little Paint Branch Park

Help the Maryland-National Capital Park and Planning Commission remove invasive species 11 a.m. to 3 p.m. the last Saturday in January, February and March at Little Paint Branch Park in Beltsville. Learn about native plants. Sign in for a safety orientation. Gloves and tools are provided. Info: 301-442-5657, Marc.Imlay@pgparks.com.

Become a VA Master Naturalist

Virginia Master Naturalists are a corps of volunteers who help to manage and protect natural areas through plant and animal surveys, stream monitoring, trail rehabilitation and teaching in nature centers. Basic training covers ecology, geology, soils, native flora and fauna, and habitat management. Info: virginiamasternaturalist.org.

Southside VA naturalist training

The Historic Southside Chapter of the Virginia Master Naturalists program is offering basic training classes beginning Jan. 28 at the VA Cooperative Extension Office at the IOW Court House in Isle of Wight, VA. The eight-week course includes 27 hours of classroom instruction covering ecology, birds, mammals, insects, fish, reptiles, plants, wetlands, forestry, weather and geology. The course also includes 13 hours of Saturday field trips to the Great Dismal Swamp, Chippokes Plantation, Piney Grove Preserve and a tour of the Blackwater Ecological Preserve. Participants must be 14 & older. Ages 14–17 must be accompanied by an adult for all classes and field trips. Fee: $125/person; $190/couple (parent/child, spouses). Registration is due by Jan. 21. Info: vmn.historicsouthside.org, 757-365-6261

Master Gardener training

The Upper Shore (MD) Master Gardener Programs invites members of the public, ages 18 & older, to sign up for *Master Gardener Training*, a nine-week course that runs 9 a.m. to 3:30 p.m. Thursdays from Feb. 20 to April 20 at the Eastern Shore Higher Education Center on the Chesapeake College Campus in Queenstown, MD. Classes are held in conjunction with the University of Maryland Extension in Dorchester, Talbot, Queen Anne's, and Kent counties. Topics include ecology, botany, soils, plant diseases,

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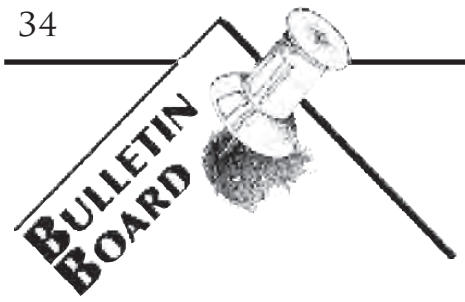
Workday Wisdom

Make sure that when you participate in cleanup or invasive plant removal workdays to protect the Chesapeake Bay watershed and its resources that you also protect yourself. Organizers of almost every workday strongly urge their volunteers to wear long pants, long-sleeved shirts, socks and closed-toe shoes (hiking or waterproof). This helps to minimize skin exposure to poison ivy and ticks, which might be found at the site. Light-colored clothing also makes it easier to spot ticks. Hats are strongly recommended. Although some events provide work gloves, not all do; ask when registering. Events near water require closed-toe shoes and clothing that can get wet or muddy. **Always bring water.** Sunscreen and an insect repellent designed to repel both deer ticks and mosquitoes help.

Lastly, most organizers ask that volunteers register ahead of time. Knowing how many people are going to show up ensures that they will have enough tools and supervisors. They can also give directions to the site or offer any suggestions for apparel or gear not mentioned here.



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insects (both pests & beneficial) and weeds. This program emphasizes community involvement and outreach as well as environmental stewardship. The $200 fee covers all costs, including the Maryland Master Gardener Handbook. Payment assistance is available based on need. For information:

- *Queen Anne's & Kent counties:* Rachel J. Rhodes at 410-758-0166, rjrhodes@umd.edu
- *Talbot County:* Mikaela Boley at 410-822-1244, mboley@umd.edu
- *Dorchester County:* Emily Zobel at 410-228-8800, ezobel@umd.edu

Adopt-a-Stream or Pond

The Prince William Soil & Water Conservation District in Manassas, VA, wants to ensure that stream cleanup volunteers have all of the support and supplies they need for trash removal projects. Participating groups receive an Adopt-A-Stream sign recognizing their efforts. For info, to adopt a stream or get a proposed site, visit waterquality@pwswcd.org. Groups can register their events at trashnetwork.fergusonfoundation.org.

American Chestnut Land Trust

The American Chestnut Land Trust in Prince Frederick, MD, needs volunteers for invasive plant removal workdays 9–11 a.m. Thursdays and 10 a.m. to 12 p.m. Wednesdays. All ages (16 & younger w/adult) are welcome. Training, tools and water are provided. Registration is required. Info: 410-414-3400, acltweb.org, landmanager@acltweb.org.

Magruder Woods

Help Friends of Magruder Woods 9 a.m. to 1 p.m. the third Saturday in January, February and March remove invasive plants in the forested swamp in Hyattsville, MD. Meet at the farthest end of the parking lot. Info: Marc.Imlay@pgparks.com, 301-283-0808, (301-442-5657 the day of event); or Colleen Aistis at 301-985-5057.

Creek Critters app

Audubon Naturalist's *Creek Critters* app lets people check their local streams' health through finding and identifying small organisms that live in freshwater, then creating health reports based on what they find.

The free app can be downloaded from the App Store and Google Play. Info: anshome.org/creek-critters. To learn about partnerships or host a Creek Critters event: cleanstreams@anshome.org.

Why aren't there more items from my state?

Many respondents in the *Bay Journal* Reader Survey wanted to know why *Bulletin Board* had significantly fewer events from their state. *Bulletin Board* lists all of items concerning environmental issues in the Chesapeake region *that it receives* by the deadlines listed elsewhere on these pages.

If you are an environmental organization, nature center or state agency, know that your constituents are looking for local programs and events in these pages! See submission guidelines on page 35.

Resources

Bilingual educator resources

Educational programs are available in English and Spanish from the Interstate Commission on the Potomac River Basin. Contact: potomacriver.org/resources/educator.

Wetlands Work website

The Chesapeake Bay Program's website, *Wetlands Work*, at wetlandswork.org, helps to connect agricultural landowners with people and programs that can support wetland development and restoration on their land.

Boating safety instruction

Boating safety classes are required for operators of recreational boats in Virginia, Maryland and the District of Columbia, as well as most other states. Those who missed the Coast Guard Auxiliary courses have online alternatives:

- *Virginians*: boat-ed.com/virginia
- *Marylanders:* boatus.org/maryland
- *DC residents & nonresidents:* boat-ed.com/districtofcolumbia
- *Comprehensive list of training options:* uscgboating.org/recreational-boaters/boating-safety-courses.php
- *Free boating safety tools & materials from the Coast Guard Auxiliary:* Info/search engine: recreational boating safety outreach.

Stormwater class

The Alliance for the Chesapeake Bay has released the Municipal Online Stormwater Training Center's *Dig Once Course*. Developed by the Local Government Program staff and the University of Maryland's Environmental Finance Center, the course provides ways that local leaders can integrate green infrastructure into community capital projects such as road construction, and school and park improvements. Interactive lessons and videos in a user-friendly format provide communities with tools to build and enhance local stormwater programs. Info: mostcenter.org.

Watershed education capsules

Prince William (VA) Soil and Water Conservation District's *Watershed Capsules*, which teach students about the important functions of watersheds, are available, first-come, first-served. Info: pwswcd.org/capsules.

Learn if your yard is Bay-Wise

Master Gardeners in Prince George's County, MD, are part of *Bay-Wise*, a program that offers free consultations on sound environmental practices for county residents to help certify their landscapes as Bay-Wise. They look for healthy lawn maintenance, efficient watering and pest control, and native trees and plants that provide shelter and habitat for wildlife, as well as suggest approaches landowners can take to reduce pollution. Those who demonstrate these practices receive *Bay-Wise* signs. Homeowners can also evaluate their property online using the *MD Yardstick*, which tallies pollution-reducing gardening and landscaping practices. To have a yard certified, though, homeowners need to have the Master Gardeners visit and evaluate their landscape. Info: Esther Mitchell: at estherm@umd.edu, or visit extension.umd.edu/baywise/program-certification. Click on "download the yardstick" to evaluate one's landscape and/or vegetable garden.

Marine debris toolkit

The National Oceanic and Atmospheric Administration's Office of National Marine Sanctuaries and the NOAA Marine Debris Program have developed a toolkit for students and educators in coastal and inland areas to learn about marine debris and monitor their local waterways. This toolkit is a collaborative effort to reduce the impact on marine ecosystems through hands-on citizen science, education and community outreach. Info/search engine: marine debris monitoring toolkit for educators.

Turf / lawn programs

For information on the Prince William (VA) Cooperative Extension's *12 Steps to a Greener Lawn / Building Environmental Sustainable Turf BEST Lawns* low-cost, research-based programs for lawn education, contact: bestlawns@pwcgov.org, 703-792-4037.

Floatable monitoring program

The Prince William Soil & Water Conservation District in Manassas, VA, needs volunteers to help assess and trace trash in streams in an effort to reduce nonpoint source pollutants in urbanized and industrialized areas in relation to the County's Municipal Separate Storm Sewers (MS4) permit. Cleanup supplies are provided. Info: waterquality@pwswcd.org.

Baltimore Biodiversity Toolkit

To help meet the need for high-quality and accessible green space in Baltimore for native plants, animals and people, the *Baltimore Biodiversity Toolkit* identifies ambassador animals that represent habitat types within, and historic to, a community. It facilitates sharing resources for supporting specific wildlife needs; monitoring and the collection of citizen science data; and developing a culture of conservation and stewardship. The toolkit contains 20 ambassador wildlife species representing four habitats. These animals require a variety of conditions that are present in high-quality environments for human, plant and animal health. Its multi-platform format helps partners prioritize community greening projects based on representative species, citizen science data and spatial analysis that includes social, economic and ecological indicators. Info: fws.gov.

Wildlife education trunks

The Maryland Department of Natural Resources is offering a variety of wildlife education trunks for use by teachers, home-school educators, naturalists and other instructors. These free, interdisciplinary tools are designed to interest students in local

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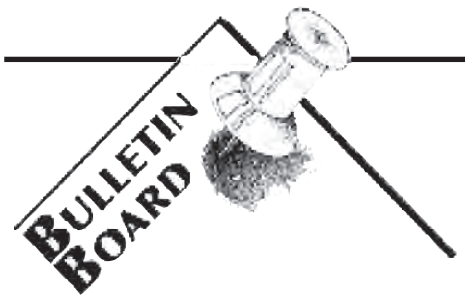

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wildlife while building on disciplines such as art, language arts, math, physical education, science and social studies. Each trunk contains an educator guide with background information, lesson plans and hands-on K–12 activities, as well as supplies, books, furs, replica tracks, videos and other hands-on items. Trunks subjects include aquatic invasive species, bats, black bears, furbearers, white-tailed deer and wild turkeys. Trunks are available at seven locations around the state and can be borrowed on a first-come, first-served basis for up to two weeks. Info/search engine: Wildlife Education Trunks.

Test for chemicals in water

Prince William County, VA, and the state's Department of Environmental Quality need volunteers to join their *Chemical Water Quality Monitoring Teams*, who collect chemical data from local streams. DEQ will teach volunteers techniques to collect and read the data. Monitoring sites are accessible for easy data collection. Info: waterquality@pwswcd.org.

Forums / Workshops

BeaverCON 2020

The Beaver Institute and Ecotone invite professionals, researchers and practitioners to learn what works in beaver conflict management and watershed restoration at *BeaverCON 2020,* 8 a.m. March 3 to 4 p.m. March 5 at the Delta Hotels by Marriott Baltimore in Hunt Valley, MD. Participants will learn how beavers provide much-needed ecological recovery, assist with restoring threatened and endangered species, improve water quality and provide important adaptations to climate change. Cost-effective techniques to coexist with beavers will also be featured. Tickets are $275. Info: info@beavercon.org, BeaverCon.org.

Forest workshop

The Carroll County Forest Conservancy District Board's spring workshop, *It's About the Forest!*, takes place 8:30 a.m. to 3 p.m. March 14 at Wesley Freedom United Methodist Church in Sykesville, MD. Attendees, ages 16+ (17 & younger w/adult) will learn about forest history; forest fires in the mid-Atlantic; forests of the future; brook trout restoration; stream corridor wildlife; stream restoration; and financial assistance to help woodland landowners maintain and restore forests. Breaks throughout the day will provide an opportunity to meet the speakers and visit exhibitor tables. Fee of $50 includes morning coffee and pastries, snacks, lunch and workshop materials. Doors open at 8 a.m. for registration and morning refreshments. Register by March 6. Info: carrollcountyforestryboard.org or Donna Davis at 410-848-9290, donnal.davis@maryland.gov.

Events / Programs

Richmond film festival

The *10th Annual RVA Environmental Film Festival,* Feb. 7–13, will showcase nearly 20 local and national films selected to raise awareness of environmental issues. Many films will bring solution-oriented messages of hope with the goal of inspiring audiences to promote planet health as an individual or by getting involved with a local environmental group. Film headliners are the *Biggest Little Farm, Butterfly Trees, The Story of Plastic,* and *The Human Element.* The festival will take place at several Richmond area locations. Admission is free. A schedule of dates, times and locations will be posted on rvaeff.org as the festival approaches.

Learn to sea kayak

The nonprofit Chesapeake Paddlers Association's annual *Introduction to Sea Kayaking* workshop takes place 8:30 a.m. to 4 p.m. March 1 at Cult Classic Brewery in Stevensville on Kent Island, MD. The course covers kayak design, paddling pointers, kayaking gear, places to paddle and transporting and storing kayaks, as well as tips from area kayakers. Boats and gear will be on display. The $30 fee includes a light breakfast, lunch and instruction. Preregistration is required. Info: sk101_2020.eventbee.com or Shelly Wiechelt at CPAShellyW@gmail.com.

Stream science classes

The Audubon Naturalist Society's Woodend Sanctuary in Chevy Chase, MD, are offering stream science classes for people, ages 10 & older, who are interested in learning about biological stream monitoring. The instructor is Cathy Wiss, a Maryland Biological Stream Survey-certified instructor. Classes include:

- *Introduction to Stream Science Series / Healthy Stream Biology Classroom Session:* 7–9:30 p.m. Jan. 23 (Section A) or, March 25 (Section B). Both sections cover the same material. Learn how benthic macroinvertebrates (organisms that live in the bottom of streams) help to assess a streams' health. Learn how to identify these organisms to the taxonomic level of order through a PowerPoint presentation and by examining preserved specimens through a hands-on session with microscopes. Follow up this class with the *Field Workshop* on March 28.
- *Advanced Series / Aquatic Insect Family ID:* 7–9:30 p.m.) Jan. 30 (*Beetles, Megaloptera & Water Bugs*); Feb. 6 (*Caddisflies & Aquatic Moths*); Feb. 13 (*Dragonflies, Damselflies & True Flies*); Feb. 20 (*Mayflies*); Feb. 27 (*Stoneflies & Review*). Learn how to identify aquatic insects to the taxonomic level of family through this series of five classes. Identification to family level greatly enhances the understanding of stream ecology and power of monitoring data.
- *Field Workshop:* 9:30 a.m.–12 p.m. March 28. Ten Mile Creek, Boyds, MD. Practice monitoring techniques. Collect, identify benthic macroinvertebrates.

The fee for each class is $25. Waivers are available for ANS monitoring program participants and middle school & high school students earning SSL credit through their school systems. Registration required: anshome.org/adults. Info: cathy.wiss@anshome.org.

Grow a green garden

Unity Gardens is presenting *Greener Gardens, One Step at a Time* 10 a.m.–1 p.m. March 7 at Woods Memorial Presbyterian Church in Severna Park, MD. Attendees of all ages can listen to Barbara Ellis discuss options that gardeners and homeowners can take to create sustainable gardens and landscapes that are attractive and healthy for humans, wildlife, pets and the environment as a whole — including the Bay and its tributaries. Tickets are $70 in advance and $75 at the door (until sold out) and include the lecture and buffet brunch. All proceeds benefit Unity Gardens. Register: unitygardens.org/events/. Info: unitygardensaa@gmail.com.

MD sport fisheries award

The Maryland Department of Natural Resources and Sport Fisheries Advisory Commission are accepting nominations for the newly created *Maryland Sport Fisheries Achievement Award*, which recognizes an individual who has provided sustained efforts in habitat management, conservation, education, research or other contributions that benefit fish and recreational fishing. The winner will be announced in July and receive a proclamation signed by Gov. Larry Hogan, DNR Secretary Jeannie Haddaway-Riccio and the chair of the fisheries c ommission. A donation will also be made to a fisheries-related organization designated by the recipient. Complete an online nomination form and submit a detailed essay describing the nominee's contributions by Jan. 31 Info/search engine: Maryland Sport Fisheries. Info: Paul Genovese at 410-260-8328, paul.genovese@maryland.gov.

Eastern Neck NWR

Friends of Eastern Neck are offering walks at 8–10 a.m. Feb. 1, and March 7 in Eastern Neck National Wildlife Refuge, in Kent County, MD. Because these walks take place in areas not usually open to the public, participants have a good chance of spotting waterfowl and wildlife. The 2-mile walks are on flat terrain and are led by a local birding expert or naturalist. Participants, who must be 13 or older, should wear boots and dress warmly. Binoculars

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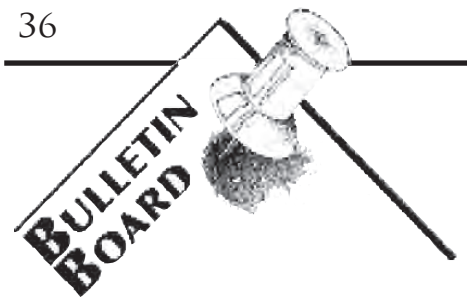
New Submission Guidelines

The *Bay Journal* regrets it is not always able to print every notice it receives because of space limitations. Priority is given to events or programs that most closely relate to the preservation and appreciation of the Bay, its watershed and resources. Items published in *Bulletin Board* are posted on the online calendar; unpublished items are posted online if staffing permits. Guidelines:

- **Send notices to kgaskell@bayjournal.com.** Items sent to other addresses are not always forwarded before the deadline.
- *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 month. Deadlines run at least two months in advance. See below.
- Submissions to *Bulletin Board* must be sent either as a Word or Pages document, or as simple text in the body of an e-mail. PDFs, newsletters or other formats may be considered if there is space and if information can be easily extracted.
- Programs must contain all of the following information: a phone number (include the area code) or e-mail address of a contact person; the title, time (online calendar requires an end time as well as a start time), date and place of the event or program. Submissions must state if the program is free, requires a fee, has age requirements, has a registration deadline or welcomes drop-ins.
- **March issue: February 11**
- **April issue: March 11**



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and cameras are encouraged. No dogs! Walks are free, but tax-deductible donations to Friends of Eastern Neck are welcome. There are no rain dates. Registration is limited. To register: http://bit.ly/ENwinterwalks19-20. Info: Melissa Baile at 410-639-7160.

Eden Mill Nature Center

Upcoming events at Eden Mill Nature Center in Pylesville, MD, include:

Paint Nights: 6:30–8:30 p.m. Jan. 17 (*Chickadee in the Snow*) & Jan. 24 (*Cardinal in the Snow*) Adults. Use acrylics to paint on a 14x18-inch canvas. Materials, instruction provided. Fee: $41.

Fly Tying for Fly Fishing: 7–8:30 p.m. Feb. 4 & March 3. Ages 8+ (15 & younger w/registered adult). Instructions, guidance, materials provided to create popular fly patterns. Fee: $8.

Nature Storybook Art for Homeschoolers Session 3: 12:45–2:45 p.m. Feb. 5, 12 & 19. Ages 5–12. Techniques include drawing, painting, collage, crafting/constructing. Fee: $45.

Preschool Nature Party - I Heart Nature Party: 10–11 a.m. Feb. 11. Ages 2–5 w/adult. Nature activities, story, craft, special snack and weather permitting, a short hike. Fee: $11.

Preregistration is required for each program. Info: edenmill.org, edenmillnaturecenter@gmail.com.

Cromwell Valley Park

Upcoming programs at Cromwell Valley Park's Willow Grove Nature Center in Parkville, MD, include:

Winter Birds & Nests: 1–2:30 p.m. Jan. 12. All ages. Take an easy walk to observe winter residents and look for nests. Then, head inside to examine nest exhibits and eggs. Fee: $4.

Winter Birding: 8–10 a.m. Jan. 18. Ages 12+ Birder John Canoles will discuss winter bird adaptations, markings. Later, drink hot chocolate, coffee at the center. Bring binoculars, if possible. Fee: $4.

River Cane Arrows: 1–3 p.m. Jan. 19. Meet at Primitive Technology Lab. Ages 14+ River cane is essentially American bamboo. Learn how to straighten, cut, fletch and glue primitive arrow with sinew, hide. Fee: $5.

Trail Tots: 10:30–11:30 a.m. Tuesdays, Jan. 21–Feb. 25 *or* Wednesdays, Jan. 22–Feb. 26. Ages 2–5 w/adult. Explore natural world through nature play, stories, crafts. Nonmobile siblings only, adult is an active participant. Dress for the outdoors. Fee: $80 for 6 sessions. Register for one series only through on-line system.

O My Gourd! 1–3 p.m. Jan. 25. Ages 8+ Create a house for wrens, chickadees or swallows using a gourd grown in the park's Children's Garden. Fee: $7.

Apples in the Oven: 1–3 p.m. Jan. 26. Ages 10+ Learn about John Chapman, aka Johnny Appleseed. Make an apple tart in the earth oven. Fee: $5.

Cabin Fever: 1–2:30 p.m. Feb. 1. All ages. Ward off winter blues by taking a hike. Return to the center for hot chocolate. Fee: $4.

Woodchuck, Groundhog, Whistle Pig, Pasture Poodle, Land Beaver, or Punxsutawney Phil? 1–2:30 p.m. Feb. 2. Ages 8+ They're all the same animal. Learn about woodchuck biology, search for a burrow, sample ground hog stew! Fee: $5.

Full Maple Moon Hike: 6–7:30 p.m. Feb. 7. Ages 5+ Accompany a naturalist to find a maple tree, tap it, then head back to the center for maple-flavored hot chocolate. Fee: $5.

Bone Tools - Osteo-technology: 1–3 p.m. Feb. 15. Adults. Meet at Primitive Technology Lab. Learn how to make an awl or a bone knife. Participants will grind on stone with sand, water. Fee: $5.

Nature Quest Winter Hike: 1–3 p.m. Feb. 16 All ages. Pick up a *Nature Quest Passport* at the center, then join a naturalist to find the markers. Fee: $4.

Maple Sugaring Weekend: Drop in any anytime from 11 a.m.–3 p.m. Feb. 22 & 23 All ages. Tap a tree, boil sap, make a pancake. Free. No registration.

Twig & Leaf Creatures: 1–2:30 p.m. Feb. 29. Ages 2–10 w/adult. Take a walk to gather twigs & leaves, then return to center to make a valley creature. Fee: $4.

Ages 12 & younger must be accompanied by an adult. Except where noted, programs are free and require registration. Info: 410-887-2503, cromwellvalleypark.org, info@cromwellvalleypark.org. Online registration: cromwellvalleypark.campbrainregistration.com. For special accommodations, call 410-887-5370 or 410-887-5319 (TTY), giving as much notice as possible.

Oregon Ridge Nature Center

Upcoming events at the Oregon Ridge Nature Center in Cockysville, MD, include:

Shoots & Letters: 10–11 a.m. Thursdays. Ages 3+ New nature-related outdoor adventure or activity each week. Jan. 16 (*Owls*); Jan. 23 (*Fox & Coyote*); Jan. 30 (*Groundhogs*); Feb. 6 (*Rocks & Minerals*); Feb. 13 (*Clouds*); Feb. 20 (*Maple Sugaring*); Feb. 27 (*Woodpeckers*). Fee: $2 per child. No registration.

Bookworm Story Time: 11–11:45 a.m. Feb. 7. Toddlers to age 6. Nature story & activity. Dress to go outdoors briefly. Free; donations appreciated. No registration.

Critters Up Close: 1–2 p.m. Saturdays & Sundays in January. All ages. Animal encounter, activity. Details available on Facebook. Fee: $3.

Maple Sugaring Weekends: 11 a.m.–4 p.m. Feb. 22 & 23 and 29 & March 1. All ages. Hike 0.75 miles to the sugar bush to tap a tree for sap. See how sap is processed, taste maple syrup, sugar. Watch the film, *Maple Sugaring Story*, or *Sugar on the Snow* demos. Free admission. Groups of 10+ must preregister.

Annual Pancake Breakfast Fundraiser: 8 a.m.–12 p.m. March 7 & 8. All ages. Breakfast, raffles, live music. Fee: $8/ages 9 & older; $4/ages 2–8; free for ages 2 & younger.

Council Speaker Series / Enjoying the Outdoors Safely in the Age of Lyme Disease: 7–8:30 p.m. Jan 20. Adults. John Aucott, director of the Johns Hopkins Lyme Disease Clinical Research Center, will discuss how to prevent, manage Lyme and other tick-borne illnesses. Free. No registration.

Wake Up Groundhog! 10–11:30 a.m. Feb. 1 & 2. Ages 5+ Learn the lore, natural history of groundhogs. Take a short hike outdoors look for their hideouts or other winter animal activity. Fee: $3.

Let's Make Tracks! 1–3 p.m. Feb. 8 & 9. Ages 4+ Hit the trails to look for tracks, scat left behind by animals. Later, create a track story to take home. Fee: $3.

Owl You Need is Love! Night Hike & Campfire: 7–9 p.m. Feb. 8. Ages 6+ Learn about native owls, meet resident birds, try to call in owls along the trails (no guarantees). End the night around a campfire with s'mores. Fee: $5. Preregistration appreciated.

Great Backyard Bird Count: 10–11:30 a.m. Feb. 15 & 16. Ages 4+ Learn about winter birds, take a light walk to search for them. Bring binoculars or borrow a pair from the center. Fee: $2.

Ages 15 & younger must be accompanied by an adult. Except where noted, registration is required for each program. (Supply email address, phone number and ages of the children attending. Payment is due within one week of registration. Make checks payable to: ORNCC and mail to the nature center at 13555 Beaver Dam Road, Cockeysville, MD 21030.) Programs are for individuals and immediate families. Groups must call center to schedule programs. Info: 410-887-1815, info@OregonRidgeNatureCenter.org. For special accommodations, call 410-887-1815, 401-887-5370 or 410-887-5319 (TTD/Deaf), giving as much notice as possible.

Anita Leight Estuary Center

Upcoming programs at the Anita C. Leight Estuary Center in Abingdon, MD, include:

Critter Dinner Time: 10:30 a.m. Jan. 18. All ages. Learn about turtles, fish and snakes while watching them eat. Free. No registration.

A Hunt for Tracks: 12:30–2 p.m. Jan. 18. Meet at Bosely Conservancy. Ages 5+ Search for signs of wildlife. Create a track mold. Fee: $4.

Nuts about Squirrels: 3–4:30 p.m. Jan. 18. *Celebrate Squirrel Appreciation Day* by learning about them, making a squirrel craft. Fee: $3.

Tails & Tots: 1 p.m. Jan. 19. Ages 0–6 w/adult. Nature stories, songs, activity. Free. No registration.

Chilly Insect Hunt: 11 a.m.–12 p.m. Jan. 25. Ages 5+ Use a magnifying glass to hunt for insects outside. Learn how insects survive winter. Fee: $3.

Winter Afternoon "Campout": 2–3:30 p.m. Jan. 25. Ages 5+ Practice putting up a tent, making a "fire"

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Chesapeake Challenge

Answers to *Snow What? Really Cool Flake Facts!* on page 26.

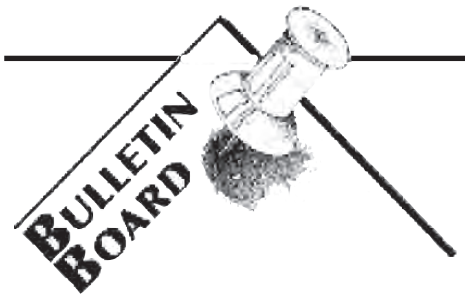
1. False. Scientists found two identical flakes during a 1988 Wisconsin storm. 2. True. The water molecules that make up snowflakes can only unite in a way that creates a six-sided ice crystal 3. D 4. D 5. D 6. B 7. C 8. A. snow squall, B. snowburst, C. blizzard 9. D 10. ancraophobia - wind; chionophobia - snow; cryophobia - cold; lilapsophobia - severe weather events

Bay Buddies

Answers to Snow Much Fun! on page 26.

1. Sledding 2. Cross-country Skiing 3. Tobogganing 4. Make Snow Forts 5. Wildlife Watching 6. Tapping Maples for Syrup 7. Skating 8. Snowball Fight 9. Ice Fishing 10. Snowshoeing

Indoor Pastime: Read Books About the Chesapeake



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indoors. Eat s'mores. Fee: $3.

≋ *Minecraft & Nature:* 3–4:30 p.m. Jan. 26. Ages 8–12. Compare Minecraft's natural world with real nature. Learn what's true, what's fantasy. Fee: $5.

≋ *2019 Summer Research Intern Presentation:* 1–2 p.m. Jan. 26. Ages 14+ Eric Amrhein will present *A Survey of Microplastics in Otter Point Creek.* Learn about the relatively new environmental issue of microplastics, including what they are, where they come from, possible impacts to the environment, how they can be measured, what to do to reduce their impact. Free.

≋ *Nature & Nosh Speaker Series/ Wildlife & Habitat Management on Aberdeen Proving Ground: Supporting the Army's Testing & Training Mission by Protecting its Biological Resources:* 3–5 p.m. Jan. 25. Ages 14+ Because military lands often are protected from human access and impact, they contain significant large tracts of valuable natural resources. Forester Jess Baylor and wildlife biologist Deidre DeRoia will discuss the challenges, opportunities associated with conducting natural resources programs, projects on APG. Fee: $5.

Except where noted, ages 12 & younger must be accompanied by an adult for all programs. Events meet at the center and require registration unless otherwise noted. Payment is due at time of registration. Info: 410-612-1688, 410-879-2000 x1688, otterpointcreek.org.

Paradise Park

Upcoming free events at Paradise Park in Portsmouth, VA, include:

≋ *Power Walks:* 8–9 a.m. Feb 22 & March 28. All ages. Walk at a brisk pace for approximately 1 mile on the nature trails. Wear comfortable shoes.

≋ *Family Nature Walks:* 12–1 p.m. Jan. 18, Feb. 1, 29 March 7 & 14. Learn about native plants, wildlife. Look for signs of wildlife. Wear comfortable shoes.

≋ *Basics of Botany:* 10 a.m.–12 p.m. Feb. 15. All ages. Learn about plants, propagation methods.

≋ *Native Mosses:* 10 a.m.–12 p.m. Jan. 25. All ages. Presentation by Vickie Shufer, director of botany for the SHRC Virginia Native Plant Society.

≋ *River Star Homes Workshop / Invasive Plant ID & Removal:* 10 a.m.–12 p.m. Feb. 8. Cyndi Wyskiewicz extension agent for Portsmouth Master Gardeners and Yolima Carr Conservation Landscape Curator for Paradise Creek Nature Park teach participants how to identify, remove invasive plants. Free. To register for this program: Contact Barbara Gavin bgavin@elizabethriver.org, 757-392-7135.

≋ *Winter Bird Walks:* 8:30–10 a.m. Jan. 25, Feb. 29 & March 28.

Children must be accompanied by adults at all events. Registration is required for all events: paradisecreek.elizabethriver.org.

CBMM Winter Speaker Series

Upcoming talks in the Winter Speaker Series at the Van Lennep Auditorium of the Chesapeake Bay Maritime Museum in St. Michaels, MD, include:

≋ *Transformation of a Waterfront: Navy Point in St. Michaels Over Two Centuries:* 2 p.m. Jan. 30. CBMM chief curator Pete Lesher will discuss the archaeological surveys and historic architecture research of the museum's grounds and its rich past.

≋ *The Packing House - Repurposing a Historic Phillips Packing Company Factory for the Future:* 5:30 p.m. Feb. 4. Eastern Shore Land Conservancy Vice President of Conservation Katie Parks will tell how this historic preservation project is connecting the area's past with its future.

≋ *Preserving the Heritage of the Nanticoke People:* 2 p.m. Feb. 13. Chief Natosha Carmine, will speak about her vision for honoring and preserving the tribe's heritage for the generations that follow.

≋ *Cultural Narratives of Sea Level Rise on the Chesapeake:* 2 p.m. Feb. 20. Washington College Associate Professor of Anthropology Aaron Lampman will share the results of a two-year study in which he and his students conducted interviews to explore the social, cultural and economic barriers to climate-induced relocation, despite scientific predictions that indicate catastrophic land loss on Maryland's Eastern Shore over the next 50 years.

≋ *Oysters in Maryland - A Glass Half Empty or Half Full?* 5:30 p.m. Feb. 25. Shannon Hood, University of Maryland Extension associate agent, will discuss research and community engagement strategies aimed at preserving the oyster's role in ecological systems and local cultural heritage.

The cost is $7.50 per talk, with a discount for those who register for all five sessions. Advance registration is encouraged. Info: cbmm.org/speakerseries.

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channel that mimics nearby natural creeks. This approach will not only drain the ponded water but also introduce tidal marsh hydrology to the site, reinvigorating vegetation growth and improving the marsh's health and longevity.

It has only been one year since the channel was dug. No daytime bird surveys have been conducted this year, and visits for other purposes have yet to detect any saltmarsh sparrows. However, it may take a few years for the vegetation to change enough to become suitable for them.

There's no simple recipe for saving saltmarsh sparrows and their marsh habitat from rising water. Each marsh has its own history, conditions and challenges. But there are several promising approaches to restoring and enhancing high marsh habitat.

Conserving lands to create corridors by which marshes can migrate, raising marsh elevation through thin-layering, improving tidal water exchange, planting transitional crops (switchgrass) in parts of agricultural fields that become saturated or too salty, and controlling or eradicating invasive plants and animals (like phragmites and nutria) are some of the tools that can be used to preserve healthy coastal marsh ecosystems.

Conserving these coastal salt marshes not only supports saltmarsh sparrows and other marsh-dependent wildlife. Our lives are affected, too. Healthy coastal marshes protect real estate from flooding, provide clean water and support multibillion-dollar fishery, recreation and tourism industries. Investing in our marshes is good for wildlife and good for people.

For information:

≋ *Atlantic Coast Joint Venture Salt Marsh Plan:* acjv.org/saltmarsh/

≋ *Atlantic Coast Joint Venture - Salt Marsh Sparrow Consevation:* acjv.org/saltmarsh-sparrow-2/

≋ *Conservation Fund - Blackwater 2100* (use these words in search engine)

≋ *Marsh Elevation at Blackwater National Wildlife Refuge* (use these words in search engine)

≋ *Wetland Restoration at Farm Creek Marsh:* md.audubon.org/sites/default/files/farm_creek_marsh_083018-web.pdf

≋ Save the Salt Marsh (video): vimeo.com/361373133/2610ef7192

Thank you to Matt Whitbeck, Blackwater National Wildlife Refuge, and David Curson, Audubon Maryland-DC, for their assistance with this article.

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

Various stages of the thin-layering project at Blackwater National Wildlife Refuge near Cambridge on Maryland's Eastern Shore, from top:
Pre-construction in October 2016 (David Curson / Audubon MD-DC)
Immediately after post-thin-layering in May 2017 (Matt Whitbeck / U.S. Fish and Wildlife Service)
October 2019 (Matt Whitbeck / U.S. Fish and Wildlife Service)

Hindsight in 2020: To make sure next 10 years count, include everyone

By Kate Fritz

To fight for change tomorrow, we need to build resilience today.
— Sheryl Sandberg

Happy 2020! As we leave the 2010s behind, I've been thinking a lot about what's in store for the Chesapeake Bay movement in the next 10 years, especially as our movement evolves and becomes more representative of the 18 million people who live, work and play in the watershed.

I sometimes wish I could better read the tea leaves for the future, but while I can't predict what will happen, I do know things will change — and our movement needs to embrace the concept o f building resiliency across both our environmental and social systems.

Resilience is defined as an ability to recover from or adjust easily to misfortune or change. This concept is frequently used to describe solutions to climate change challenges, but it can also be applied to social systems. Scientists and practitioners have been building resiliency into our ecosystem over the last few decades, and it is now time for our movement to focus efforts on our human and social systems in order to weather the next decade of unpredictable changing conditions.

So, if change is our only constant, how can we prepare? We start by building more responsive, modern and flexible social systems to build resilience for the future.

We have made strides, and, with the changing demographic trends in the Chesapeake region, our movement needs to focus more on these efforts. As the Baby Boomer generation continues to retire, and Generation X and the Millenials step onto the leadership stage, we have already started to see a shift in the voices and perspectives represented within organizations, communities and partnerships. Women continue to be promoted into leadership positions within organizations and on boards of directors.

Communities of color are creating space within our movement, such as the work of ecoLatinos in the Chesapeake Bay region and the Audbubon Naturalist Society's Taking Nature Black conference. Much like the ecosystems we are seeking to protect, our movement is actively seeking more diversity and better representation of the population that lives in this watershed.

To build a more resilient Bay restoration movement, I believe we need to focus our efforts on three things: diversifying the perspectives represented in our partnerships, creating an agenda based on equity, and giving power and voice through inclusivity.

Attendees at the 2019 Chesapeake Watershed Forum gather for presentations and discussion. The theme of the conference, "Better Together," highlighted the need to pursue environmental goals in the spirit of teamwork and inclusivity. (Will Parson / Chesapeake Bay Program)

≋ *Diversifying the perspectives represented in our partnerships:* In a future where the new norm is anything but normal, we need as many different perspectives in our partnerships as possible. This doesn't mean we just throw people together and expect positive results. It requires us to create spaces that have ground rules on behavior and expectations on outcomes, so that we all start from the same page. This work requires us to be authentic when we build our relationships, an activity that requires us to be more vulnerable and willing to step out of our comfort zones. A diversity of voices will add different perspectives, ones that will bring new and different ideas and activities to solve age-old problems — and will no doubt challenge the way we've always done things. The world faces new challenges, and our watershed requires a diversity of thought and perspective to weather whatever storms may come.

≋ *Creating an agenda based on equity:* Equity is the concept of giving everyone what they specifically need, while equality is the concept of giving everyone everything equally. The concept of equity builds from a base of equality, but recognizes that there are some communities in our watershed that have fewer resources than others. These resources could be watershed group representation or project funding, for example. Resiliency at the Chesapeake Bay regional level will require that our movement recognize the disparity across our communities and bring resources to those areas that will build capacity for more equity in the outcomes of our movement. One example is a rural local government without the tax base that a larger urban community might have, which therefore does not have the funding and resources to reduce flooding. When we create agendas that recognize the need to bring more resources to specific communities first, then we begin to create an agenda of equity.

≋ *Giving power and voice through inclusivity:* Inclusivity is a mindset that enables our movement to act and behave in ways that welcome and embrace diversity. When teams are inclusive, they work to lift each other up and do their best collective work, thereby becoming a genuine part of the solution. An inclusive team values what you bring to the table. Inclusive teams become allies with, and for, each other; it's a support network that makes the individuals that much stronger and lifts up their voices.

We must not only seek a diversity of voices but create inclusive spaces that give power and voice to those that have not traditionally been heard, helping to create a more resilient movement overall.

As we embark on the new version of the Roaring '20s, I look forward to working through the future's challenges — and promises — together. At the Alliance for the Chesapeake Bay, we are focused on continuing to build a resilient movement where we collectively bring together communities, companies and conservationists to restore the lands and waters of the Chesapeake Bay.

The work we all do in 2020 will build on the work we started in previous decades, so please, let's be present, be kind, be open, be together.

Kate Fritz is executive director of the Alliance for the Chesapeake Bay.

For ring-billed gulls, color of feathers is often 'so last year'

By Mike Burke

Identifying gulls has flummoxed many a birder, including me. Gulls take several years to reach their adult feathers. Getting there involves a complicated progression through such mysterious plumages as juvenile, first alternate, second basic, and third alternate before ending in their definite phases. For years, rather than hazarding a guess on a specific species, I have entered the generic "gull species" on my checklist.

We were confronted with this problem a few Januarys ago while birding at Shorter's Wharf on the edge of the Blackwater National Wildlife Refuge outside Cambridge, MD. A group of gulls was loafing along the shore during a clear, cold morning. I could identify a greater black-backed gull, which is a giant among gulls and has jet-black wings. And there were a couple of adult laughing gulls

There were another half dozen gulls that all appeared to be the same size, but some were brown and white while others had soft silver wings and backs. Despite their superficial differences, they were all ring-bills (*Larus delawarensis*).

Adults were easiest to identify. A black band around the yellow bill gives the bird its name and serves as a quick diagnostic sign. Their heads and necks were white with a bit of brown. They had pearl gray wings that reached back over their white tails. The wing tips were black, spotted with white dots near the end. This was their "definitive basic" plumage. Same-age males and females look alike regardless of the time of year.

Next to the two adults were four younger birds, but with brown replacing most of the silver seen in adults. In almost all avian species, by the time young birds fledge, they are the same size and shape as their parents. This was a major clue in recognizing that these birds were ring-bills, just like the adults. The fact that all age groups display that eponymous black ring around the end of the bill confirmed the identification.

One of the brownish gulls wasn't even a year old. It had extensive brown on its head, neck and chest. The wings were mostly black and brown. Only the back displayed the gray feathers of the adults. The other three birds were second-winter birds. Their wings and backs were silver, but their heads, necks and breasts showed much more brown than those of the two adults.

By the end of February, the adults would go through another molt, jettisoning the brown feathers for bright white everywhere but the wings and back.

Shortly thereafter, ring-bills would return to the same nesting area where they were born. These nesting colonies can range from a few dozen nests to tens of thousands of breeding pairs. By June, the colonies would be filled with every age group and the whole range of ring-bill plumages.

Ring-billed gulls of all ages have a black band around their yellow bill. (Dave Menke / U.S. Fish and Wildlife Service)

Most ring-bills breed far from oceans along inland freshwater beaches. The nest is a simple scrape in the ground with a bit of vegetation. Females lay two to four eggs (usually three), taking a day or two between each one. Each egg weighs about 12% of the mother's mass. By the time she lays the third egg, she is nutritionally depleted. That final egg is off to a slower and less robust start than its siblings. Fewer than half of these final eggs are likely to survive.

Eggs are a lusterless khaki green with extensive black blotches. When the chicks hatch, their natal down looks nothing like their parents. These little puffs of black-and-white are embarking on a complex molting regime that will take them three years to complete.

Ring-bills are partial mid– to long-distance migrants, and some birds don't migrate at all. Those that do may fly hundreds or even thousands of miles from their breeding territory in Canada and around the Great Lakes. In the winter, the birds fan out across both U.S. coasts, the South and into Mexico. A few continue down into Central America.

The history of ring-bills is a tale of great losses followed by recovery. Like so many other birds with brilliant white feathers, ring-bills were hunted for the millinery trade between 1880 and 1920. During this era, eggs were stolen by the hundreds from nesting colonies for use in fine dining establishments. In addition, farmers wrongly believed that the birds were pests and shot them in vast numbers. Populations plummeted.

All of that changed with the advent of the Migratory Bird Treaty and companion legislation. The species mounted a steady comeback between 1920 and 1990. The population exploded 250% over the next 20 years. Today, ring-bills are common and widespread.

Ring-bills are omnivores, going wherever they can find a steady supply of food. Their dietary mainstay is tiny fish, but they also gobble up earthworms, insects, grain, small rodents like voles, and human garbage. They frequent landfills and farm fields, shopping malls and parking lots, beaches and marinas — and boat ramps, like the one at Shorter's Wharf where the gulls had taken a break from fishing.

It has only been in recent years that I have started studying plumage variety in gulls. My trip checklists now usually note the specific gull species rather than my old generic fallback listing.

I've found that it's not as confusing as I thought. Sure, there are a lot of color variations, but ring-bills are all basically the same. Kind of like humans, now that I think of it.

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

A ring-billed gull is nutritionally depleted by the time she lays a third egg. The final egg in this nest will be off to a slower and less robust start than its older siblings. Fewer than half of these final eggs are likely to survive (Jacquelyn Jacobson / U.S. Fish and Wildlife Service)

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The canary in this 'coal mine' is the saltmarsh sparrow

BY KATHY RESHETILOFF

Along the Atlantic Coast, a quiet sparrow blends in with the grasses of the salt marsh. Often hard to spot as it gathers food to bring back to its nest, the saltmarsh sparrow is recognized by its orange eyebrow and moustache and black-streaked breast and sides.

The species is the only bird exclusive to East Coast salt marshes, nesting along the coast from Virginia to Maine. They make their nests in the higher parts of the marsh dominated by saltmeadow cordgrass (*Spartina patens*) and saltgrass (*Distichlis spicata*). Successful nesting is timed with the lunar cycle and tides. Spring tides, the highest high tides of the month, coincide with new and full moons, often flooding nests.

The most successful nests are those begun soon after the high tides of the new moon. The eggs have a chance to hatch before the arrival of the high tides of the next full moon, two weeks later. The chicks need to be developed enough to crawl safely upward on the grass so their beaks stay above water.

While these birds are adapted to typical monthly high tides and occasional large storm events, they are now threatened by increased flooding from rising seas and more frequent storms. The coastal marsh habitat that these birds need is being lost. High marsh is changed into low marsh no longer able to support saltmarsh sparrows.

The saltmarsh sparrow is the only bird exclusive to East Coast salt marshes, nesting along the coast from Virginia to Maine. (Brian Henderson / CC BY-NC 2.0)

Saltmarsh sparrow numbers have dropped as their high marsh nesting habitat is increasingly flooded by high tides and storm surges. Rangewide surveys have estimated a decline of about 9% per year between 1998 and 2012, indicating an overall loss of 75% of the saltmarsh population during that time.

Sea level rise and more frequent and intense storm events not only reduce nest success, but change the character of a marsh. As tidal waters move farther upslope, marshes can often migrate inland. Newly created marshes at the upland boundary may replace the lost older marsh. But in many places, this conversion is not producing vibrant meadows of marsh grasses. Instead, dying trees are giving way to open water or large stands of invasive phragmites, unsuitable nesting habitat for saltmarsh sparrows and other coastal wetland birds.

Although the threats may seem overwhelming, federal and state agencies, academic institutions and conservation organizations are coordinating on ways to conserve coastal marshes for saltmarsh sparrows. Pilot projects are already under way.

At Blackwater National Wildlife Refuge, 26,000 cubic yards of sediment (dredged material) from the Blackwater River were transferred in 2016 to a portion of marsh using a process called "thin-layering" to raise the surface of 40 acres of marsh. This project was implemented by the Audubon Maryland-DC and The Conservation Fund in partnership with the U.S. Fish and Wildlife Service.

Raising the surface of the marsh 4–6 inches will improve the health of marsh vegetation, allowing oxygen to reach the marsh plant roots and native marsh grasses to flourish and restore high marsh habitat.

Bird surveys have been conducted by Audubon and University of Delaware for the Saltmarsh Habitat and Avian Research Program. Results are encouraging. Although saltmarsh sparrows have yet to be detected at the restoration site, many bird species have returned, including salt marsh-dependent birds like the seaside sparrow.

Another project at Farm Creek Marsh, a 700-acre private sanctuary owned by Chesapeake Audubon Society, aims to improve the health of a newly formed marsh. Here, as trees die from saltwater incursion, they are replaced by marsh grasses. But the recently transitioned marsh is deteriorating due to the surface ponding of water. The new marsh lies in a shallow basin that prevents water from naturally draining to nearby tidal creeks.

To remedy this, the marsh was connected to the tidal creek by a 500-foot

A project to preserve high marsh habitat transferred 26,000 cubic yards of sediment into a portion of the marsh at the Blackwater National Wildlife Refuge near Cambridge, MD. The process, called "thin-layering," raised the surface of 40 acres of marsh. (Dave Harp)

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